



Portola Fine Particulate Matter (PM_{2.5}) Serious State Implementation Plan



Proposed Draft for Adoption: November 25, 2024
**by Northern Sierra Air Quality Management District Board of
Directors**

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I. Background

A. Introduction

In December 2012, the U.S. Environmental Protection Agency (EPA) strengthened the annual PM_{2.5} National Ambient Air Quality Standards (NAAQS) by lowering the level from 15 µg/m³ to 12 µg/m³ and retained the 24-hour standard of 35 µg/m³. The term PM_{2.5} refers to fine particulate matter (PM_{2.5}) two and a half microns or less in diameter. Fine particulate matter contains microscopic solids or liquid droplets that are small enough to be inhaled deeply into the lungs where they accumulate and aggravate respiratory conditions, particularly asthma. Fine particulates are associated with heart and lung disease, increased respiratory symptoms and disease, decreased lung function, and premature death. Chronic exposure to fine particulates has also been implicated in increased risk for cardiac events. Populations especially at risk include children, the elderly, and those with existing health problems.

Title I of the Clean Air Act (CAA) requires the EPA to designate areas in the United States as being in “attainment” or “nonattainment” following the adoption or revision of the NAAQS. The region is given a classification that describes the degree of nonattainment. This classification dictates specific planning requirements under the CAA, including the time provided to attain the standard.

On April 15, 2016, the EPA designated the City of Portola (City) and surrounding areas of Plumas County (County), California (Portola NAA) located in the Northern Sierra Air Quality Management District (District) as a federal Moderate nonattainment area for the annual PM_{2.5} standard of 12 µg/m³. The District adopted the Moderate State Implementation Plan for the Portola NAA in January of 2017 and submitted it to the California Air Resources Control Board (CARB). CARB approved the Moderate SIP and Portola Fine Particulate Matter (PM_{2.5}) Attainment Plan on February 16, 2017 and on February 28, 2017 submitted it to the EPA for approval. On March 25, 2019, the EPA approved portions of the Moderate SIP (84 Federal Register (FR) 11208;) which became effective April 24, 2019.

For the Moderate SIP, the District and CARB also developed enforceable measures to allow EPA to credit incentive-based emission reductions towards the attainment demonstration. According to EPA guidelines, emission reductions achieved from the implementation of an incentive program can be credited towards an attainment demonstration if they meet the following integrity elements: enforceable, quantifiable, surplus, and are permanent. To meet these goals the District developed the Portola Fine Particulate Matter (PM_{2.5}) Attainment Plan (Plan) to demonstrate

attainment of the PM_{2.5} standard by 2021. The core element of the attainment strategy is implementing the Greater Portola Wood Stove Change-out Program (Portola Change-out Program) using EPA Targeted Airshed grant funds. The main goal of the Program is to replace old, uncertified wood stoves with cleaner burning and more energy efficient home heating devices in the nonattainment area. As part of the enforceable measure, CARB must submit annual reports performing a retrospective assessment that evaluates the overall performance of the Program and develop recommendations for future enhancements to Program implementation.

On July 24, 2019, the City of Portola adopted Ordinance 354, Portola Municipal Code Chapter 15.10, *Wood Stove and Fireplace Ordinance and the Prohibition of the Open Burning of Yard Waste*, which replaced Ordinance 344 (adopted June 22, 2016) in its entirety. This Ordinance was subsequently replaced by Ordinance 359, Portola Municipal Code Chapter 15.10, *Wood Stove and Fireplace Ordinance and the Prohibition of the Open Burning of Yard Waste*, on September 9, 2020. The intent of the Ordinance is to meet the enforceable commitment outlined in the Plan, to address contingency measures; and to attempt to bring the area into attainment, alongside the woodstove changeout program funded by 2015, 2018 and 2021 EPA Targeted Airshed grants, and administered by the District. The Portola Change-out Program enforceable commitment measure was submitted into the Plan on February 28, 2017, and approved as a revision to the moderate SIP effective May 2, 2018.

On November 19, 2020, CARB addressed the CAA contingency measure requirement by approving the *Proposed Portola PM_{2.5} Plan Contingency Measure SIP Submittal*. On March 3, 2021, the EPA took final action to approve the contingency measure elements for the Portola NAA (202186 FR 12263). This action approved a SIP revision that included the revised City of Portola Ordinance 359, which further regulated PM_{2.5} emission sources to meet the Moderate area contingency measure requirement for the 12 µg/m³ annual PM_{2.5} NAAQS.

On November 1, 2022, EPA proposed to find that the Portola NAA had failed to attain the 12 µg/m³ annual PM_{2.5} NAAQS by the December 31, 2021, Moderate area attainment date. Effective on January 30, 2023, the EPA took final action determining that the Portola NAA failed to attain the 12 µg/m³ annual PM_{2.5} NAAQS by the December 31, 2021 Moderate area attainment date and designated Portola NAA as a Serious nonattainment area.

Following the Serious classification, the area is required to submit a Serious SIP to EPA by July 30, 2024 (18 months after the effective date of designation, January 30, 2023). Upon reclassification of the area from Moderate to Serious

Nonattainment under subpart 4 of part D, title 1 of the CAA, the SIP submission must meet the following Serious area requirements outlined in 40 CFR, Part 8, Section III:

1. Provisions to assure that the best available control measures, including the best available control technology for stationary sources, for the control of direct PM_{2.5} and PM_{2.5} precursors shall be implemented no later than four years after the area is reclassified (CAA section 189(b)(1)(B));
2. A demonstration (including air quality modeling) that the plan provides for attainment as expeditiously as practicable but not later than December 31, 2025, or where the state is seeking an extension of the attainment date under section 188(e), a demonstration that attainment by December 31, 2025 is impracticable and that the plan provides for attainment by the most expeditious alternative date practicable and not later than December 31, 2030 (CAA sections 189(b)(1)(A), 188(c)(2), and 188(e));
3. Plan provisions that require reasonable further progress (RFP) (CAA section 172(c)(2));
4. Quantitative milestones that are to be achieved every three years until the area is redesignated to attainment and that demonstrate RFP toward attainment by the applicable date (CAA section 189(c));
5. Provisions to assure that control requirements applicable to major stationary sources of PM_{2.5} also apply to major stationary sources of PM_{2.5} precursors, except where the state demonstrates to the EPA's satisfaction that such sources do not contribute significantly to PM_{2.5} levels that exceed the standard in the area (CAA section 189(e));
6. A comprehensive, accurate, current inventory of actual emissions from all sources of PM_{2.5} and PM_{2.5} precursors in the area (CAA section 172(c)(3));
7. Contingency measures to be implemented if the area fails to meet any requirement concerning RFP or quantitative milestones or fails to attain by the applicable attainment date (CAA section 172(c)(9)); and
8. A revision to the nonattainment new source review program to lower the applicable "major stationary source" ^[4] threshold from 100 tons per year (tpy) to 70 tpy (CAA section 189(b)(3)) and to satisfy the subpart 4 requirements for major stationary sources of PM_{2.5} precursors (CAA section 189(e)).

The attainment date for a Serious area “shall be as expeditiously as practicable but no later than the end of the tenth calendar year beginning after the area's designation as nonattainment. Since EPA designated the Portola NAA as nonattainment for the 12 µg/m³ annual PM_{2.5} NAAQS effective January 15, 2015, the attainment date for the Portola NAA is December 31, 2025.”

The Portola NAA will remain nonattainment until the PM_{2.5} annual design value meets the 12 µg/m³ annual PM_{2.5} standard and other maintenance demonstrations and requirements are met.

B. Nonattainment Area Description

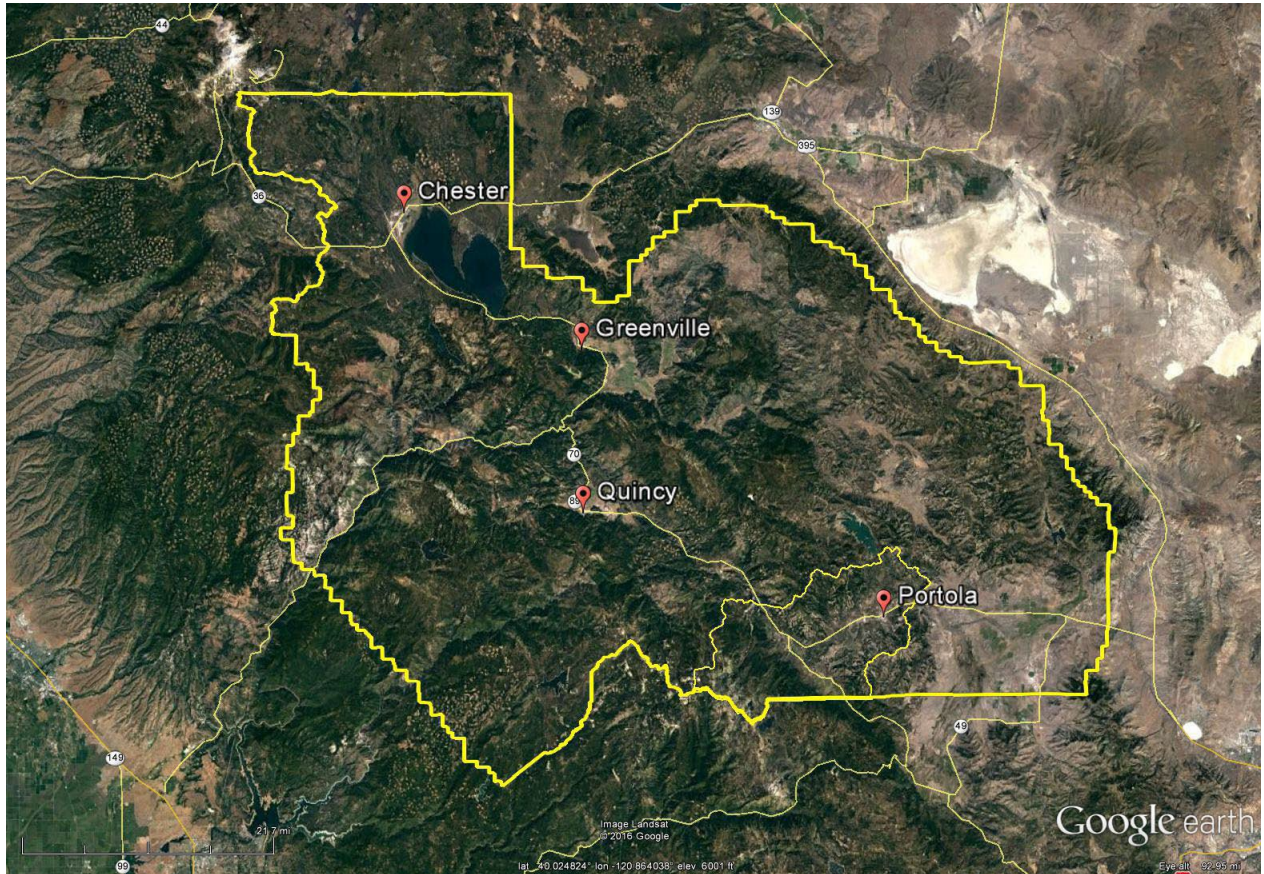
The Portola NAA includes the City of Portola and the nearby communities of Iron Horse, Delleker, C-Road, Mohawk Vista, Plumas-Eureka, Blairsden-Graeagle, Gold Mountain, Whitehawk, Clio, Johnsville, and portions of Lake Davis. The Portola NAA boundaries are consistent with previously established PM_{2.5} nonattainment boundaries for California State PM_{2.5} Standard. CARB utilized hydrographic boundaries based on watersheds. A watershed boundary defines a ridge of high land that separates areas drained by different river systems. Specifically, CARB identified the Portola Valley State PM_{2.5} NAA as that portion of Plumas County within the following Super Planning Watersheds: Humbug Valley, Sulphur Creek, Frazier Creek, and Eureka Lake.

Plumas County is large, covering 2,613 square miles. The vast majority of the area is zoned as Timber Resource Land, with more than 75 percent of the county owned and managed by the federal government. Plumas County has approximately 20,000 residents with four main population centers, all rural in character and separated by mountainous terrain: Portola, Quincy, Greenville, and Chester (Figure 1). The Portola NAA is located in an intermountain basin isolated by rugged mountains, transitioning from conifer-dominated forests to the north, west and south, to grassland/high desert to the east. The mountain chains that dominate the topography of Plumas County drastically affect the climate of the Portola NAA. First, as the Portola NAA is on the leeward side of the Sierra range, it receives much less precipitation than areas further west and averages only 20 inches annually¹. Even Quincy, less than 30 miles to the northwest receives twice the amount of precipitation, averaging 40 inches a year. Second, the Portola NAA's high elevation, 4,890 feet, affects the temperature and precipitation patterns. Third, the Portola NAA has very cold temperatures - the average daily low temperature for the 6-month period of October through March is

¹ Based on data from the Western Regional Climate Center (<http://www.wrcc.dri.edu/>) Cooperative Climatological Data Summaries (<http://www.wrcc.dri.edu/climatedata/climsum/>).

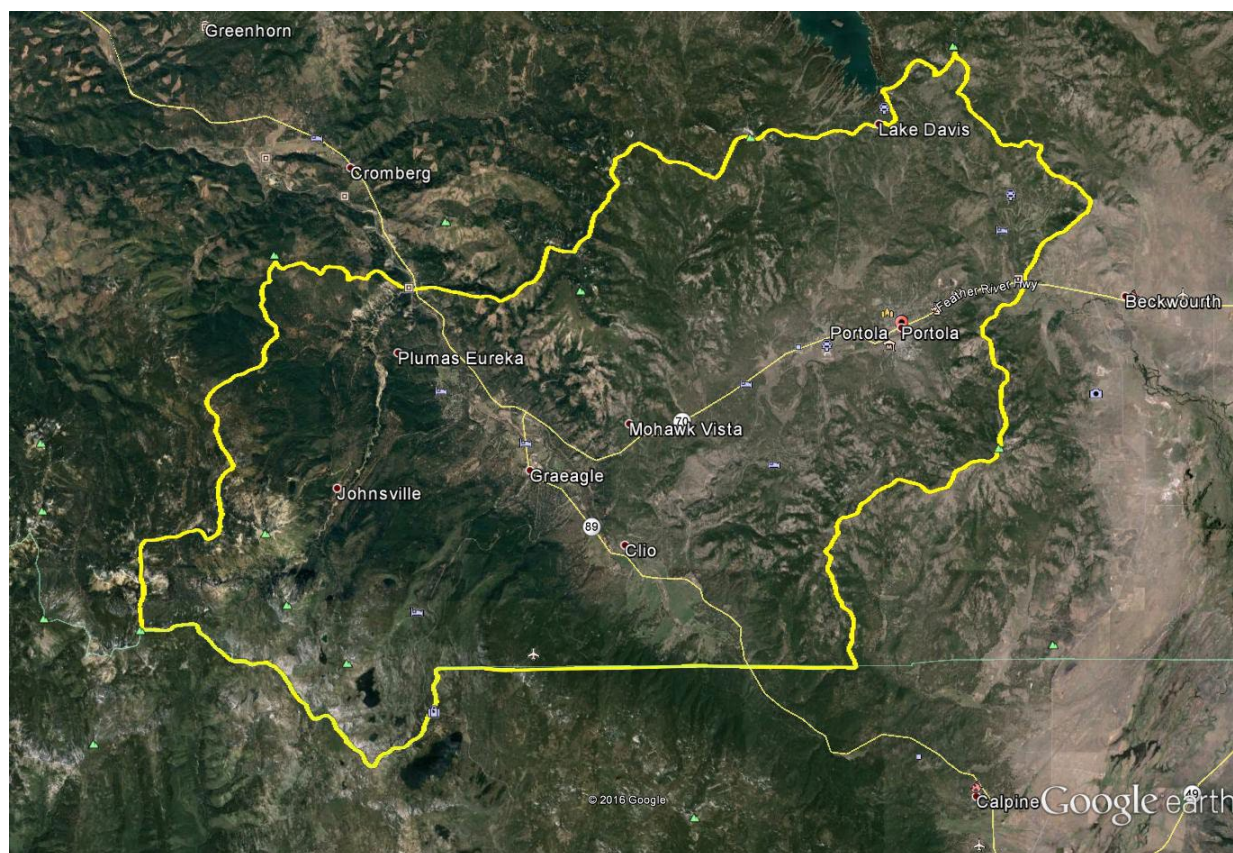
21.8 degrees Fahrenheit, and the Portola area sees frost an average of 218 days per year. Fourth, the simple fact that the Portola area is tightly surrounded on three sides by mountains that impairs pollution dispersion, especially when there is a low temperature inversion, as is often the case in the winter.

Figure 1. Map of Plumas County, California



The overwhelming majority of the population of the Portola NAA is within the City of Portola, the only incorporated city. The City has a total area of 5.4 square miles and is located on the Middle Fork of the Feather River in an isolated bowl formed by surrounding mountains where smoke can easily become trapped by wintertime inversion conditions. The city population is about 2,100. Figure 2 shows the Portola NAA.

Figure 2. Portola NAA



Prevailing winds in the Portola NAA are from the southwest during the day, and many days are quite windy. At night, however, the air is often very still, although there is sometimes a gentle breeze from the east that follows the Middle Fork of the Feather River downstream through a convoluted canyon system.

Portola's unemployment rate is well above the national and state averages, reaching 22.3 percent in 2010². The 2011 median home value was only 41 percent of the state median, and the median household income was approximately half (54 percent) that of the state. Although the City of Portola is considered economically challenged, nearby communities within the Nonattainment Area, considered resort/golf course communities, have higher median incomes.

C. History of Efforts to Address PM_{2.5}

Over the years, the District has made efforts towards reducing particulate matter pollution in the Portola NAA. The District has implemented a mandatory District-wide

² <https://www.bestplaces.net/economy/city/california/portola>

no-burn/permissive burn day for outdoor residential burning for over 25 years and informs the public, on a daily basis, whether predicted meteorological conditions will provide enough dispersion to allow for outdoor burning. In 2002, the City adopted a change-of-ownership city ordinance that requires replacement or removal of uncertified stoves when a home is sold. The uncertified stoves do not have pollution control systems built into them. Certified stoves, on the other hand, have been tested by an independent third party at the time of manufacture to assure they meet emissions performance standards. They carry an EPA certification sticker. The ordinance also requires that all newly installed wood burning appliances be EPA certified.

D. Purpose of the Attainment Plan

The annual standard for PM_{2.5} is met whenever the three-year average of the annual mean PM_{2.5} concentrations for a designated monitor is less than or equal to 12.0 µg/m³. Since 2013, the PM_{2.5} monitor located in Portola has exceeded the standard and has a 2021 design value of 12.6 µg/m³. This document provides the pathway for meeting the annual PM_{2.5} standard by December 31, 2025. The attainment plan describes emissions contributing to the PM_{2.5} problem and outlines emission reduction strategies. The plan demonstrates that these strategies will reduce PM_{2.5} concentrations in the area below the levels of the annual by the end of 2025. This plan will be considered by CARB and, if adopted, submitted for approval to EPA.

II. Ambient Air Quality Monitoring

The Portola NAA air pollution problems result from the combination of wood smoke emissions from home heating devices, meteorological conditions adverse to the dispersion of those emissions, and mountain terrain that traps pollutants close to the source. This chapter describes the monitoring efforts in the area and summarizes PM_{2.5} air quality trends and statistics. It also includes a summary of analyses which point to residential wood burning as the primary contributor to the PM_{2.5} mass.

A. History of Air Quality Monitoring

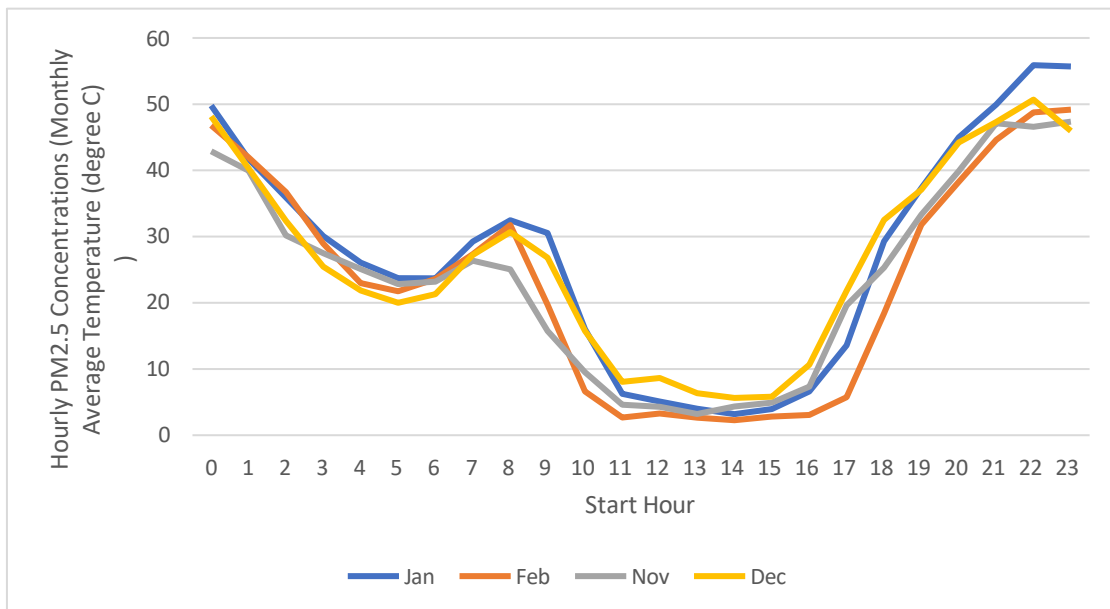
The PM monitoring in the area started early in 1995 to address City's air quality concerns when the District started collecting PM₁₀ data using a Sierra Andersen Model 1200 monitor. This early data collection confirmed that PM₁₀ concentrations were elevated during winter. Additionally, the monitor operator noted that filters were dark and gave off the distinctive heavy odor of wood

smoke. This was in sharp contrast to summertime samples that were light gray in color, had no discernible smoke odor, and contained a low mass of PM₁₀. This implied that wood combustion was a source of PM₁₀ on the sample filters. In 1997, the District enlisted CARB’s help with more advanced sampling and filter analysis. For one year, from December 1997 to December 1998, the District operated an Andersen Dichotomous Sampler in parallel with the PM₁₀ sampler, which confirmed a significant contribution from PM_{2.5} during winter, a strong indication of wood smoke impacts.

In late March of 1999, the District began operating an Andersen Sequential PM_{2.5} Federal Reference Monitor (FRM) on a 1-in-3-day schedule and PM₁₀ sampling was subsequently considered unnecessary and discontinued in June of 2000. In January of 2003, in cooperation with CARB, the District began operating a Met One Beta Attenuation Monitor Model 1020 (BAM 1020) PM_{2.5} monitor in parallel with the PM_{2.5} FRM monitor. The BAM 1020 collects continuous hourly data. The BAM 1020 data confirmed a nocturnal elevation in PM_{2.5} concentrations, further demonstrating that fluctuations of PM_{2.5} in the air had the same daily pattern as the levels of wood use and atmospheric dispersion.

Figure 3 demonstrates a pattern seen in Portola nearly every day during the winter months, from November through February. During cold stagnant periods, temperature inversions combined with an increase in fireplace and wood stove use often lead to elevated concentrations overnight and into early morning.

Figure 3. Diurnal Pattern in Winter PM_{2.5} Concentrations, 2020-2022



In January of 2003, the District began operating a Spiral Aerosol Speciation Sampler (SASS) at Portola as part of the State and Local Air Monitoring Station (SLAMS) Chemical Speciation Network (CSN). In April of 2009, as part of the nationwide effort to make carbon sampling more comparable to the Interagency Monitoring of Protected Visual Environments (IMPROVE) sampling, carbon sampling was switched to the URG 3000N instrument. Data from these samplers are routinely analyzed by CARB.

From 2000 through early 2013, the Portola PM_{2.5} monitoring site was located at 161 Nevada Street. Over the years, as the surroundings have changed, the site no longer met siting criteria and needed to be relocated. In 2013, the site was relocated to 420 Gulling Street (Portola-Gulling). In Summer of 2022, a BAM 1022 was installed at the Portola-Gulling site.

From 2013 to 2015, the data for the two sites have been combined into a single data stream for the purpose of calculating design values and tracking trends in PM_{2.5} concentrations. The combined data for the two sites were used as the basis for the nonattainment determination and for developing Moderate SIP. Portola-Gulling is the only PM_{2.5} monitoring site in the Portola NAA and includes the monitors listed in Table 1. In October of 2022, the Federal Equivalence Method (FEM) replaced the FRM monitor at the Portola-Gulling site.

Table 1. List of PM_{2.5} Monitoring Equipment at Portola-Gulling Site

AQS Parameter	Hourly Or Daily?	Monitor Type	AQS Method	Instrument	FRM/FEM?	Start	End
88502	Daily	LoVolSSI	810	Met One SASS/SuperSASS Teflon	No	7/1/2013	
88101	Daily	LoVolSSI	145	R & P Thermo Fisher Model 2025 PM-2.5 Sequential Air Sampler w/VSCC	FRM	5/24/2014	2/8/2023
88101	Daily	LoVolSSI	118	R & P Thermo Fisher Model 2025 PM _{2.5} Sequential w/WINS	FRM	7/1/2013	5/23/2014
88501	Hourly	BAM	731	Met-One BAM-1020 W/PM _{2.5} SCC	No	7/1/2013	2/29/20
88101	Daily	LoVolSSI	145	R & P Thermo Fisher Model 2025 PM-2.5 Sequential Air Sampler w/VSCC	FRM	10/30/2015	8/9/2022
88502	Hourly	BAM	731	Met-One BAM-1020 W/PM _{2.5} SCC	No	3/1/2020	7/31/2022
88502	Hourly	BAM	733	Met-One BAM W/PM _{2.5} VSCC	No	8/1/2022	8/31/2022
88101	Hourly	BAM	209	Met One BAM-1022 Mass Monitor w/ VSCC or TE-PM _{2.5} C	FEM	10/1/2022	

B. Design Values

Between 2014 and 2022, PM_{2.5} concentrations at the Portola NAA were significantly impacted by wildfires. Figure 4 illustrates trends in annual design values calculated using two sets of data. One set includes all collected data, and the second set excludes data affected by atypical wildfire events. Analyzing the second set of data is important for understanding trends and evaluating the impact of the Greater Portola Woodstove Change-out Program (Portola Change-out Program). The first home heating device funded by the Portola Change-out Program was installed on May 10, 2016. By December 31, 2022, 547 home heating devices in the Portola NAA were replaced with cleaner burning and more efficient alternatives. Upgrading home heating devices to better technology was only one aspect of the comprehensive strategy designed to reduce emissions from home heating. Chapter IV describes the Portola Change-out Program in more details. Since the inception of the Portola Change-out Program, annual design values decreased 15 percent. Annual statistics are listed in Table 2.

Figure 4. Trends in PM_{2.5} Annual Design Values

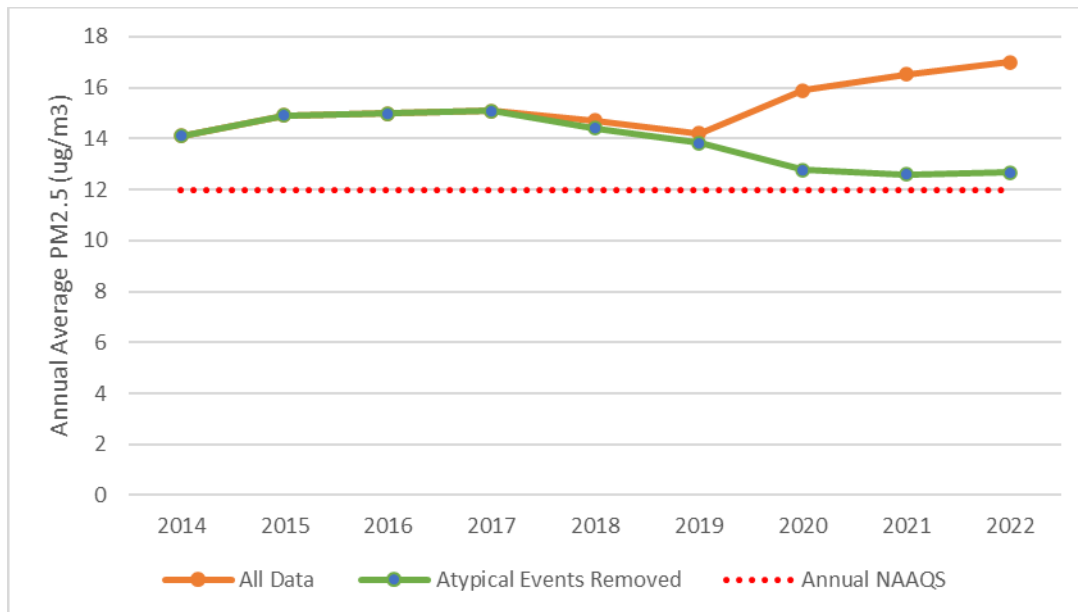


Table 2. 2015-2022 Annual PM_{2.5} Statistics

Statistic	2015	2016	2017	2018	2019	2020	2021	2022
Annual Average (All Data)	15.6	13.9	15.8	14.6	12.2	20.9	16.4	13.7
Annual Average (Atypical Events Excluded)	15.6	13.9	15.8	13.6	12.2	12.6	13.1	12.3
Annual Design Value (All Data)	14.9	15.0	15.1	14.7	14.2	15.9	16.5	17.0
Annual Design Value (Atypical Events Excluded)	14.9	15.0	15.1	14.4	13.8	12.8	12.6	12.7

The 2021 design value of 12.6 µg/m³ will serve as a base design value for estimating emission reductions needed for attainment and rollback modeling in Chapter V. The 2021 design value is based on data collected between 2019 and 2021. Since 2020 and 2021 coincided with the COVID-19 pandemic, ambient air quality on these two years would reflect higher emissions from burning wood for home heating because residents were working and studying at home due to social distancing restrictions. While schools and many businesses use propane for heat, most households use wood for heat, so spending a lot of time at home lead to increased emissions from woodstoves and fireplaces.

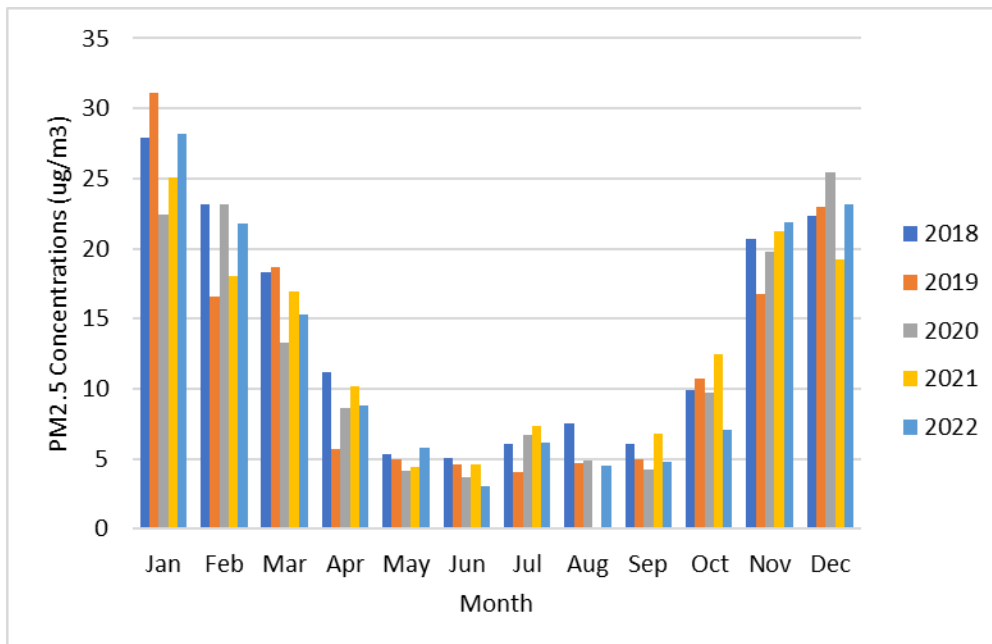
Outside of wildfire season, PM_{2.5} concentrations in the Portola NAA are typically higher during the winter months because strong overnight temperature inversions limit vertical mixing as emissions of PM_{2.5} increase due to residential wood burning. These inversions are strengthened by the high terrain surrounding Portola, which acts as a barrier to wind and allows inversions to become more stable as cold air flows downslope into the valley, trapping pollutants near the surface. Temperature inversions were common in Portola throughout winter and into spring, with below-normal temperatures observed from November through April. Temperatures on days with PM_{2.5} concentrations above the curtailment threshold averaged 7°F below normal, with average lows below 15°F.

C. Nature of the Problem

As a result of its geography and climate, elevated PM_{2.5} concentrations at the Portola NAA are limited to fall and winter. The area is susceptible to frequent surface temperature inversions, which play a major role in Portola NAA's air quality, especially during winter when these inversions are strongest. The Portola Valley and its surrounding mountains act like a bowl, trapping a dense shallow layer of cold air

under a layer of warm air. Warm air above cooler air acts like a lid, suppressing vertical mixing and trapping the cooler air at the surface. The strength and duration of the inversion will regulate PM_{2.5} levels by confining them to a shallow vertical layer near the surface. Residents of the area typically burn wood for heat and the combined emissions from wood stoves and fireplaces are trapped in this shallow surface layer, leading to elevated PM_{2.5} concentrations. Figure 5 illustrates seasonality in PM_{2.5} concentrations as well as year-to-year variations driven by the strength and duration of the inversion and fluctuations in winter temperature. Depending on the year, the average concentrations during the two highest months, January and December ranged from 19.2 µg/m³ to 31.1 µg/m³.

Figure 5. Monthly Average PM_{2.5} Concentrations at Portola (2018-2022)



Burning wood for heat is the main source of ambient PM_{2.5} levels and all other sources are insignificant as demonstrated by the following analyses:

- 1) Chemical composition data;
- 2) Positive Matrix Factorization (PMF) modeling;
- 3) Strong statistical correlations between PM_{2.5} mass and levoglucosan; and
- 4) Diurnal patterns in PM_{2.5} concentrations.

1. Chemical Composition

Ambient monitoring data from speciation samplers located at the Portola monitoring site were used to assess the chemical composition of PM_{2.5}. Two samplers and

multiple filter media are used to determine chemical speciation profiles. A SASS sampler is used to collect PM_{2.5} constituents including ions (sulfate, nitrate, sodium, potassium, and ammonium) and numerous trace elements while a URG 3000N (URG) sampler is used for collecting elemental and organic carbon data. Both speciation samplers (SASS and URG) operate on a 1-in-6-day sampling schedule. PM_{2.5} gravimetric mass and elements are measured by X-ray fluorescence (XRF) on Teflon-membrane filters. Ions are measured by ion chromatography on nylon-membrane filters. Organic and Elemental Carbon (OC and EC respectively) are measured by Total Optical Reflectance (TOR) method on quartz-fiber filters. Additionally, wood burning markers, including levoglucosan, mannosan, and galactosan are analyzed by Gas Chromatography – Mass Spectrometry (GC-MS) on Teflon membrane filters. The data are analyzed by CARB's Monitoring and Laboratory Division and reported to EPA's Air Quality Systems (AQS) database. Currently applied measurement technology does not quantify all measured components, so the sum of the measured species is always less than the full measured mass. PM mass reconstruction applies multipliers to measured species to estimate unmeasured components. To reconstruct PM_{2.5} mass concentrations using chemical composition data, assumptions about the molecular form of the species must be made.

Table 3 presents assumptions used in this report. Sulfate and nitrate are assumed to be neutralized to ammonium sulfate [(NH₄)₂SO₄] and ammonium nitrate (NH₄NO₃) with the NH₄⁺ fraction accounted for by applying stoichiometric multipliers as specified in Table 3. EC is used without any multipliers. Geological material is estimated following the formula utilized by the IMPROVE Program. Elements are estimated by summing the remaining elements by XRF, excluding sulfur and geological elements.

One of the principal sources of uncertainty in PM_{2.5} mass reconstruction is the organic carbon (OC) to organic matter (OM) conversion factor. OM is a complex mixture of hundreds of individual compounds with varying composition and concentration. Thermal optical methods are used to estimate the OC on the PM_{2.5} filter. These methods, however, quantify only the carbon present in the samples, and not the total OM, which can include hydrogen, oxygen, nitrogen, and other elements in addition to carbon. Multiplicative factors have been used to estimate OM from OC measurements, but these factors represent average behavior and can vary substantially depending on the location or the season. We estimated the OM as a difference between measured PM_{2.5} mass on the speciation sampler and the sum of reconstructed components, including ammonium nitrate, ammonium sulfate,

elemental carbon, geological material, and trace elements. If OM estimated in this fashion was lower than the measured OC, OC was used to represent OM on that day. Since elemental and organic carbon data are missing for May 17 through August 9, 2022, additional analysis was performed in which carbonaceous aerosols, which include elemental and organic carbon, were calculated as a difference between measured PM_{2.5} mass and the sum of reconstructed components, including ammonium nitrate, ammonium sulfate, geological material, and trace elements.

Table 3. Form of Molecular Species Assumed in this Report

Component	Formula
Ammonium Nitrate	1.29 x Nitrate
Ammonium Sulfate	1.38 x Sulfate
Organic Matter	Estimated as a difference between measured PM _{2.5} and the sum of ammonium nitrate, ammonium sulfate, elements, geological, and EC
Carbonaceous Aerosols	If carbonaceous aerosols are reported instead of OM and EC, they are calculated as a difference between measured PM _{2.5} and the sum of ammonium nitrate, ammonium sulfate, elements, and geological
EC	As measured
Geological	2.2 x Aluminum + 2.49 x Silicon + 1.63 x Calcium + 2.42 x Iron + 1.94 x Titanium
Elements	Sum of remaining species (excluding S, Al, Si, Ca, Fe, and Ti)

During the COVID-19 pandemic, collection of speciation samples was suspended after quarter 1 of 2020 and it was not resumed until quarter 2 of 2021. Therefore, quarter one of 2020 data were combined with quarters 2 through 4 of 2021 data to generate a combined 2020/2021 annual average.

Carbonaceous aerosols, which include OM and EC, are responsible for 86 percent of PM_{2.5} mass annually and 94 percent on an average exceedance day (Figure 6 and

Figure 7). The combined contribution from all other components (geological material, elements, ammonium nitrate, and ammonium sulfate) was on average under $2 \mu\text{g}/\text{m}^3$ annually.

Figure 6. Portola 2018-2021 Annual Average $\text{PM}_{2.5}$ Composition

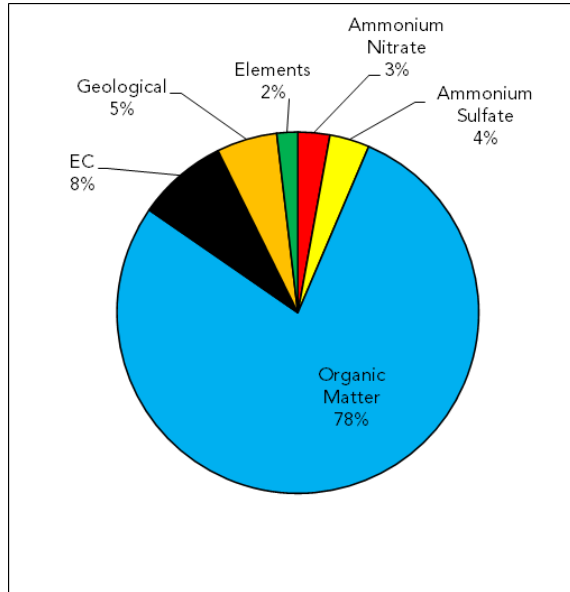
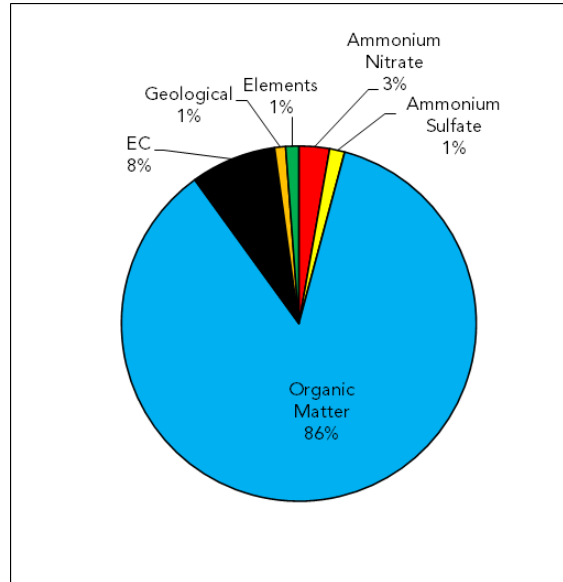
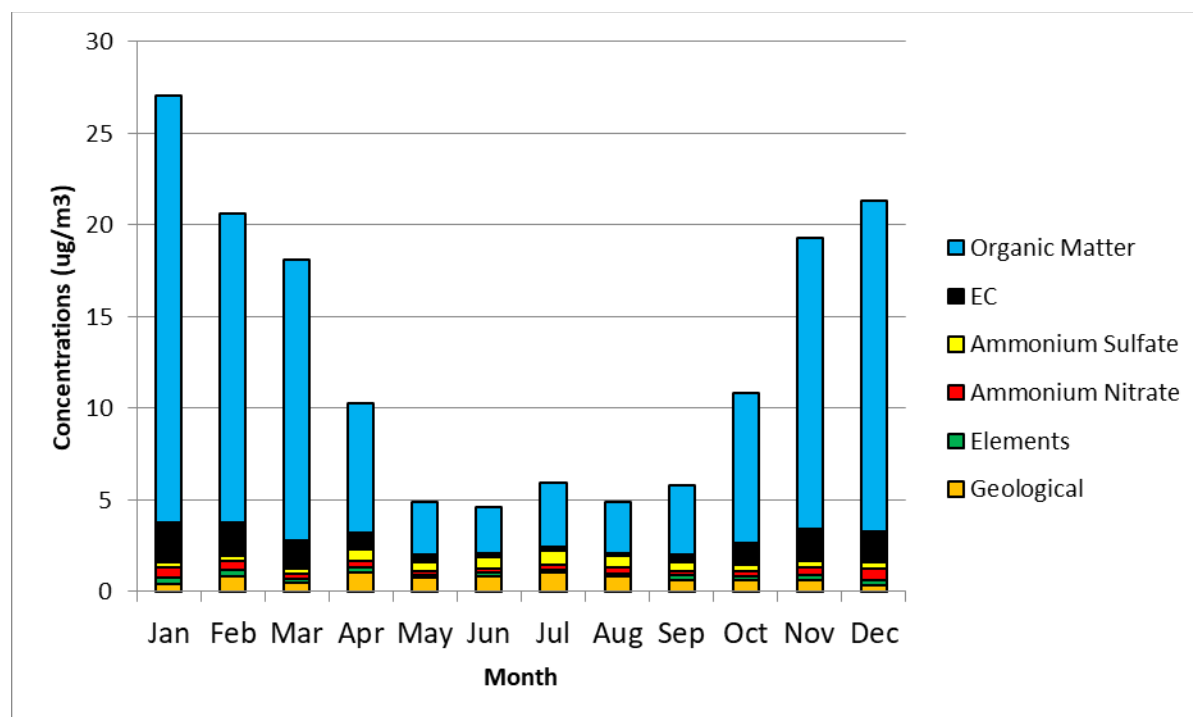


Figure 7. Portola 2017-2022 Exceedance Day $\text{PM}_{2.5}$ Composition



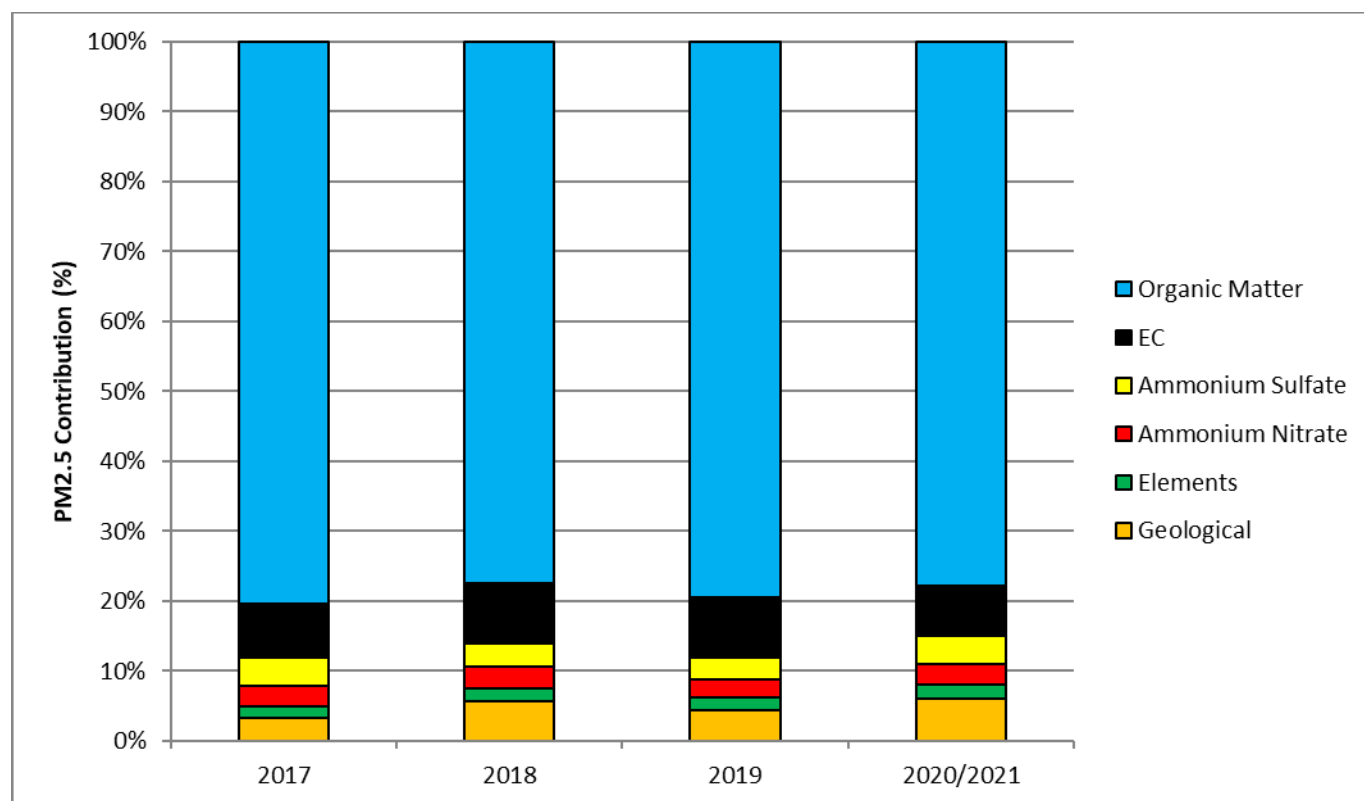
The seasonal pattern further illustrates the overwhelming contribution from carbonaceous aerosols (Figure 8). Any increase in $\text{PM}_{2.5}$ is driven by these aerosols while concentrations of all other components combined (ammonium nitrate, ammonium sulfate, geological material, and elements) are low, about $2 \mu\text{g}/\text{m}^3$ on average, and remain fairly flat throughout the year. During the six coldest months (Jan, Feb, March, Oct, Nov, and Dec) carbonaceous aerosols are responsible for over 90 percent of the mass.

Figure 8. Portola 2018-2021 Monthly Average PM_{2.5} Composition



Due to the nature of the problem and overwhelming contribution from residential wood burning, chemical composition at Portola remained the same from year to year. Figure 9 illustrates percent contribution to PM_{2.5} mass from 2017 through 2020/2021 combined years. During this period, carbonaceous aerosols contributed between 84 and 89 percent of the total PM_{2.5} mass annually. Since the composition did not change over time, the PMF modeling, as described in Section 2 and used in the Moderate SIP is still applicable and will be used as part of the rollback modeling.

Figure 9. Percent Composition to PM_{2.5} between 2017 and 2020/2021



2. Positive Matrix Factorization

Positive matrix factorization (PMF) is a multivariate source apportionment method that attributes PM_{2.5} observed concentrations to sources through statistical and meteorological interpretation of data. PMF is one of several EPA recommended receptor modeling methods for understanding of source impacts on ambient PM_{2.5} levels. To identify major PM_{2.5} sources affecting Portola monitoring site, PMF2 (a bilinear PMF model) was used in this study.

PMF contributions were calculated as a five-year weighted average. Wood burning was identified as a major source of PM_{2.5}, contributing 76.1 percent of the mass annually and 86 percent on an average exceedance day. Burning of garbage in stoves, fireplaces, or outside in open burn piles contributes another 3 percent of the mass. The two sources combined contribute almost 80 percent of the annual mass and 90 percent on the exceedance day. Figure 10 and Figure 11 illustrate annual and 24-hr source contributions, respectively, based on the PMF2 model and the full PMF report is included in Appendix A.

Figure 10. 2011-2015 Annual Average Source Contribution

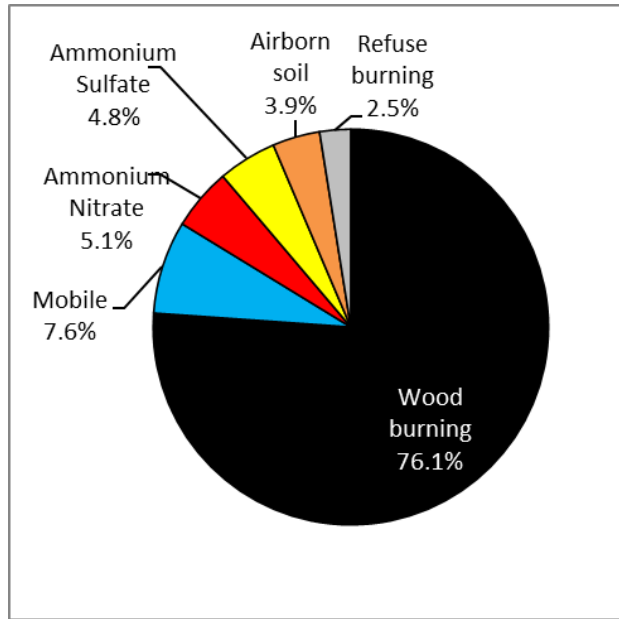
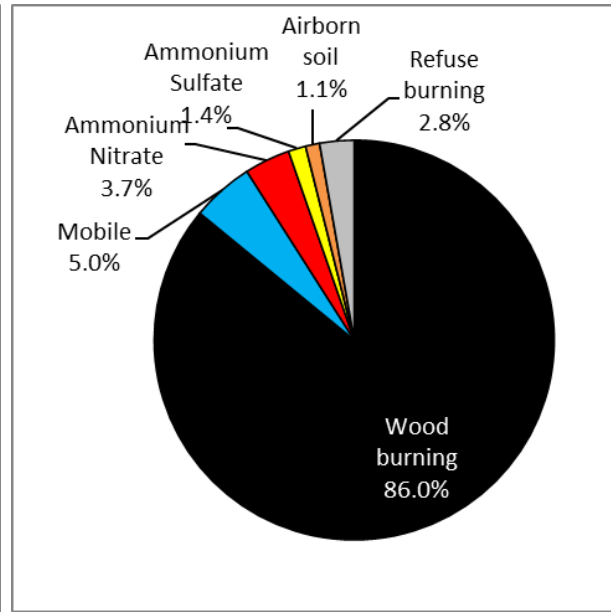


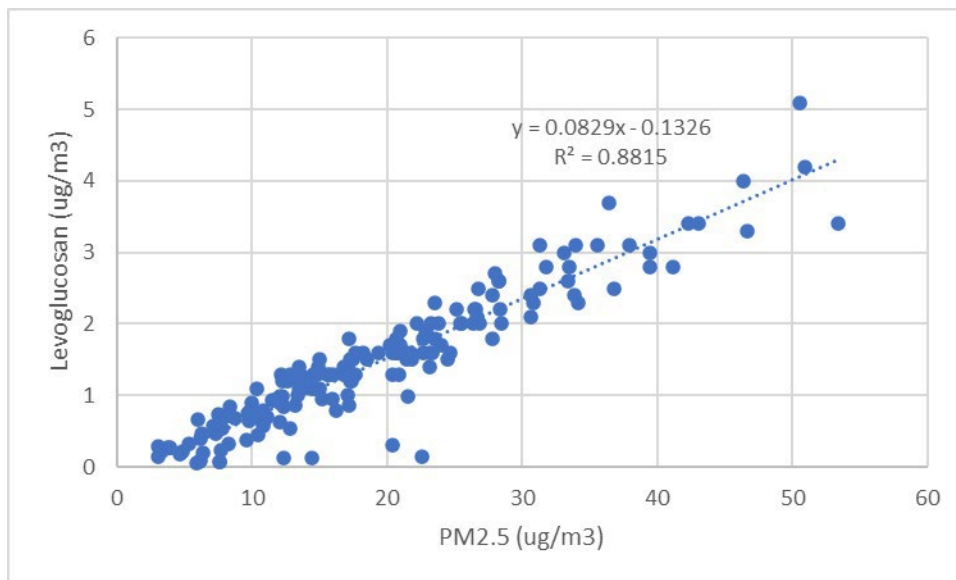
Figure 11. 2011-2015 Exceedance Day Average PM_{2.5} Source Contribution



3. Strong Correlation between PM_{2.5} Mass and Levoglucosan

High correlations between PM_{2.5} concentrations and levoglucosan, a wood burning marker, further support the significant impact of wood burning emissions on local PM_{2.5} concentrations (Figure 12).

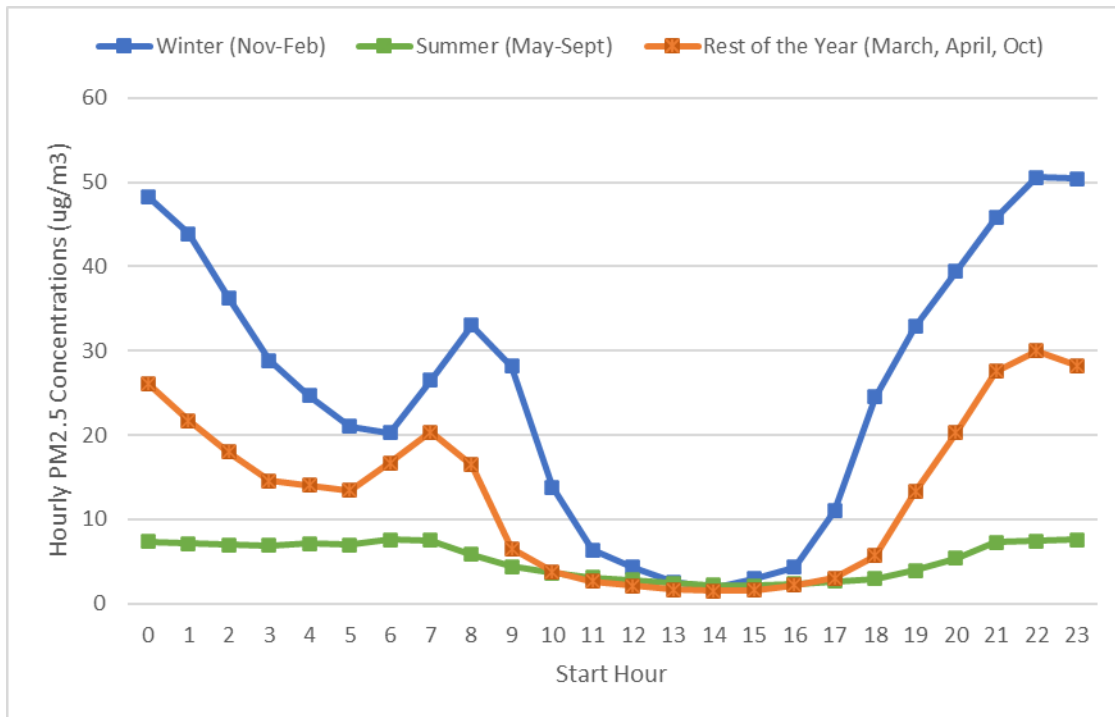
Figure 12. Correlation Between PM_{2.5} Mass and Levoglucosan (2017-2022)



4. Diurnal Patterns

Diurnal patterns of PM_{2.5} concentrations, based on the non-FEM data collected at the site, also implicate wood burning as a major source of PM_{2.5}. Residents of the Portola NAA burn wood for heat and the overall diurnal patterns in PM_{2.5} concentrations are consistent with home heating use and subsequent atmospheric dispersion. Figure 13 illustrates these patterns by season. During summer, the PM_{2.5} concentrations are nearly flat throughout the day. As temperatures drop in winter and people start burning wood for heat, morning and evening concentrations markedly increase with nighttime peak concentrations reaching up to 50 µg/m³ and daytime low concentrations of less than 2 µg/m³. Even during winter, mid-day concentrations are low reflecting less wood use and improved dispersion. Vertical mixing (driven by solar radiation) and wind speed peak at mid-day. This, along with reduced emissions from wood smoke, results in mid-day minimums in PM_{2.5}.

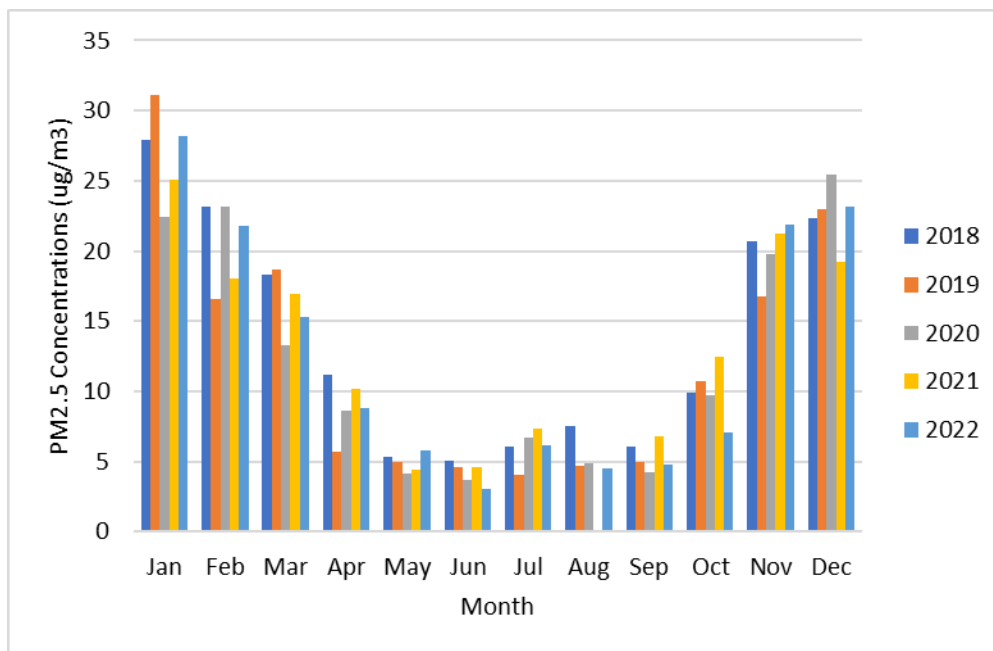
Figure 13. Diurnal Patterns in PM_{2.5} Concentrations at Portola (2019-2021)



As a result of its geography and climate, elevated PM_{2.5} concentrations at the Portola NAA are limited to fall and winter. The area is susceptible to frequent surface temperature inversions, which play a major role in the Portola NAA's air quality, especially during winter when these inversions are strongest. Portola Valley and its surrounding mountains act like a bowl, trapping a dense shallow layer of cold air under a layer of warm air. Warm air above cooler air acts like a lid, suppressing

vertical mixing and trapping the cooler air at the surface. The strength and duration of the inversion will regulate PM_{2.5} levels by confining them to a shallow vertical layer near the surface. Residents of the area typically burn wood for heat and the combined emissions from wood stoves, cooking stoves, and fireplaces are trapped in this shallow surface layer, leading to elevated PM_{2.5} concentrations. Figure 14 illustrates seasonality in PM_{2.5} concentrations as well as year-to-year variations driven by the strength and duration of the inversion and fluctuations in winter temperature. Depending on the year, the average concentrations during the two highest months, January and December ranged from 19.2 µg/m³ to 31.1 µg/m³.

Figure 14. Monthly Average PM_{2.5} Concentrations at Portola (2018-2022)



III. Emission Inventory

Emissions inventories are required by the CAA and the PM_{2.5} SIP Requirements Rule for the 12 µg/m³ annual PM_{2.5} NAAQS (PM_{2.5} Implementation Rule). Specifically, areas that exceed the health-based NAAQS and become designated as nonattainment based on monitored exceedances of these standards. These nonattainment areas must develop an emissions inventory as the basis of a SIP that demonstrates how they will attain the standards by specified dates.

Emissions inventories are one of the fundamental building blocks in the development of an attainment plan. Emissions inventories serve as 1) a primary input to air quality modeling used in attainment demonstrations; 2) the emissions data used for

developing control strategies; and 3) a means to track progress in meeting the emission reduction commitments. Emissions inventories are composed at various geographical resolutions encompassing District, air basin, and county levels.

The emissions inventories are an estimate of the air pollution emissions that are released into the environment. The following are main examples of pollution sources by key sectors emissions:

- Industrial or stationary point sources (e.g., power plants and oil refineries);
- Area-wide sources (e.g., consumer products and residential fuel combustion);
- On-road sources (e.g., passenger vehicles and heavy-duty trucks);
- Off-road mobile sources (e.g., aircraft, trains, ships, recreational boats, construction equipment and farm equipment); and
- Non-anthropogenic (natural) sources (e.g., biogenic or vegetation, geogenic (petroleum seeps), and wildfires).

The inventories presented in this chapter are the base year planning annual average emissions inventories for the Portola NAA for the years 2020 through 2028. The emissions inventory tables in this chapter include:

- Table 4 PM_{2.5} Annual Average Tons Per Day Emissions
- Table 5 NO_x Annual Average Tons Per Day Emissions
- Table 6 SO_x Annual Average Tons Per Day Emissions
- Table 7 Ammonia Annual Average Tons Per Day Emissions
- Table 8 ROG Annual Average Tons Per Day Emissions
- Table 9 2020 Annual Base Year Tons Per Day Emissions of PM_{2.5} and Precursors

Tables 4-8 actual year is 2020-2023; Tables 4-8 projected year is 2024-2026.

A more detailed description of emissions and methodologies and condensable emissions can be found in Appendix B.

Table 4. PM_{2.5} Annual Average Tons Per Day Emissions*

CATEGORY/TYPE	SUB CATEGORY	2020	2021	2022	2023	2024	2025	2026	2027	2028
AREAWIDE										
Wood burning/Refuse Burning										
MISCELLANEOUS PROCESSES	RESIDENTIAL FUEL COMBUSTION	0.267	0.267	0.267	0.267	0.267	0.267	0.267	0.267	0.267
MISCELLANEOUS PROCESSES	MANAGED BURNING AND DISPOSAL	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003
MISCELLANEOUS PROCESSES	COOKING	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008
	Wood burning/Refuse Burning Total	0.278	0.278	0.278	0.278	0.278	0.278	0.278	0.278	0.278
STATIONARY										
Stationary Sources										
FUEL COMBUSTION	OIL AND GAS PRODUCTION (COMBUSTION)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FUEL COMBUSTION	SERVICE AND COMMERCIAL	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
WASTE DISPOSAL	INCINERATORS	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Total Stationary Sources	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Total Combustion	0.278	0.278	0.278	0.278	0.278	0.278	0.278	0.278	0.278
MOBILE										
Mobile										
ON-ROAD MOTOR VEHICLES	LIGHT DUTY PASSENGER (LDA)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ON-ROAD MOTOR VEHICLES	LIGHT DUTY TRUCKS - 1 (LDT1)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ON-ROAD MOTOR VEHICLES	LIGHT DUTY TRUCKS - 2 (LDT2)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ON-ROAD MOTOR VEHICLES	MEDIUM DUTY TRUCKS (MDV)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ON-ROAD MOTOR VEHICLES	LIGHT HEAVY DUTY TRUCKS - 1 (LHDT1)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ON-ROAD MOTOR VEHICLES	LIGHT HEAVY DUTY TRUCKS - 2 (LHDT2)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ON-ROAD MOTOR VEHICLES	MEDIUM HEAVY DUTY TRUCKS (MHDT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ON-ROAD MOTOR VEHICLES	HEAVY HEAVY DUTY TRUCKS (HHDT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ON-ROAD MOTOR VEHICLES	MOTORCYCLES (MCY)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ON-ROAD MOTOR VEHICLES	BUSES	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ON-ROAD MOTOR VEHICLES	MOTOR HOMES (MH)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
OTHER MOBILE SOURCES	TRAINS	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
OTHER MOBILE SOURCES	OFF-ROAD RECREATIONAL VEHICLES	0.002	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001

OTHER MOBILE SOURCES	OFF-ROAD EQUIPMENT	0.008	0.007	0.007	0.006	0.006	0.006	0.005	0.005	0.005
OTHER MOBILE SOURCES	OFF-ROAD EQUIPMENT (PERP)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
OTHER MOBILE SOURCES	FARM EQUIPMENT	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
	Total Mobile	0.014	0.013	0.013	0.012	0.012	0.011	0.011	0.010	0.010
Airborne Soil										
STATIONARY										
INDUSTRIAL PROCESSES	MINERAL PROCESSES	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006
AREAWIDE										
MISCELLANEOUS PROCESSES	FARMING OPERATIONS	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
MISCELLANEOUS PROCESSES	CONSTRUCTION AND DEMOLITION	0.004	0.004	0.005	0.005	0.005	0.005	0.005	0.005	0.005
MISCELLANEOUS PROCESSES	PAVED ROAD DUST	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009
MISCELLANEOUS PROCESSES	UNPAVED ROAD DUST	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055
MISCELLANEOUS PROCESSES	FUGITIVE WINDBLOWN DUST	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004
	Total Airborne Soil	0.078	0.079	0.079	0.079	0.079	0.079	0.079	0.079	0.079

Source: CARB California Emission Projection Analysis Model (CEPAM), 2022 PM2.5 Plans Emission Projections, Version 1.00

*Does not account for woodstove changes outs that are part of the District incentive measure.

Table 5. NOx Annual Average Tons Per Day Emissions

CATEGORY/TYPE	SUB CATEGORY	2020	2021	2022	2023	2024	2025	2026	2027	2028
STATIONARY										
FUEL COMBUSTION	OIL AND GAS PRODUCTION (COMBUSTION)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FUEL COMBUSTION	SERVICE AND COMMERCIAL	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FUEL COMBUSTION	OTHER (FUEL COMBUSTION)	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
PETROLEUM PRODUCTION AND MARKETING	OIL AND GAS PRODUCTION	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
AREAWIDE										
MISCELLANEOUS PROCESSES	RESIDENTIAL FUEL COMBUSTION	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041
MISCELLANEOUS PROCESSES	MANAGED BURNING AND DISPOSAL	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
MOBILE										
ON-ROAD MOTOR VEHICLES	LIGHT DUTY PASSENGER (LDA)	0.006	0.005	0.005	0.004	0.004	0.004	0.003	0.003	0.003
ON-ROAD MOTOR VEHICLES	LIGHT DUTY TRUCKS - 1 (LDT1)	0.005	0.004	0.003	0.003	0.003	0.002	0.002	0.002	0.002
ON-ROAD MOTOR VEHICLES	LIGHT DUTY TRUCKS - 2 (LDT2)	0.007	0.006	0.006	0.005	0.005	0.005	0.004	0.004	0.004
ON-ROAD MOTOR VEHICLES	MEDIUM DUTY TRUCKS (MDV)	0.009	0.008	0.007	0.006	0.005	0.005	0.005	0.004	0.004
ON-ROAD MOTOR VEHICLES	LIGHT HEAVY DUTY TRUCKS - 1 (LHDT1)	0.022	0.020	0.019	0.017	0.015	0.014	0.013	0.011	0.010
ON-ROAD MOTOR VEHICLES	LIGHT HEAVY DUTY TRUCKS - 2 (LHDT2)	0.003	0.003	0.003	0.003	0.003	0.002	0.002	0.002	0.002
ON-ROAD MOTOR VEHICLES	MEDIUM HEAVY DUTY TRUCKS (MHDT)	0.005	0.004	0.003	0.003	0.002	0.002	0.002	0.002	0.002
ON-ROAD MOTOR VEHICLES	HEAVY HEAVY DUTY TRUCKS (HHDT)	0.010	0.008	0.007	0.006	0.005	0.005	0.004	0.004	0.004
ON-ROAD MOTOR VEHICLES	MOTORCYCLES (MCY)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ON-ROAD MOTOR VEHICLES	BUSES	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000
ON-ROAD MOTOR VEHICLES	MOTOR HOMES (MH)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
OTHER MOBILE SOURCES	TRAINS	0.084	0.085	0.086	0.088	0.089	0.089	0.091	0.092	0.094
OTHER MOBILE SOURCES	OFF-ROAD RECREATIONAL VEHICLES	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.004	0.004
OTHER MOBILE SOURCES	OFF-ROAD EQUIPMENT	0.126	0.119	0.112	0.105	0.096	0.089	0.082	0.076	0.071
OTHER MOBILE SOURCES	OFF-ROAD EQUIPMENT (PERP)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
OTHER MOBILE SOURCES	FARM EQUIPMENT	0.023	0.021	0.020	0.018	0.017	0.016	0.015	0.014	0.013
NATURAL (NON-ANTHROPOGENIC)										
NATURAL SOURCES	SOIL	0.048	0.048	0.048	0.048	0.048	0.048	0.048	0.048	0.048
	Total NOx	0.395	0.379	0.367	0.354	0.341	0.329	0.318	0.310	0.302

Source: CARB California Emission Projection Analysis Model (CEPAM), 2022 PM2.5 Plans Emission Projections, Version 1.00

Table 6. SOx Annual Average Tons Per Day Emissions

CATEGORY/TYPE	SUB CATEGORY	2020	2021	2022	2023	2024	2025	2026	2027	2028
STATIONARY										
FUEL COMBUSTION	SERVICE AND COMMERCIAL	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
PETROLEUM PRODUCTION AND MARKETING	OIL AND GAS PRODUCTION	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
AREAWIDE										
MISCELLANEOUS PROCESSES	RESIDENTIAL FUEL COMBUSTION	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.012
MISCELLANEOUS PROCESSES	MANAGED BURNING AND DISPOSAL	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
MOBILE										
ON-ROAD MOTOR VEHICLES	LIGHT DUTY PASSENGER (LDA)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ON-ROAD MOTOR VEHICLES	LIGHT DUTY TRUCKS - 1 (LDT1)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ON-ROAD MOTOR VEHICLES	LIGHT DUTY TRUCKS - 2 (LDT2)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ON-ROAD MOTOR VEHICLES	MEDIUM DUTY TRUCKS (MDV)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ON-ROAD MOTOR VEHICLES	LIGHT HEAVY DUTY TRUCKS - 1 (LHDT1)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ON-ROAD MOTOR VEHICLES	LIGHT HEAVY DUTY TRUCKS - 2 (LHDT2)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ON-ROAD MOTOR VEHICLES	MEDIUM HEAVY DUTY TRUCKS (MHDT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ON-ROAD MOTOR VEHICLES	HEAVY HEAVY DUTY TRUCKS (HHDT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ON-ROAD MOTOR VEHICLES	MOTORCYCLES (MCY)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ON-ROAD MOTOR VEHICLES	BUSES	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ON-ROAD MOTOR VEHICLES	MOTOR HOMES (MH)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
OTHER MOBILE SOURCES	TRAINS	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
OTHER MOBILE SOURCES	OFF-ROAD RECREATIONAL VEHICLES	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
OTHER MOBILE SOURCES	OFF-ROAD EQUIPMENT	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
OTHER MOBILE SOURCES	OFF-ROAD EQUIPMENT (PERP)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
OTHER MOBILE SOURCES	FARM EQUIPMENT	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total SOx		0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013

Source: CARB California Emission Projection Analysis Model (CEPAM), 2022 PM2.5 Plans Emission Projections, Version 1.00

Table 7. Ammonia Annual Average Tons Per Day Emissions

CATEGORY/TYPE	SUB CATEGORY	2020	2021	2022	2023	2024	2025	2026	2027	2028
STATIONARY										
WASTE DISPOSAL	SEWAGE TREATMENT	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
WASTE DISPOSAL	LANDFILLS	0.001	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
AREAWIDE										
MISCELLANEOUS PROCESSES	RESIDENTIAL FUEL COMBUSTION	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
MISCELLANEOUS PROCESSES	FARMING OPERATIONS	0.095	0.095	0.094	0.094	0.094	0.094	0.094	0.094	0.094
MISCELLANEOUS PROCESSES	OTHER (MISCELLANEOUS PROCESSES)	0.009	0.010	0.010	0.010	0.010	0.009	0.009	0.009	0.009
MOBILE										
ON-ROAD MOTOR VEHICLES	LIGHT DUTY PASSENGER (LDA)	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
ON-ROAD MOTOR VEHICLES	LIGHT DUTY TRUCKS - 1 (LDT1)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ON-ROAD MOTOR VEHICLES	LIGHT DUTY TRUCKS - 2 (LDT2)	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
ON-ROAD MOTOR VEHICLES	MEDIUM DUTY TRUCKS (MDV)	0.000	0.000	0.001	0.001	0.001	0.001	0.001	0.001	0.001
ON-ROAD MOTOR VEHICLES	LIGHT HEAVY DUTY TRUCKS - 1 (LHDT1)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ON-ROAD MOTOR VEHICLES	LIGHT HEAVY DUTY TRUCKS - 2 (LHDT2)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ON-ROAD MOTOR VEHICLES	MEDIUM HEAVY DUTY TRUCKS (MHDT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ON-ROAD MOTOR VEHICLES	HEAVY HEAVY DUTY TRUCKS (HHDT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ON-ROAD MOTOR VEHICLES	MOTORCYCLES (MCY)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ON-ROAD MOTOR VEHICLES	BUSES	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ON-ROAD MOTOR VEHICLES	MOTOR HOMES (MH)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
OTHER MOBILE SOURCES	TRAINS	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
OTHER MOBILE SOURCES	OFF-ROAD RECREATIONAL VEHICLES	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
OTHER MOBILE SOURCES	OFF-ROAD EQUIPMENT	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
OTHER MOBILE SOURCES	OFF-ROAD EQUIPMENT (PERP)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
OTHER MOBILE SOURCES	FARM EQUIPMENT	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Total Ammonia	0.122	0.124	0.125	0.124	0.124	0.124	0.124	0.124	0.124

Source: CARB California Emission Projection Analysis Model (CEPAM), 2022 PM2.5 Plans Emission Projections, Version 1.00

Table 8. ROG Annual Average Tons Per Day Emissions

CATEGORY/TYPE	SUB CATEGORY	2020	2021	2022	2023	2024	2025	2026	2027	2028
STATIONARY										
FUEL COMBUSTION	OIL AND GAS PRODUCTION (COMBUSTION)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FUEL COMBUSTION	SERVICE AND COMMERCIAL	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FUEL COMBUSTION	OTHER (FUEL COMBUSTION)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
WASTE DISPOSAL	INCINERATORS	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
CLEANING AND SURFACE COATINGS	LAUNDERING	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
PETROLEUM PRODUCTION AND MARKETING	OIL AND GAS PRODUCTION	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
PETROLEUM PRODUCTION AND MARKETING	PETROLEUM MARKETING	0.010	0.010	0.010	0.009	0.009	0.008	0.008	0.008	0.007
INDUSTRIAL PROCESSES	FOOD AND AGRICULTURE	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
AREAWIDE										
SOLVENT EVAPORATION	CONSUMER PRODUCTS	0.034	0.034	0.034	0.034	0.034	0.035	0.035	0.035	0.035
SOLVENT EVAPORATION	ARCHITECTURAL COATINGS AND RELATED PROCESS SOLVENTS	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008
SOLVENT EVAPORATION	PESTICIDES/FERTILIZERS	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
SOLVENT EVAPORATION	ASPHALT PAVING / ROOFING	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.007
MISCELLANEOUS PROCESSES	RESIDENTIAL FUEL COMBUSTION	0.359	0.359	0.359	0.359	0.359	0.359	0.359	0.359	0.359
MISCELLANEOUS PROCESSES	FARMING OPERATIONS	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063
MISCELLANEOUS PROCESSES	MANAGED BURNING AND DISPOSAL	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
MISCELLANEOUS PROCESSES	COOKING	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
MOBILE										
ON-ROAD MOTOR VEHICLES	LIGHT DUTY PASSENGER (LDA)	0.013	0.011	0.010	0.010	0.009	0.009	0.008	0.008	0.008
ON-ROAD MOTOR VEHICLES	LIGHT DUTY TRUCKS - 1 (LDT1)	0.009	0.008	0.007	0.006	0.005	0.005	0.004	0.004	0.004
ON-ROAD MOTOR VEHICLES	LIGHT DUTY TRUCKS - 2 (LDT2)	0.010	0.008	0.008	0.008	0.008	0.008	0.007	0.007	0.007
ON-ROAD MOTOR VEHICLES	MEDIUM DUTY TRUCKS (MDV)	0.013	0.011	0.010	0.009	0.009	0.008	0.008	0.008	0.007
ON-ROAD MOTOR VEHICLES	LIGHT HEAVY DUTY TRUCKS - 1 (LHDT1)	0.006	0.006	0.005	0.005	0.005	0.004	0.004	0.004	0.004
ON-ROAD MOTOR VEHICLES	LIGHT HEAVY DUTY TRUCKS - 2 (LHDT2)	0.001	0.001	0.001	0.001	0.001	0.000	0.000	0.000	0.000

ON-ROAD MOTOR VEHICLES	MEDIUM HEAVY DUTY TRUCKS (MHDT)	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ON-ROAD MOTOR VEHICLES	HEAVY HEAVY DUTY TRUCKS (HHDT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ON-ROAD MOTOR VEHICLES	MOTORCYCLES (MCY)	0.005	0.005	0.004	0.004	0.004	0.004	0.004	0.004	0.004
ON-ROAD MOTOR VEHICLES	BUSES	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ON-ROAD MOTOR VEHICLES	MOTOR HOMES (MH)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
OTHER MOBILE SOURCES	TRAINS	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004
OTHER MOBILE SOURCES	RECREATIONAL BOATS	0.026	0.026	0.025	0.025	0.024	0.024	0.023	0.023	0.022
OTHER MOBILE SOURCES	OFF-ROAD RECREATIONAL VEHICLES	0.074	0.073	0.071	0.069	0.068	0.066	0.065	0.063	0.062
OTHER MOBILE SOURCES	OFF-ROAD EQUIPMENT	0.064	0.063	0.063	0.063	0.061	0.060	0.058	0.056	0.054
OTHER MOBILE SOURCES	OFF-ROAD EQUIPMENT (PERP)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
OTHER MOBILE SOURCES	FARM EQUIPMENT	0.004	0.004	0.004	0.004	0.004	0.003	0.003	0.003	0.003
OTHER MOBILE SOURCES	FUEL STORAGE AND HANDLING	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
NATURAL (NON-ANTHROPOGENIC)										
NATURAL SOURCES	BIOGENIC SOURCES	1.786	1.786	1.786	1.786	1.786	1.786	1.786	1.786	1.786
	Total ROG	2.504	2.492	2.485	2.479	2.473	2.467	2.461	2.456	2.451

Source: CARB California Emission Projection Analysis Model (CEPAM), 2022 PM2.5 Plans Emission Projections, Version 1.00

A. Emissions of PM_{2.5} and Precursors Background

The Portola NAA emissions inventory is not especially complicated, and is typical of a small, high elevation mountain community. There are no tribal lands, no major sources, or large industries (existing or anticipated), no significant rush hour traffic, and no impact from offshore emissions or salt spray as observed in coastal areas.

The California Department of Forestry and Fire Protection (CalFire) generally declares a comprehensive ban on open burning during the summer months when fire danger is high. Thus, open burning only occurs during the spring, winter and fall months, when conditions are appropriate.

Within the Portola NAA, there are two potential sources of wood smoke, either open burning or residential home heating devices. Open burning can be the burning of yard debris within open burn piles on residential properties, or land management burning for disposing of timber harvest waste, promoting fire safety, and maintaining forest health. The District enforces a comprehensive open burning program. The District Open Burning Rules, 300 through 317, provide a framework for this program³.

Every day, the District will make a declaration of either a Permissive Burn Day or a No-Burn Day for the public and land managers (Forest Service, Bureau of Land Management, State Parks, etc.). These declarations are based upon a daily burn decision by CARB. These decisions are based on factors related to the ability of smoke from open burning to rise and disperse adequately, including surface and upper-air temperatures and wind velocities, relative humidity, and anticipated forecast changes. For example, the presence of a strong temperature inversion is likely to result in a No-Burn Day determination, since the ability of smoke from open burning to rise and disperse adequately depends upon atmospheric stability at any given time and the influence of surrounding terrain.

Smoke from residential wood burning devices (wood stoves and fireplaces) dominates the emission inventory, especially during the very frigid winter months when numerous Portola residents are using wood for heat. Wood burning emissions tend to be trapped near ground level by regular wintertime inversions, and since Portola (where the violating monitor is located) is in a basin along a gently meandering river, lateral dispersion is limited. This is the reason replacing old wood stoves is the backbone of the attainment strategy. With high PM_{2.5} levels mostly due

³ <https://myairDistrict.com/index.php/rules/>.

to impacts from residential wood burning, the District has been working together with the City of Portola to aggressively lower the PM_{2.5} levels utilizing EPA Targeted Airshed Grants 2015, 2018, and 2020.

On June 8, 2016, the City of Portola adopted Ordinance 344⁴ to regulate emissions from wood stoves and fireplaces. Beginning November 2017, the District started curtailment days that were considered voluntary in Zone 1. On July 7, 2019, the City of Portola Ordinance 344 was replaced with Ordinance 354⁵ to include prohibition of open burning of yard waste and debris within City of Portola. On September 9, 2020, the City of Portola adopted a City Ordinance, Ordinance 359⁶, which implements a more stringent woodburning curtailment program if the contingency measure is triggered. On October 26, 2020, the District Board adopted a resolution directing the District to fulfill its obligations under Ordinance 359, approve Ordinance 359 into the attainment plan, and submit the provisions of Ordinance 359 that address the contingency measure requirements to CARB for inclusion in the California SIP. CARB submitted Ordinance 359 to EPA on December 28, 2020. Effective April 2, 2021, EPA approved Ordinance 359 into a SIP.⁷ On January 1, 2021, the District started a mandatory woodstove curtailment program. On curtailment days burning wood in the City of Portola is allowed only in wood burning heaters registered with the District and certified to a Phase II or a more stringent certification.⁸.

Initially, the District called curtailment days at 30 µg/m³ daily average. EPA's determination that the Portola NAA failed to attain the 12 µg/m³ annual PM_{2.5} NAAQS by the Moderate attainment deadline, which became effective on January 30, 2023, triggered a contingency measure which resulted in lowering the curtailment threshold to 20 µg/m³ and expanding the curtailment season to include March, April, September, and October beginning September 1, 2023. Every day, the curtailment status is updated and announced to the Portola residents. If there are adverse weather conditions that will cause significant fine particulates in the air (PM_{2.5}), the District will issue a mandatory wood stove curtailment. The District has not quantified the emissions reductions from the wood stove curtailment program.

4 https://library.municode.com/ca/portola/ordinances/code_of_ordinances?nodeId=776460

5 https://library.municode.com/ca/portola/ordinances/code_of_ordinances?nodeId=972865

6 https://library.municode.com/ca/portola/ordinances/code_of_ordinances?nodeId=1121803

7 https://library.municode.com/ca/portola/ordinances/code_of_ordinances?nodeId=1121806

8 <https://myairDistrict.com/index.php/greater-portola-area-hub/#portola-indoor-burn-status>

B. Emission Inventory Structure and Function

The CARB maintains the emission inventory for the State as a whole and divided into various distinct smaller inventories for each county and each nonattainment area. There are over 1700 emission categories in the inventory, although source types associated with approximately two thirds of these categories do not exist in the Portola NAA. The data used to create the inventories are based on factors such as population, surface area, road miles, American Community Survey data from the U.S. Census Bureau and so forth, as appropriate to the specific categories. Many of the categories are refined based on data supplied by individual air Districts.

The emissions inventory is broadly split into sections of stationary, area-wide, and mobile sources. Stationary sources in the Portola NAA include a small aggregate mining and processing facility, a small concrete batch plant, three gas stations, a landfill, and a mortuary.

Area-wide sources include consumer products, architectural coatings and solvents, asphalt usage, farming operations, construction, cooking, road dust, managed burning, and diverse types of fuel combustion. Mobile sources include on-road mobile sources (cars, trucks, etc.), off-road mobile sources (construction equipment, recreational vehicles, and farm equipment), trains, and lawn and garden equipment.

The annual emissions inventory is also split into winter and summer inventories, with winter being the months of October through March and summer being April through September. Aside from days influenced by wildfire emissions, the highest recorded PM_{2.5} concentrations in the Portola NAA consistently occur during the winter. The District curtailment period is during the months of September through April.

The base year for the emissions inventory is 2020 and the attainment year is 2025. Anticipated changes in emissions, including forecast reductions from control measures, will be added to, or subtracted from the base year to estimate the projected inventories and projected attainment inventory. These projected inventories will be used to demonstrate attainment (the “attainment demonstration”) no later than 2025, as well as to demonstrate reasonable further progress and quantitative milestones. CARB and the District selected 2020 as the base year emissions inventory since it was one of the three years that was part of the 2021 design value where EPA determined that the Portola NAA did not meet the 12 µg/m³ annual PM_{2.5} NAAQS by the Moderate attainment deadline.

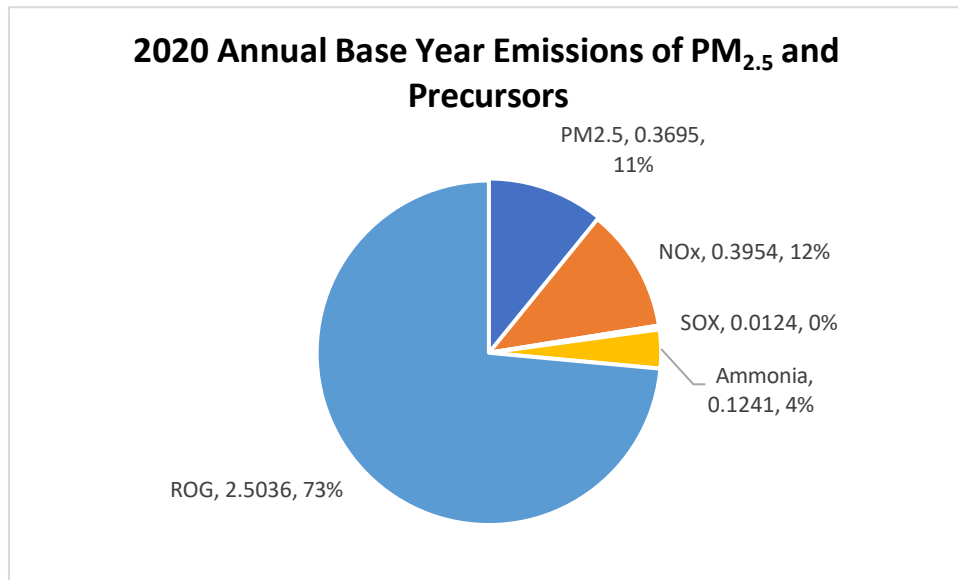
C. PM_{2.5} and Precursor's Emissions Summary

Per the PM_{2.5} Implementation Rule, the 2020 base year summary emissions of directly emitted PM_{2.5} and PM_{2.5} precursors are listed in Table 9 and summarized in Figure 15. The pollutant of greatest concern in the Portola NAA is PM_{2.5}. The precursors to PM_{2.5} are sulfur oxides (SOx), nitrogen oxides (NOx), volatile organic compounds (VOC), and ammonia (NH₃). By federal approval and precedent, California's emission inventory uses Reactive Organic Gases (ROG) instead of VOCs, although, ROG and VOC are considered interchangeable. The transformation of precursors to actual PM_{2.5} depends primarily on the air chemistry (including the presence of ammonia), pollutant concentrations, and atmospheric conditions such as temperature and humidity. Precursor emission reductions are of negligible importance in bringing the area into attainment. This is for three reasons: (1) precursor emissions are small to begin with; (2) the main source is residential fuel combustion, which will be reduced by the attainment plan (more efficient wood stoves burn less wood); (3) and the largest remaining precursor sources could not reasonably be controlled (i.e. they are of biogenic origin or from sources already subject to strenuous controls at the State or national level). Table 9 shows annual precursor emissions comparison to PM_{2.5} for the 2020 base year, according to the emissions inventory categories.

Table 9. 2020 Annual Base Year Emissions of PM_{2.5} and Precursors

Pollutant	Stationary	Areawide	Mobile	Natural	Total
PM2.5	0.0057	0.3502	0.0136	0.0000	0.3695
NOx	0.0016	0.0414	0.3043	0.0481	0.3954
SOX	0.0000	0.0119	0.0005	0.0000	0.0124
Ammonia	0.0015	0.1191	0.0035	0.0000	0.1241
ROG	0.0112	0.4730	0.2331	1.7864	2.5036

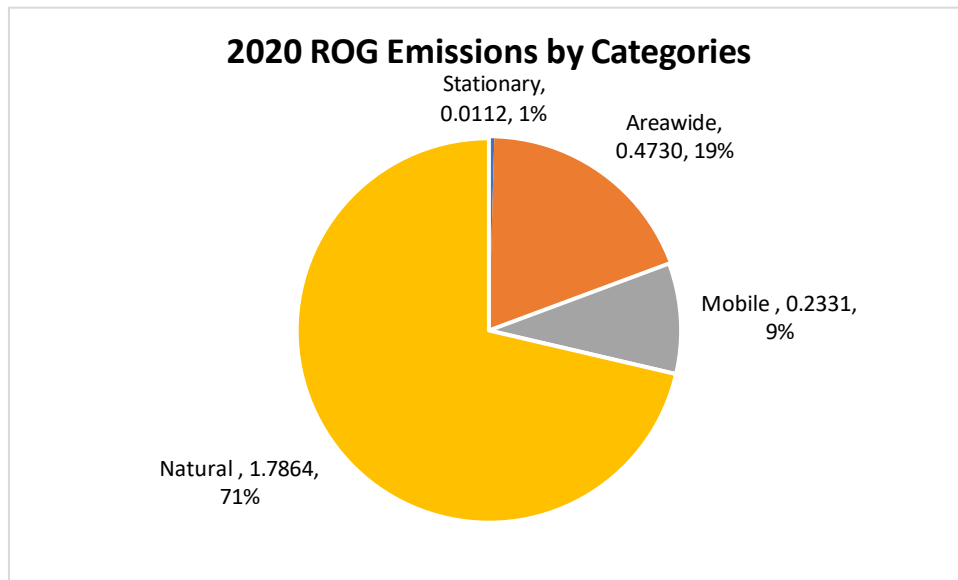
Figure 15. 2020 Annual Base Year Tons Per Day Emissions of PM_{2.5} and Precursors



Based on the Districts findings from the 2020 base year, the biggest pollutant contributor is the precursor ROG. The second is NO_x and is based on mobile sources. The third pollutant is PM_{2.5} and Table 4 explains a detailed report for this high value from Areawide categories and subcategories causes. The fourth is Ammonia, and again the value is mostly based on Areawide categories and subcategories causes. The least pollutant is SOX, with the primary cause to be natural sources or biogenic sources that are not considered anthropogenic.

1. ROG Summary

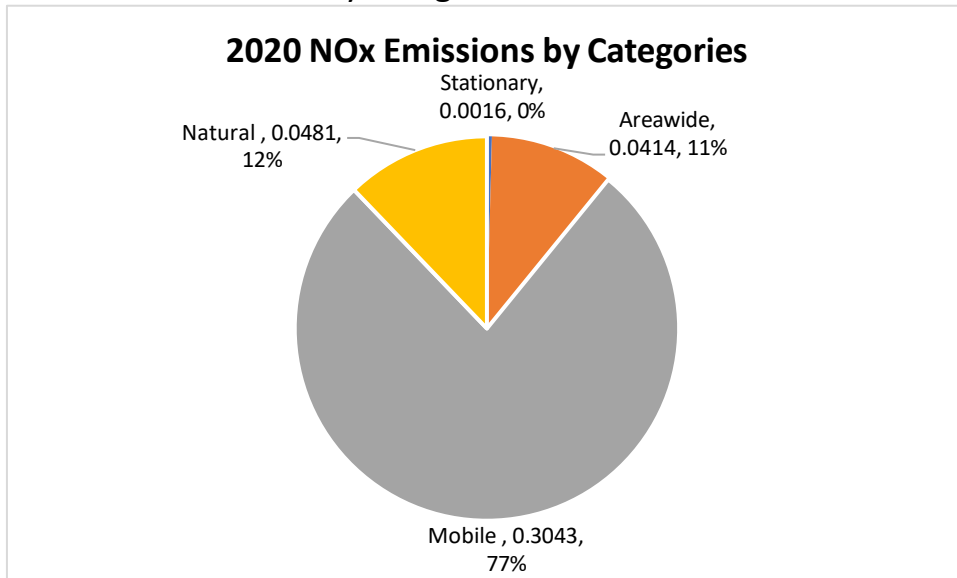
Figure 16. 2020 ROG Emissions by Categories



Biogenic ROG emissions from pine and fir trees (the dominant vegetation in the area), chaparral, and other vegetation are much greater than anthropogenic emissions, as shown in Table 8 under the 2020 base year with controlling 71 percent of the ROG emissions. Anthropogenic emissions (Stationary, Mobile and Areawide) factor in about 29 percent with the same base year 2020. The main contributor for Areawide is Residential Fuel Combustion, while Mobile is based on off-road mobile sources and on-road mobile sources. The Stationary based off the Petroleum Production and Marketing. All percentages are based on Table 7.

2. NOx Summary

Figure 17. 2020 NOx Emissions by Categories



The major category for NOx emissions stem from off-road mobile sources and on-road mobile sources with a total of 77 percent, Figure 17. Based on Table 5 categories and subcategories, about 11 percent come from residential wood combustion and managed burning. While 0 percent come from other forms of fuel combustion The remaining 12 percent comes from natural sources (soil). With mobile being the main reason for high emissions, the next logical controlled category is residential fuel combustion. All percentages are based on Table 5.

3. PM_{2.5} Summary

Figure 18. 2020 PM_{2.5} Emissions by Categories

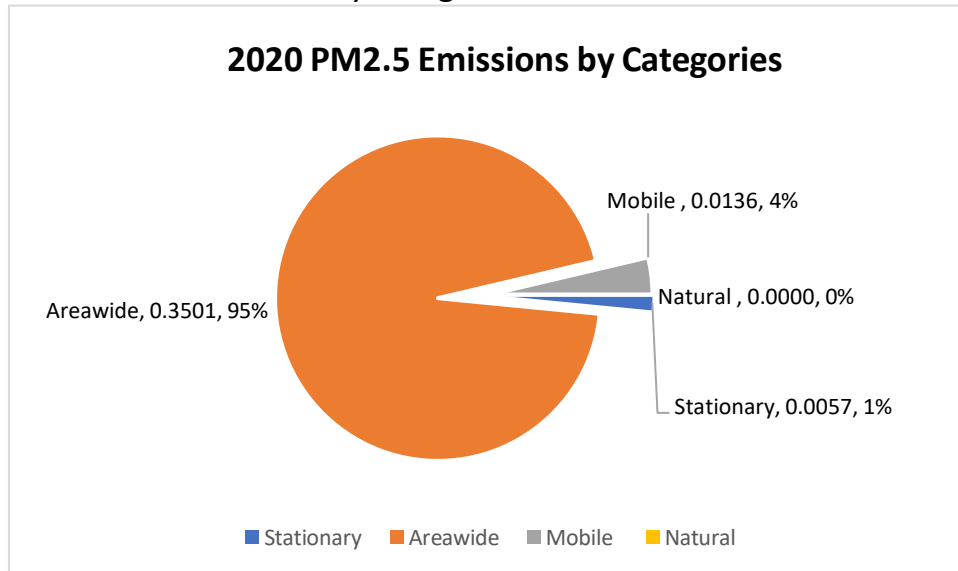
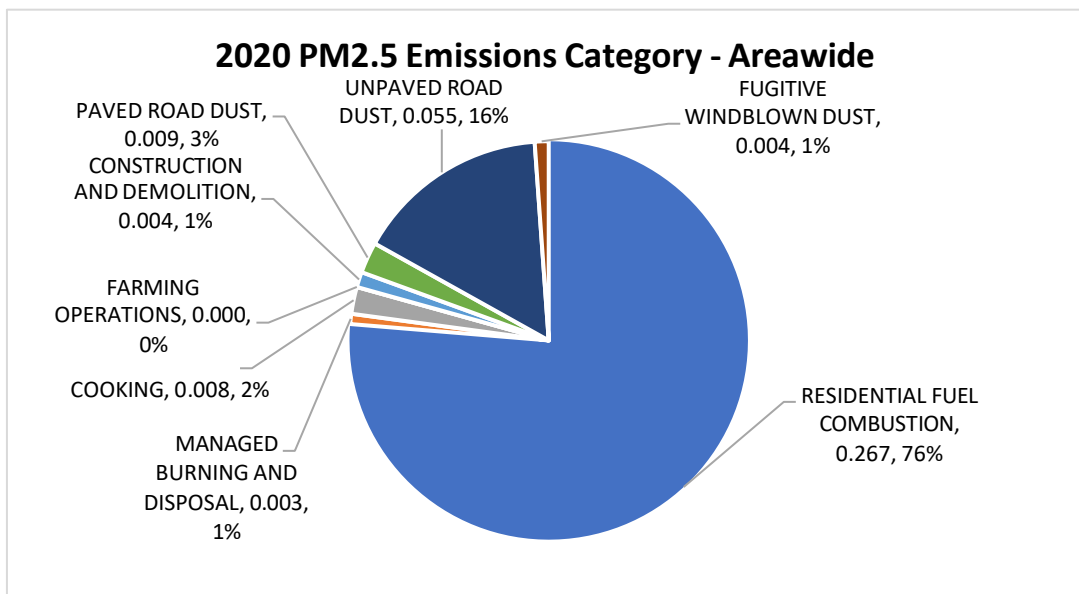


Figure 19. 2020 PM_{2.5} Emissions – Areawide Category



Majority of the Portola NAA is owned by the federal government and managed by the U.S. Forest Service, with hundreds of miles of unpaved roads crisscrossing the forest. Table 4 explains the difference between airborne soil from stationary and areawide category. Areawide for PM_{2.5} is the biggest contributing factor with many subcategories. Based on Table 4, Residential wood combustion dominates the PM_{2.5} emissions inventory, and this is especially true during cold months (September through April), although many residents also heat their homes with wood on cool nights during the summer. The remaining other factor that PM_{2.5} is the Airborne Soil

with multiple subcategories referenced in Table 4. All percentages are based on Table 4.

4. Ammonia Summary

Ammonia (NH₃) emissions are 76 percent of ammonia emissions are from livestock (mainly cattle). Residential wood combustion accounts for 12 percent. The remaining 10 percent are from miscellaneous processes (7 percent), , motor vehicles (2 percent) and landfills (1 percent), with a tiny percentage from trains and sewage treatment. Biogenic ammonia emissions from natural decomposition processes have not been quantified. All percentages are based on Table 7.

5. SO_x Summary

SO_x emission sources are primarily residential fuel combustion (93 percent, of which slightly more than half is from fuel oil used for residential heating, with the remainder being from wood burning appliances) and managed burning for disposal (1 percent). The remaining 6 percent of SO_x emissions are from motor vehicles, trains, and fuel combustion. All percentages are based on Table 6.

IV. Control Strategy and Implementation

CARB is required to submit a Serious SIP to EPA by July 30, 2024 (18 months after the initial designation on January 30, 2023). The Serious area requirements are outlined in Section I. Chapter III, Emission Inventory, describes the 2020 and future year baseline (no additional actions beyond already adopted regulations) inventories in detail. The emissions of directly emitted PM_{2.5} are projected to decrease slightly by 2025 due to the contingency measures that were implemented in April 2023 following the redesignation to Serious in January 2023. Since the high PM_{2.5} levels are overwhelmingly due to the impacts of smoke from residential wood burning devices, the only way to demonstrate attainment is by controlling emissions from these devices and educating the community about wood smoke pollution and how to engage in better wood burning practices.

This chapter outlines the proposed control strategy and the implementation schedule for the area to meet the standard by December 31, 2025. Due to the overwhelming impact of wood smoke on PM_{2.5} concentrations and the area's dependence on wood for home heating, the attainment demonstration for the Portola NAA relies heavily on emission reductions projected to be achieved from a voluntary wood stove change-out program incentive measure (Woodstove Incentive Measure). The District is offering incentives, up to the full cost of purchase and installation, to qualified residents of the Portola NAA using uncertified wood stoves or inserts as a primary source of heat. The Woodstove Incentive Measure includes replacing 100 uncertified wood heaters with cleaner-burning and more energy efficient technology is estimated to reduce PM_{2.5} emissions by 0.025 tons per day (tpd) that is projected to bring the area into attainment. This is the only measure for which emission reductions are factored into attainment demonstration.

In order to rely on discretionary incentive programs to satisfy the CAA emission reduction requirements, the District must demonstrate that the reductions are real, enforceable, quantifiable, surplus, and permanent. The following elements are required as part of this demonstration:

- Integrity
- Commitment (Federal Enforceability)
- Technical Analyses
- Funding
- Resources
- Outreach and Public Disclosure

- Legal Authority

Details regarding each of these elements are included in Appendix C.

On June 8, 2016, the City of Portola adopted Ordinance 344 to providing for regulation of wood stoves and fireplaces⁹. Beginning November 2017, the District started curtailment days that were considered voluntary in Zone 1. On July 7, 2019, the City of Portola amended Ordinance 354 to state that all open burning of yard waste and debris shall be banned within city limits of the City of Portola¹⁰.

On September 9, 2020, the City of Portola adopted a City Ordinance, Ordinance 359, which implements a more stringent woodburning curtailment program if the contingency measure is triggered. On October 26, 2020, the District Board adopted a resolution directing the District to fulfill its obligations under Ordinance 359, approve the Ordinance 359 into the attainment plan, and submit the provisions of Ordinance 359 that address the contingency measure requirements to CARB for inclusion in the California SIP. EPA approval took effect on April 2, 2021.

The District and CARB developed an enforceable measure as part of the Moderate SIP to allow EPA to credit the incentive emission reductions towards the attainment demonstration. EPA approved the enforceable measure on April 2, 2018. The reductions achieved due to change-outs completed since 2016 meet these integrity elements. As part of the enforceable measure, CARB submitted an annual report to EPA demonstrating enforceability.¹¹

Another key strategy is the adoption of a District Rule on by the end of 2025. The District Rule will define allowed woodstove burning practices and the enacted changes will be permanent, enforceable, and have penalties associated for violating them. Previously, the City Ordinance 359 was the only regulatory measure to address woodburning in Portola. . The District Rule will ensure that healthy air will be maintained well past the attainment date and possibly provide partially significant reductions prior to the attainment date in 2025.

In addition to the two key strategies, the District is developing other measures to reduce the impact of PM_{2.5} from wood stove smoke. The District is conducting an aggressive outreach and educational campaign to help residents understand the benefits of changing from an old wood stove to a cleaner home heating device and

⁹ https://library.municode.com/ca/portola/ordinances/code_of_ordinances?nodetid=776460

¹⁰ https://library.municode.com/ca/portola/ordinances/code_of_ordinances?nodetid=972865

¹¹ <https://ww2.arb.ca.gov/resources/documents/wood-stove-change-out-program-greater-portola-nonattainment-area-and-progress>

the importance of clean burning. The District worked closely with the City of Portola and enlisted outreach partners such as the local hardware and grocery store, post office, library, senior community center, and schools to assist in the distribution of educational materials and advertise the change-out program.

A. Determination of Primary Sources of PM_{2.5} in the Portola NAA

PM_{2.5} concentrations in the Portola NAA are dominated by emissions from wood burning as demonstrated by seasonal and diurnal patterns in PM_{2.5} concentrations, chemical composition data, the PMF model, and statistical correlations between PM_{2.5} mass and levoglucosan, a wood burning tracer. Detailed analyses identifying wood smoke as a main source of PM_{2.5} in the area are provided in Chapter II, Ambient Air Quality. The impact of wood burning on PM_{2.5} mass was quantified using PMF modeling (Appendix A). The PMF model estimated that 76.1 percent of PM_{2.5} mass annually is from wood burning. Burning garbage in stoves, fireplaces, and in open burn piles contributes another 2.5 percent of the mass. On high PM_{2.5} days contribution from wood burning combined increases to almost 90 percent.

Within the Portola NAA, wood smoke can originate from open burning or from home heating devices. Open burning can be conducted by the residents in the Portola NAA outside of Portola City limits, or by the land managers (Forest Service, Bureau of Land Management, State Parks, etc.). The residents occasionally dispose of yard debris by burning in open piles outside of the Portola City limits. Land managers perform prescribed burns of timber harvest waste to promote fire safety and maintain forest health. Both residents, when burning over one acre of broadcast burning, and land managers must request a burn permit prior burning. Open burning is allowed only on days with good dispersion. The District in coordination with CARB makes a declaration of either a permissive Burn Day or a No-Burn Day. The Districts and the CARB consider a number of factors in making burning declarations to ensure that smoke from open burning will rise and disperse rapidly. Open burning is mostly conducted during the day, between 9 A.M. and 3 P.M. Low PM_{2.5} concentrations during the day, as illustrated previously in Figure 13 of Chapter II, demonstrate that the open burning program is managed well and does not unduly contribute to the PM_{2.5} mass. Figure 13 illustrates that PM_{2.5} concentrations are highest during evenings and throughout the night (i.e., 5:00 pm to 12:00 am) and again in the morning (i.e. 5:00 am to 8:00 am) when more people are home and using their wood stoves and fireplaces. Seasonal variations in PM_{2.5} concentrations Figure 5 and PM_{2.5} composition Figure 8 demonstrate that PM_{2.5} concentrations are high during the

winter-time heating season, further illustrating the impact of wood smoke from home heating on PM_{2.5} levels.

B. Development of Emission Reduction Strategy

In early 2015, EPA contracted with the Environmental Finance Center (EFC) at the University of North Carolina to evaluate program alternatives that the District could use to reduce PM_{2.5} in the Portola NAA without increasing the cost burden on low-income households. -The resulting report, “Opportunities for Reducing Wood Smoke in the Portola, California Area” suggested that “the way to incentivize a household – especially a low-income household – to change out a working wood stove with a more efficient alternative is through a tiered strategic plan to not only address the financial barriers to wood stove change-outs but also to foster a spirit of civic responsibility to address these air quality challenges.” The report identified federal, state and local assistance programs available for home weatherization, wood stove upgrades and energy assistance; Home Repair and Weatherization program by the U.S. Department of Agriculture (USDA), Low Income Home Energy Assistance Program (LIHEAP), U.S. Department of Energy weatherization program, Plumas County Housing and Rehabilitation Program, Liberty Utilities CARE and Energy Savings Assistance Programs, and the Plumas-Sierra Rural Electric Cooperative’s Winter Rate Assistance Program (WRAP). The full report is available in Appendix D.

On March 2, 2015, the EFC, EPA and the District convened a residential wood smoke roundtable with key leaders from community, local organizations and businesses (environmental, health, financial, utility) and local, state, and federal government. This productive roundtable discussion concluded that a proactive, collaborative strategy for improving air quality must also include educational outreach, economic incentives, and community support in order to successfully change habits and reduce wood smoke in the area. Following the roundtable discussion, the District, working closely with the City of Portola and other local organizations, embarked on an aggressive outreach and educational campaign. At the same time the District was working hard on exploring potential funding sources.

In March and April 2015, the District administered a survey to assess the demographics of the community’s residents, particularly as they relate to home heating including the type of fuel used for heating, the types of wood burning devices, and the amount of wood burned. The results of the survey were incorporated into CARB emission estimates of residential wood combustion. There are approximately 2,460 households in the Portola NAA. About half of the households use wood as a primary source of heat. Natural gas is not available

anywhere in the Portola NAA, so that is not an option for residential heating. Although many of these houses might also have alternative heating source appliances (electric or propane) in the home, wood is abundant in Portola and many residents enjoy the ease and self-sufficiency of burning this renewable resource, especially because of its relative low cost. The Portola Area Residential Heating Survey is located in Appendix E.

The District, in partnership with CARB, EPA, and the City of Portola developed a strategy to drastically reduce smoke emissions from wood burning devices. This was accomplished by pairing a City Ordinance addressing wood stove and fireplace emissions with an incentive-based wood stove change-out program throughout the Portola NAA.

C. Incentive Measure and Enforceable Commitment

Due to the overwhelming impact of wood smoke on PM_{2.5} concentrations and the area's dependence on wood for home heating, the attainment demonstration for the Portola NAA relies on emission reductions projected to be achieved from a voluntary wood stove change-out program. In order to rely on discretionary incentive programs to satisfy the CAA emission reduction requirements, the District has to demonstrate that the reductions are real, enforceable, quantifiable, surplus, and permanent. The following elements are required as part of this demonstration:

- Integrity
- Commitment (Federal Enforceability)
- Technical Analyses
- Funding
- Resources
- Outreach and Public Disclosure
- Legal Authority

Details regarding each of these elements are included in Appendix C. The District developed strict and thorough guidelines to implement the wood stove change-out program. The guidelines and work plan are included in Appendix F.

1. Greater Portola Area Wood Stove Change-Out Program

There is strong evidence that wood stove change-out programs are a cost-effective way to significantly improve air quality in communities where the use of wood stoves is widespread. However, Portola is economically disadvantaged and many of its residents cannot afford to pay even partial costs of changing out wood stoves.

Portola's unemployment rate is well above the national and State averages, having reached 22.3 percent in 2010 compared to the state unemployment rate of 5.0 percent. The 2011 median home value was only 41 percent of the state average, and the median household income was approximately half (54 percent) of the state average. Currently, median home values are 48 percent of the state average and the median household income is 75.1 percent of the state median annual income. In the past, the District and the City of Portola offered a \$1,000 incentive for changing out old wood stoves. However, due to the socioeconomics of the area, there was very little interest, as the incentive amount would cover only a fraction of the total cost of change-out. It was the combination of the above economic facts that led the District to believe that funding adequate to cover 100 percent of the cost of changing out to cleaner wood stoves was needed, at least within the city limits of Portola.

The District began implementation of the Portola Change-out Program in 2016. The Program serves the Portola NAA and was initially funded with EPA 2015 Targeted Airshed Grant (TAG). Since that first grant, the Portola Change-out Program received additional TAG funding in fiscal years 2018 and 2020. Table 10 lists funding dedicated to implementing this Program. The objective of the Portola Change-out Program is to reduce PM_{2.5} emissions from residential wood heating to attain the 12 µg/m³ annual PM_{2.5} NAAQS. Replacing 416 old wood burning devices with less-polluting and more efficient alternative between 2015 and 2020 led to a 15 percent decrease in an annual average PM_{2.5} design value between 2015 and 2021. However, the decrease in concentrations was not sufficient to attain the 12 µg/m³ annual PM_{2.5} standard by the Moderate attainment date of December 31, 2021. Additional emissions reductions will be necessary to attain the standard by the Serious attainment date of December 31, 2025. As outlined in the Attainment Demonstration Section of this SIP, replacing 100 uncertified wood burning stoves with less-polluting and more energy efficient home heating alternatives between January 1, 2021, and December 31, 2024, is estimated to reduce PM_{2.5} emissions by 0.025 tpd resulting in estimated 2025 design value of 11.8 µg/m³.

Table 10. Funding for Woodsmoke Reduction Program

Agency	2015 TAG	2018 TAG	2020 TAG	Combined
TAG Grand Total	\$2,483,607.00	\$3,172,238.00	\$2,842,468.00	\$8,498,313.00
TAG District	\$2,308,607.00	\$2,970,612.00	\$2,655,967.00	\$7,935,186.00
TAG CARB	\$175,000.00	\$201,626.00	\$186,501.00	\$563,127.00
District Match	\$40,000.00	\$40,000.00	\$40,000.00	\$120,000.00
Total Project Cost	\$2,523,607.00	\$3,212,238.00	\$2,882,468.00	\$8,618,313.00

The District has about \$5 million remaining in the 2018 and 2020 TAG Funding to implement a multi-faceted program focused on reducing emissions from wood burning home heating devices by providing incentives for replacing older wood heating devices, installing wood sheds, offering vouchers for chimney sweeps, and educating the public about device operation and the benefits of using properly seasoned wood. In an effort to replace the old devices with the cleanest technology available, the District will offer an additional \$1,000-\$2,000 for every wood stove replaced with a pellet, propane, or kerosene device depending on location

One of the important aspects of the program is to ensure that the non-certified wood stoves removed from homes are destroyed so the stoves cannot be used at a different location. The District partnered with the City of Portola to assist with the temporary storage, destruction and removal of non-certified wood stoves.

2. Summary of Change-out Program to Date

Prior to beginning the program, the District researched other wood stove change-out programs. The local chapter of the Hearth, Patio and Barbeque Association continues to assist the District with wood stove demonstration workshops. There was a break in these workshops due to the COVID-19 pandemic during 2020 and 2021. The District resumed these community events in 2022 with assistance from the local Hearth, Patio, and Barbecue Association chapters.

The District utilized local county counsel to assist in developing and distributing a Request for Qualification (RFQ) to determine the final qualifying list of retailers which would participate in the program. This was distributed to wood stove retailers throughout the three counties within the District’s jurisdiction: Nevada, Plumas, and Sierra. Additionally, the District distributed the RFQ to retailers in the Reno and Sacramento Valley areas. The District then carefully screened the applicants and developed a final agreement with the qualifying retailers. Retailers were required to meet the extensive requirements in the RFQ, pass a screening process, and sign an

agreement with the District in order to participate in the program. Following the wide distribution of the RFQ, the District received two responses from local Plumas County wood stove retailers. These retailers then signed a Retailer/Contractor Agreement with the District. These two retailers; Wolf Creek Wood Stoves and Quincy Hot Spot were then included on the “List of Qualified Retailers”. The list is maintained by the District and distributed to all qualifying applicants for the change-out program.

The District worked with the City of Portola to develop the eligibility requirements for City residents. The District also worked with the City and a contracted technical company to develop a Google-Earth based map of the eligible areas for the change-out program. This map is used to determine if an applicant is eligible for the program and the incentive amount. The eligibility criteria are located in Appendix F.

An important aspect of a wood stove change-out program is making sure that the old, uncertified stoves are permanently destroyed and disposed of properly. The City of Portola took on that responsibility as outlined in the Memorandum of Understanding (MOU) between the District and the City of Portola (Appendix G).

A particularly challenging legal issue was whether the State of California Prevailing Wage requirements applied to the change-out program. The District worked with the County Counsel and the State of California Department of Industrial Relations to determine that wood stove retailers were required to meet the prevailing wage requirements for business buildings, but not for residential homes.

Another challenge was assuring that all building permit requirements were met appropriately. There are three entities responsible for permitting homes within the Portola NAA:

- 1) City of Portola permits home within the city limit;
- 2) Plumas County permits homes outside of the city limit; and
- 3) State of California Department of Housing permits all manufactured and mobile homes.

The District works closely with each permitting facility to streamline the process and make sure that the change-out program proceeds according to schedule.

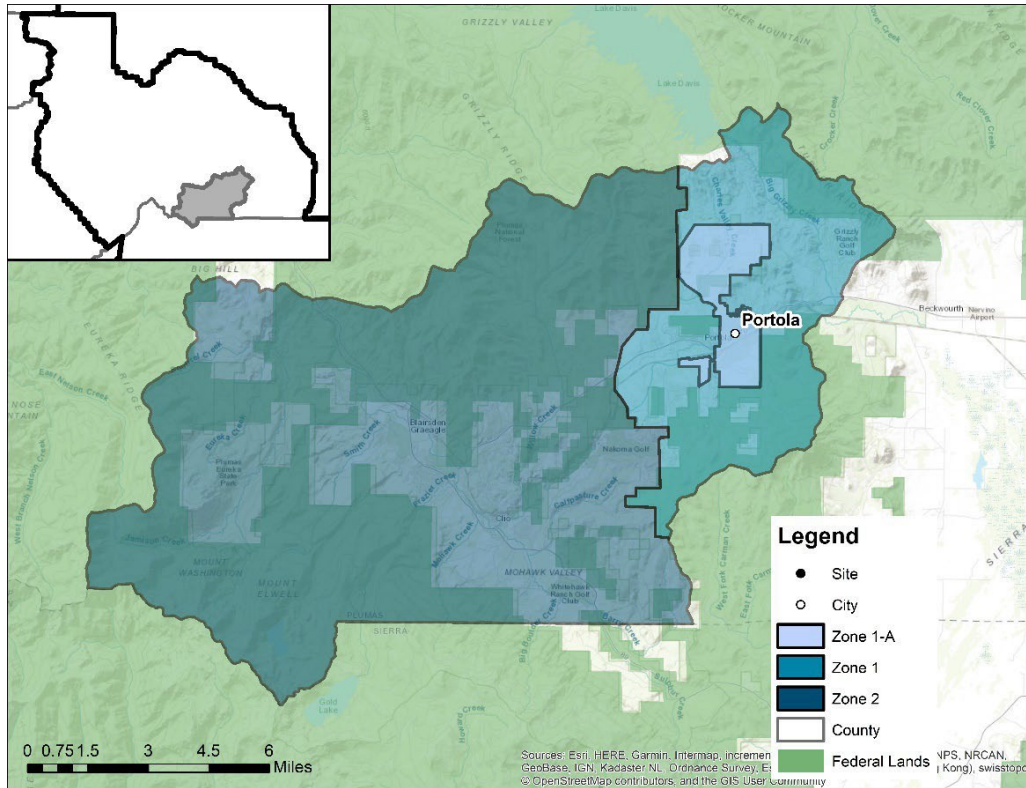
As previously discussed, in March and April 2015, the District administered a residential heating survey to assess the demographics of the community’s residents, particularly as they related to heating sources and wood stoves. This survey was distributed to the general population in the Portola NAA by utilizing the internet and

the manual distribution of the survey in various community areas, such as post offices, library, and grocery stores. The Portola Area Residential Heating Survey and its results are included in Appendix E.

3. Wood Stove Change-out Program Details

Over the next two years, 2024 through 2026, the District will administer a comprehensive wood stove change-out program with only those changed-out by December 31, 2024 being credited toward the attainment demonstration. As part of this program, the District will offer incentives ranging from \$3,500 to \$13,500 to encourage owners of older uncertified stoves within the Portola NAA to switch to newer cleaner-burning devices. To qualify for this program, the uncertified stove must be operable and currently in use in the residence. The Portola Change-out Program provides residents within the Portola City limits (Zone 1) up to \$5,000 to replace an uncertified stove with a certified wood stove or up to \$6,500 to replace an uncertified wood stove with one using alternative fuels such as pellet, propane or kerosene. Figure 19 shows the different zones. The program provides up to \$13,500 to replace uncertified wood stoves for electric mini split heat pumps or as an additional heat source in homes with newer EPA certified wood stoves. For residents outside of the city limits, but still within the Portola NAA (Zone 2), the program provides a \$3,500 rebate to replace an uncertified wood stove with a certified wood stove or a \$4,500 rebate to replace an uncertified wood stove with an alternative fuel device, such as pellet, propane or kerosene-fueled stove. The program offers a \$13,500 rebate to replace an uncertified wood stove for an electric mini split heat pump. As mentioned above, the District has about \$5 million remaining in the 2018 and 2020 TAG Funding which is sufficient to fund the 100 change outs event at the maximum rebate.

Figure 20. Zones in Portola NAA



Appendix F details the wood stove change-out process. To participate in the program the resident must complete an application, which is then reviewed by the District. All other applicants are considered for the Portola Change-out Program. The District schedules a pre assessment visit to inspect the stove prior to approving the application. Once an application is approved by the District, the letter with further instructions is mailed to the applicant. All of the installations must be completed by a District-approved retailer, as listed in Appendix F. The resident is required to make an appointment with the retailer for in-home estimate. The retailer will visit the home to verify that the wood burning device is eligible for the change-out program and helps the homeowner select the best replacement device for their needs. The retailer takes a photo of the old device and identifies it with tracking number on the application. The retailer then sends an estimate for costs to replace the device to the District and leaves a copy with the applicant. The retailer must have pre-approval from the District if the estimate is over the permitted amount depending on Zone. Additionally, an applicant is responsible for the added cost of any upgrades. Once the District approves the retailer estimate, the retailer installs the new device, takes a photo of the new device, then transports the old device to the City of Portola Public

Works Yard. One of the most important aspects of the program is to ensure that the non-certified wood stoves removed from homes are destroyed and the City agreed to work with the District-approved retailers to collect all removed stoves. The District developed a MOU with the City of Portola to destroy the stoves. The City matches the stove with the program tracking number, destroys the stove with a plasma torch, and stores the stove in a locked yard. The City fills out and signs a verification of destruction form and submits it to the District. The form contains the tracking number and photo of the destroyed stove. The City then has the pieces of the stove removed by a scrap retailer. Once the installation has been inspected by the responsible party, the retailer submits the entire packet to the District for reimbursement. The District inspects the packet, and if approved, reimburses the retailer. The retailer follows up with in-home training on proper use of the newly installed device. This in-home training by the retailer is an important aspect of the program to ensure the maximum reductions in emissions. The retailer asks each resident to complete a survey. The importance of following the best practices in wood burning is further reinforced when District staff visits the residence one wood burning season later to follow-up on the installation.

In order to meet the standard by December 31, 2025, the District needs to replace 100 stoves between 2021 and 2024. Since the change-out program is voluntary, the District took extra steps to ensure sufficient participation. From early on the District embarked on an aggressive outreach campaign to educate the residents on the importance of reducing PM_{2.5} for their own health and the well-being of the community. The District widely advertised the Portola Change-out Program throughout the community by distributing flyers and promoting the programs through the website and local newspapers. A key element of the advertising campaign was a kick-off meeting which provided an opportunity for residents to complete applications on site and talk to the retailers. The District will conduct a similar event during each year of the program. To have a continuous presence in the community the District maintains a satellite office at Portola, with District staff providing assistance with filling applications and answering questions related to the program. The District continues to employ a translator to help communicate with the Spanish-speaking community. Further, when air quality is predicted to be bad, older uncertified wood stoves are not allowed to be used.

4. Enforceable Commitment Calculation

The emission reductions necessary to demonstrate attainment will be achieved by implementing a wood stove change-out program. Listed below are the step-by-step

instructions and formulas for calculating emission reductions achieved by replacing uncertified wood stoves with cleaner-burning and more energy efficient alternatives.

The first step in calculating emission reductions required converting certification test emission rates in grams per hour (g/hr) to emission factors in pounds per ton (lb/ton), as described below:

1. The certification test emission rate of the replacement device was scaled upward by 50 percent to reflect the variations in in-home performance;
2. The scaled emission rate was divided by the average burn rate of 1.5 kilograms per hour (kg/hr) to calculate grams of PM_{2.5} emissions per kilogram of wood (g/kg); and
3. The result was multiplied by 2 to convert g/kg to lb/ton.

In the next step, the following equation was used to calculate emission factor in pounds per ton:

$$\text{Equation 1: } EF = (ER \times 1.5) / BR \times 2$$

Where:

<i>EF</i>	Emission factor in pounds per ton
<i>ER</i>	Emission rate in grams per hour
<i>BR</i>	Average burn rate in kilograms per hour of operation
1.5	Factor used to scale certification test emission rate to reflect potential increase in emissions during in-home operation
2	Factor used to convert grams per kilogram to pounds per ton

In the final three steps, the formulas shown in Equations 2 through 4, were used to calculate PM_{2.5} emissions of the old device, the new device, and the difference between them.

$$\text{Equation 2: } E_{old} = (EF_{old} \times WU \times WD)/2000$$

$$\text{Equation 3: } E_{new} = (EF_{new} \times WU \times WD \times (EFC_{old}/EFC_{new}))/2000$$

$$\text{Equation 3b: } E_{pellet} = (EF_{pellet} \times PU)/2000$$

$$\text{Equation 4: } E_{benefit} = E_{old} - E_{new}$$

Where:

Symbol	Definition
E_{old}	Emissions of old device (ton/year)
E_{new}	Emissions of new device (ton/year)
E_{pellet}	Emissions of pellet stove (ton/year)
EF_{old}	Emission factor for the old device (lb/ton)
EF_{new}	Emission factor for the replacement device (lb/ton)
EF_{pellet}	Emission factor for the pellet stove (lb/ton)
WU	Wood usage (cords/year)
WD	Wood density (ton/cord)
PU	Pellet usage (ton/year)
EFC_{old}	Device efficiency for the old device (%)
EFC_{new}	Device efficiency for the new device (%)
$E_{benefit}$	Emission reductions from change-out (ton/year)

Since emission factors for pellet stoves are more representative of actual in-home usage, a default PM₁₀ emission factor of 3.06 lb/ton, consistent with NSPS Review, was used for all pellet stoves. Portola households that use a pellet stove as the main source of heat are estimated to use two to three tons of pellet fuel per year per the

residential home heating survey submissions. To ensure a conservative approach, three tons were assumed in estimating emission reductions. Consistent with California’s Short Lived Climate Pollutant Reduction Strategy, propane and kerosene fueled heating devices were assumed to have negligible PM_{2.5} emissions. Table 11 lists constants and conversion factors used in calculating emission reductions and Table 12 lists estimated emission reductions achieved from each type of change-out as well as total emission reductions.

Table 11. Constants and Conversion Factors for Calculating Emission Reductions from Change-out Program.

Constants & Conversions	Value	Unit	Source
Woodstove Uncertified PM ₁₀ Emission Factor	30.60	lb/ton	AP-42, Table 1.10.-1
Woodstove Uncertified PM _{2.5} Emission Factor	29.47	lb/ton	CARB Methodology for Residential Wood Combustion
Woodstove 2020 NSPS Certified PM ₁₀ Emission Rate	2.00	g/hr	2020 NSPS
Woodstove 2020 NSPS Certified PM _{2.5} Emission Rate	1.93	g/hr	CARB Methodology for Residential Wood Combustion
Woodstove Average PM _{2.5} Emission Rate for Change-out Program	2.38	g/hr	Based on the emission rate for the 413 devices installed via the change out program through 2022
Emission Rate Scaling Factor	1.50		Assuming in use emission are 50% higher
Woodstove 2020 NSPS Certified PM _{2.5} Emission Factor	3.85	lb/ton	PM _{2.5} Emission Rate*Scaling Factor /Burn Rate* Conversion from g/kg to lb/ton

Woodstove Average PM _{2.5} Emission Factor for Change-out Program	4.75	lb/ton	PM _{2.5} Emission Rate*Scaling Factor /Burn Rate* Conversion from g/kg to lb/ton
Pellet Stove PM ₁₀ Emission Factor	3.06	lb/ton	2020 NEI Nonpoint Wagon Wheel
Pellet Stove PM _{2.5} Emission Factor	2.95	lb/ton	CARB Methodology for Residential Wood Combustion
PM _{2.5} Emission Fraction of PM ₁₀	96.30	%	CARB Methodology for Residential Wood Combustion
Old Device Efficiency	54	%	AP-42, Table 1.10-5
New Device Efficiency	68	%	AP-42, Table 1.10-5
Wood Use in Uncertified Wood Stove	4.3	cords/year	District Survey
Pellet Use	3	tons/year	Quincy Hot Spots Personal Communication
Wood Density	1.54	ton/cord	CARB Emission Methodology
Average Burn Rate	1.5	kg/hour	Gary Blais Personal Communications
Conversion from lb to ton	2000		
Conversion from g/kg to lb/ton	2		

Table 12. Estimated Emission Reductions.

Change-out Type	Estimated Number	Emissions Before (tpy)	Emissions After (tpy)	Emissions Saved (tpy)	Emissions Saved (tpd)
Wood Stove Uncertified to Heat Pump	20	1.951	0	1.951	0.005
Wood Stove Uncertified to Certified Stove	50	4.878	0.506	4.372	0.012
Wood Stove Uncertified to Pellet Stove	30	2.927	0.133	2.794	0.008
Totals	100	9.757	0.639	9.118	0.025

D. City of Portola Wood Stove and Fireplace Ordinance History

The Portola City Wood Stove and Fireplace Ordinance was previously adopted in 2002 as Portola Ordinance 298. On June 22, 2016, upon the District’s request, the City of Portola adopted a new Ordinance, 359, to address the PM_{2.5} pollution problem. The fully adopted City Ordinance is presented in Appendix H. The ordinance contains many different strategies to reduce emissions from wood burning heaters which are effective immediately upon adoption. The following PM_{2.5} measures are currently being implemented at the local level to achieve compliance with the 12 µg/m³ annual PM_{2.5} NAAQS:

1. Existing homes
 - a. Prohibit the installation of uncertified heating devices.
 - b. Prohibit the installation of unqualified fireplaces.
 - c. Limit certified wood stoves to two per property.
2. Change of ownership
 - a. Require removal or replacement of uncertified wood stoves.
 - b. Limit the number of certified wood heating devices to two per property.
3. New constructions
 - a. Require new constructions to offer non-wood heat.

4. New constructions or remodeling
 - a. Limit the number of certified wood stoves to two per property.
 - b. Limit the number of EPA-qualified fireplaces to one per home.
5. Prohibit the installation of wood fired boilers or hydronic heaters.
6. Restrict burning materials to seasoned wood, uncolored paper, pellets, and manufactured logs.
7. Require wood stove retailers to distribute educational materials provided by the District.

In addition to measures which took effect immediately, the ordinance includes a mandatory burning curtailment rule which took effect on January 1, 2021. This rule made it illegal to burn in an uncertified stove on days when high atmospheric stability would limit pollutant dispersion. The purpose of this rule is two-fold. First, the rule encourages owners of uncertified stoves to upgrade to certified stoves or risk not being able to heat their home. Second, the rule provides a mechanism for preventing PM_{2.5} concentrations from reaching high levels on days when stable atmospheric conditions limit pollutant dispersion. The rule makes it illegal to burn wood when pollution is forecast to exceed 20 µg/m³ unless an EPA certified stove is used.

E. District Rule

The District will adopt the Portola City Ordinance 359 (Appendix H) as a District Rule by the end of 2025. The District Rule will include all the requirements from the City Ordinance. The elements in the District Rule will apply to all of Zone one. These elements include:

- Prohibition of the Open Burning of Yard Waste
- Requirements for New Wood Burning Devices
- Requirements for Existing Wood Burning Devices
- Permitted Fuels in Wood Burning Devices, Wood Burning Fireplaces, Wood-Fired Cookstoves, Wood-Fired Fire Pits
- Mandatory Curtailment of Wood Burning Heaters, Wood Burning Fireplaces, Wood-Fired Fire Pits and Wood-Fired Cookstoves During Stagnant Conditions
- Curtailment Levels and Period
- Outdoor Wood-Fired Boiler Installation Prohibited
- Wood Stove Retailers/Contractors Required to Provide Educational Materials
- Violations
- Continuing violations—Each day being a separate violation

- Prohibit open burning in City limits

Additional elements not in the City Ordinance 359 that will be included in the District Rule are:

- Curtailment exemption due to service disruption
- Prohibit open burning during curtailment days in Zone 1

The District commits to enacting a District Rule that will take place of the City Ordinance 359 that will be effective by the end of 2025. This new rule will enable the District to enforce the curtailment program within Zone 1.

F. Prohibit Open Burning During Winter

To further reduce PM_{2.5} emissions during winter, the District commits to enforcing a District Rule which prohibits open burning on forecasted curtailment days in the most densely populated region of the Portola NAA, Zone 1. The District will continue to offer seasonal green waste curbside vouchers to residents in this region to encourage compliance with the District Rule.

G. Additional Strategies for Attainment

In addition to the wood stove change-out program and the requirements in the City's Wood Stove and Fireplace Ordinance, the District is implementing the following strategies to further reduce woodsmoke emissions with the Portola NAA.

1. Educational Campaign

Ever since Portola and the surrounding area have been designated nonattainment for the annual PM_{2.5} standard, the District has been working with the community to inform them about the health effects of PM_{2.5} and the implications of the nonattainment designation. The District staff work with the City Council and the District Board for support in working with the community. The District enlisted outreach partners such as the local hardware and grocery store, post office, library, senior community center, and schools to assist in the distribution of educational materials and advertise the changeout program. The District distributes press releases to local newspapers to inform the public about the problem. An example of a press release and events held are included in Appendix I.

The District hosts an annual wood stove workshop for Portola residents to discuss proper burning techniques and demonstrate new EPA-certified heating devices. With the exception of the pandemic years of 2020 and 2021 the District has hosted this

event over seven of the last nine years. Two local wood stove retailers demonstrate various models of EPA-certified wood and pellet stoves. Additionally, we have had a local electric heat pump installer present during the 2022 and 2023 events who presented on electric heat pump operation. The events include several presentations about the PM_{2.5} designation status, health effects of PM_{2.5}, and the District's continuous plan to reduce PM_{2.5} concentrations. The presenters include Julie Hunter, the District Executive Director, John Crouch, Director of Public Affairs of the Hearth, Patio and Barbeque Association or another member from within the HPBA, and Chris Neufeld, Vice President of Blaze King Industries. All speakers stress the importance of the community working together to improve air quality and thereby improving health and quality of life. The District also uses this opportunity to distribute *Burn Wise* brochures provided by the EPA.

District staff regularly attends City Council meetings to communicate the importance of using dry and seasoned wood and following the proper wood burning practices. The District also uses this opportunity to advertise the Portola Change-out Program. The District contracted with Progressive Source Communications (PSC) in the fall of 2022 creating multiple video ad campaigns that streamed throughout platforms

The District upgraded its website to advertise the wood stove change-out program and provide information about proper burning practices. Of note, one of the main tabs on the District's website now has information provided by the EPA's Burn Wise program. In addition, each resident applying to participate in a change-out program receives an informational pamphlet on the importance of good burning practices.

The District installed and maintains a dedicated phone line for residents wishing to ask questions or participate in the change-out program and a full-time employee as well as a part-time employee to assist the District with Spanish-speaking residents desiring a wood stove replacement or basic wood burning information.

2. Mandatory Wood Burning Device Curtailment Program

The District implemented a mandatory wood burning curtailment program beginning in the winter of January 1 2021. This measure followed a temporary voluntary curtailment period in 2016 - 2020 To ensure the success of the mandatory curtailment program. District developed enforcement capabilities by partnering with an air quality forecasting company Sonoma Technical Institute (STI) out of Petaluma, CA and maintaining public notification systems. The District utilizes an automated phone line for daily air quality forecasting, news articles, the District website, mailers, and social

media to deliver daily curtailment updates to the public. The STI End of Summary Report is located in Appendix L

3. Seasoned Wood Program

Wood that is not seasoned properly will burn less efficiently and release more harmful pollutants. The District implemented several programs to ensure residents have access to seasoned wood and know how to check moisture. These include:

- Supplying seasoned wood to households in need;
- Supplying woodsheds to households lacking proper wood storage; and
- Distributing moisture meters and stove thermometers.

Many households in the Portola NAA were lacking proper wood storage. District established a Woodshed Program to offer incentives for woodsheds to households lacking proper wood storage. Only households which participated in the wood stove change-out program or registered their EPA certified wood burning device with the District were eligible for incentives. The Woodshed program had a few different facets. Initially, District had an agreement with the local high school to build woodsheds as part of the workshop class. Later, District worked with local contractors who build and delivered woodsheds to households. District also provided materials to households to construct woodsheds on their own. Each woodshed was inspected by the District to verify that materials were used for this purpose and the woodshed was used for storing wood.

Moisture meters were distributed to households to help them monitor the wood moisture and avoid burning wet wood. They were also used as an educational tool to raise awareness about the importance of burning seasoned wood to reduce emissions and keep the device and the chimney in optimal condition. Stove thermometers were distributed to households to help maintain the stove temperature in the optimal range. Maintaining optimal burn temperature helps reduce emissions, prolongs the life of the firebox, and reduces fuel usage and creosote buildup.

4. Chimney Sweeps

Annual chimney sweep is important for maintaining good draft and preventing fire. In addition to sweeping chimneys, participating providers inspect the wood burning device and instruct households on device maintenance and operation as well as importance of using seasoned wood. District is providing incentives for annual chimney sweep to qualified residents.

5. Regulation and Enforcement of Opacity Requirement

To help control smoke from chimneys and to encourage cleaner burning techniques the District enforces existing Rule 202. This rule states the following:

“A person shall not discharge into the atmosphere from any single source of emission whatsoever any air contaminant for a period or periods aggregating more than three (3) minutes in anyone (1) hour which is:

- A. As dark or darker in shade as that designated as No. 1 on the Ringelmann Chart, as published by the United States Bureau of Mines, or
- B. Of such opacity as to obscure an observer's view to a degree equal to or greater than does smoke described in subsection (A) of this section.”

District Rule 202 was approved into the State Implementation Plan (SIP) on 9/16/1997 under 62 Federal Register 48480.

H. Summary of Commitments and Estimated Reductions

A summary of annual average PM_{2.5} inventory and reductions for the proposed control measures is provided in Table 13. Emission reductions represent the difference between the projected 2021 baseline and the 2025 emissions needed to demonstrate attainment. Replacing an additional 100 devices between January 1, 2021, and December 31, 2024, is estimated to reduce PM_{2.5} emissions by 0.025 tpd.

Table 13. Control Measure Summary

Sources	PM _{2.5} Emissions (tpd)	Implementation
2021 Baseline Emissions	0.370	
Emission Reduction Needed for Attainment		
Wood stove Change-out Program	0.025	Ongoing
Total Reductions	0.025	
2025 Attainment Year Emissions	0.345	
Other Commitments		
Mandatory Wood Burning Curtailment	N/A	Ongoing
Other Provisions of City of Portola Wood Stove and Fireplace Ordinance	N/A	Ongoing
Educational Campaign	N/A	Ongoing

Enforcement of Opacity Rule	N/A	Ongoing
Seasoned Wood Program	N/A	Ongoing
Chimney Sweep	N/A	Ongoing
Prohibit Open Burning During Winter	N/A	Ongoing

V. Attainment Demonstration

The attainment date under section 188(c)(2) of the Act for the purposes of the 12 µg/m³ annual PM_{2.5} NAAQS in the Portola NAA, will be December 31, 2025. The attainment demonstration presented below describes how the chosen control strategies would provide the emissions reductions needed to bring the Portola NAA into attainment by the end of 2025.

The main source causing the Portola NAA to violate the 12 µg/m³ annual PM_{2.5} NAAQS is wood smoke from residential burning. Wood burning is responsible for 76 percent of PM_{2.5} mass annually and 86 percent on a typical exceedance day. Wood heat is very popular in the area due to the lack of natural gas and the availability of cheap, or even free, wood. Home wood burning devices in the area include EPA certified wood stoves and fireplace inserts with various emission control technologies, as well as uncertified wood stoves and fireplaces without any emission control technology. The newer wood burning devices, when used properly, burn much cleaner and more efficiently than older devices. Since wood burning is a key source of PM_{2.5} pollution in the area, the District developed a comprehensive wood smoke reduction strategy. As outlined in Section IV, while there are many features of this strategy, the attainment demonstration relies solely on the reductions from the wood stove change-out program.

Due to the overwhelming contribution of residential wood burning to PM_{2.5} concentrations, replacing old wood burning home heating devices with less-polluting and more energy efficient alternatives is the only viable option for reducing PM_{2.5} levels despite the uncertainty associated with EPA woodstove certification program¹². The District has about \$5 million remaining¹³ in the 2018 and 2020 Targeted Airshed Funding to implement a multi-faceted program focused on reducing emissions from wood burning home heating devices by providing incentives for replacing older wood heating devices, installing wood sheds, offering vouchers for chimney sweeps, and educating the public about device operation and the benefits of using properly

¹² https://www.epa.gov/system/files/documents/2023-01/_epaig_20230125-23-E-0006_Redacted%20for%20Public%20Release.pdf

¹³ As of May, 2024.

seasoned wood. Financial assistance is essential as many of the households relying on wood to keep their homes warm are lower- and middle-income families. To demonstrate attainment, the District will need to encourage 100 of the 595 owners of uncertified wood heating devices to participate in the program. The program will ensure that the uncertified wood heating devices are destroyed, thereby removing them from any secondary market. Replacing 416¹⁴ old wood burning devices with less-polluting and more energy efficient alternative home heaters in Portola NAA led to 15 percent decrease in annual design values between 2015 and 2021. Replacing an additional 100 devices is estimated to provide 100 percent of the emission reductions needed to attain the annual standard by December 31, 2025. As described in more detail in Section IV, Attainment Strategies, the District has both the funding and the program in place to achieve the estimated emission reductions.

Because the plan relies on a voluntary measure to deliver all of reductions needed to attain the standard, the District and CARB took significant precautions to ensure that the program is successful and delivers the estimated reductions. District's efforts to ensure sufficient participation included the following:

1. Financial incentives, up to the full cost of replacing an uncertified home heating device with one that is less polluting and more efficient.
2. A simple and streamlined application process, including help filling out applications in English and Spanish.
3. On-site staff to provide information and answer questions.
4. A heavy advertising campaign to spread the news about the program throughout the Portola NAA.
5. Partnerships with the City of Portola and local agencies to leverage funding and resources and further promote the program.

The Moderate SIP included an enforceable commitment to achieve emission reductions from Portola Change out Program. CARB and the District fulfilled all the terms and conditions stipulated in the Moderate SIP enforceable commitment on time.

In addition to ensuring sufficient participation to meet the projected number of change-outs, emission reductions calculations include a safety buffer. This safety buffer is in place to compensate for uncertainties inherent in any process relying on reductions achieved inside people's homes and those associated with the wood

¹⁴ Based on change-outs completed through 12/31/2020

stove certification process. The following factors make the estimated emission reductions and attainment demonstration conservative:

1. The attainment plan does not take credit for a 10 percent projected decline in NO_x emissions and 12 percent in directly emitted PM_{2.5} from mobile sources between 2021 and the end of 2024.
2. The attainment demonstration calculations factor in change-outs completed during the prior year. The retailers plan to complete most of the change-outs scheduled for a given year during summer. Therefore, the air quality during the second half of the year should reflect the change-outs completed during the summer as well as those of the prior year.
3. The attainment demonstration does not reflect any reductions from the aggressive educational campaign. Each replacement is accompanied by an educational session to instruct homeowners on the importance of using the appropriate fuel and following best practices in wood burning. Additionally, the District is reaching out to residents not participating in the change-out program to educate them as well on the best practices in wood burning, buying, and storing as outlined in Section IV, Attainment Strategies.
4. The District is implementing a suite of other measures, as part of a long-term wood smoke reduction strategy, for which no credit was taken to demonstrate attainment. The comprehensive list of measures implemented as part of the long-term wood smoke reduction strategy is included in Section IV.G., Additional Strategies for Attainment.

A. Design Value Selection

CARB selected 2021 PM_{2.5} annual design value, calculated based on the air quality from January 1, 2019 through December 31, 2021 as a modeling baseline design value for the attainment demonstration. The 2021 PM_{2.5} annual design value was also used in EPA's determination that the Portola NAA did not meet the 12 µg/m³ annual PM_{2.5} standard by the Moderate attainment date. By centering around covid-19 pandemic years, 2021 annual PM_{2.5} design value reflects high emissions of PM_{2.5} from residential home heating. Due to social distancing restrictions and the necessity to work and study remotely, Portola residents spent more time at home which required keeping the house warm around the clock. Since, unlike schools and larger businesses which use propane heaters, most residential homes are heated by burning wood in wood stoves and fireplaces, the emissions during covid-19 pandemic years are likely to be much higher compared to non-pandemic years. Table 14 lists 2019-2021 annual PM_{2.5} statistics. The modeling baseline design value

was calculated after excluding atypical events and two incorrect data points captured on August 2 and 5, 2021. The justification for excluding these days from calculation is detailed in Appendix J.

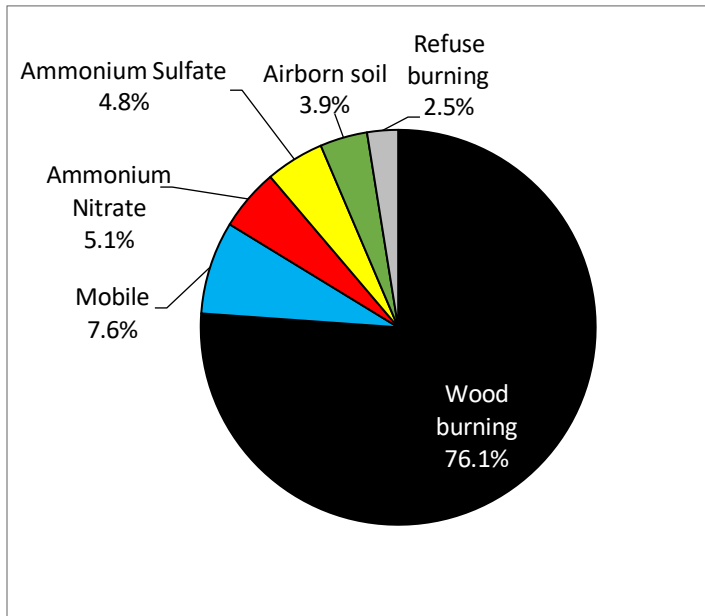
Table 14. 2019-2021 PM_{2.5} Annual Statistics and Design Value

Statistic	Annual Averages (µg/m ³)			DV (µg/m ³)
	2019	2020	2021	2021
All Data	12.2	20.9	16.4	16.5
Atypical Events Excluded	12.2	12.6	13.1	12.6

I. PM_{2.5} Source Categories

Thorough analysis of chemical composition data combined with analysis of diurnal and temporal patterns identified wood burning as the main contributor to the PM_{2.5} mass. Section II summarizes analyses of ambient data. While analyses of ambient data can help identify major source categories, receptor models can provide quantitative information on ambient sources contributing to the observed PM_{2.5}. To estimate source contributions in the Portola NAA, a Positive Matrix Factorization (PMF) model was applied using 2011-2015 PM_{2.5} speciated data. The model clearly identified six source types contributing to PM_{2.5} in the area and assigned percentage contributions to each source. The average source contribution was scaled to the 2021 design value to estimate how much each component contributes to the design value. Figure 20 illustrates annual source contributions based on the PMF model results.

Figure 21. 2011-2015 Annual Average Source Contribution



To determine if it is appropriate to apply an older rollback model result to 2018-2021 data, historical trends in chemical composition were evaluated. As illustrated in Figure 21, 2018-2021 chemical composition closely resembles 2013-2014 composition. Because all $PM_{2.5}$ components, besides organic and elemental carbon which originate from burning wood in residential home heaters, are so insignificant, despite the decline in overall $PM_{2.5}$ concentration (Figure 22) the year-to-year percent composition remains the same (Figure 23).

Figure 22. Comparison of Annual PM_{2.5} Composition, 2013-2014 to 2018-2021

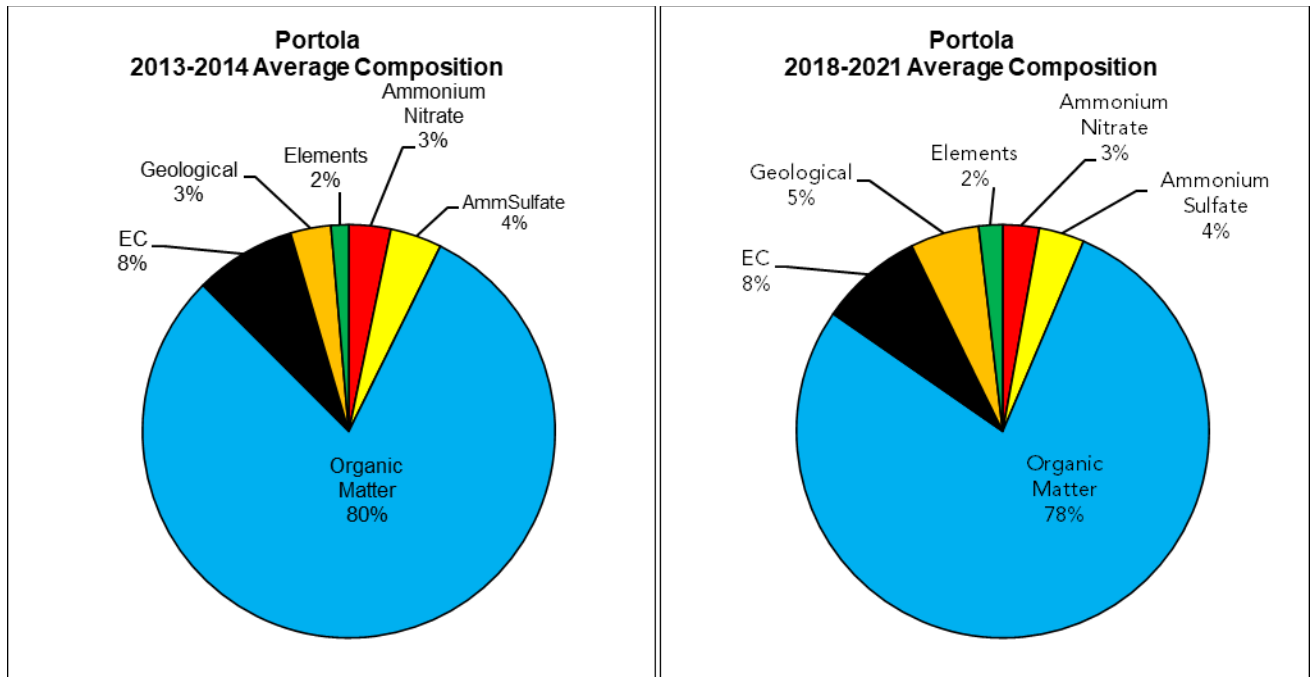


Figure 23. Trends in PM_{2.5} Chemical Speciation

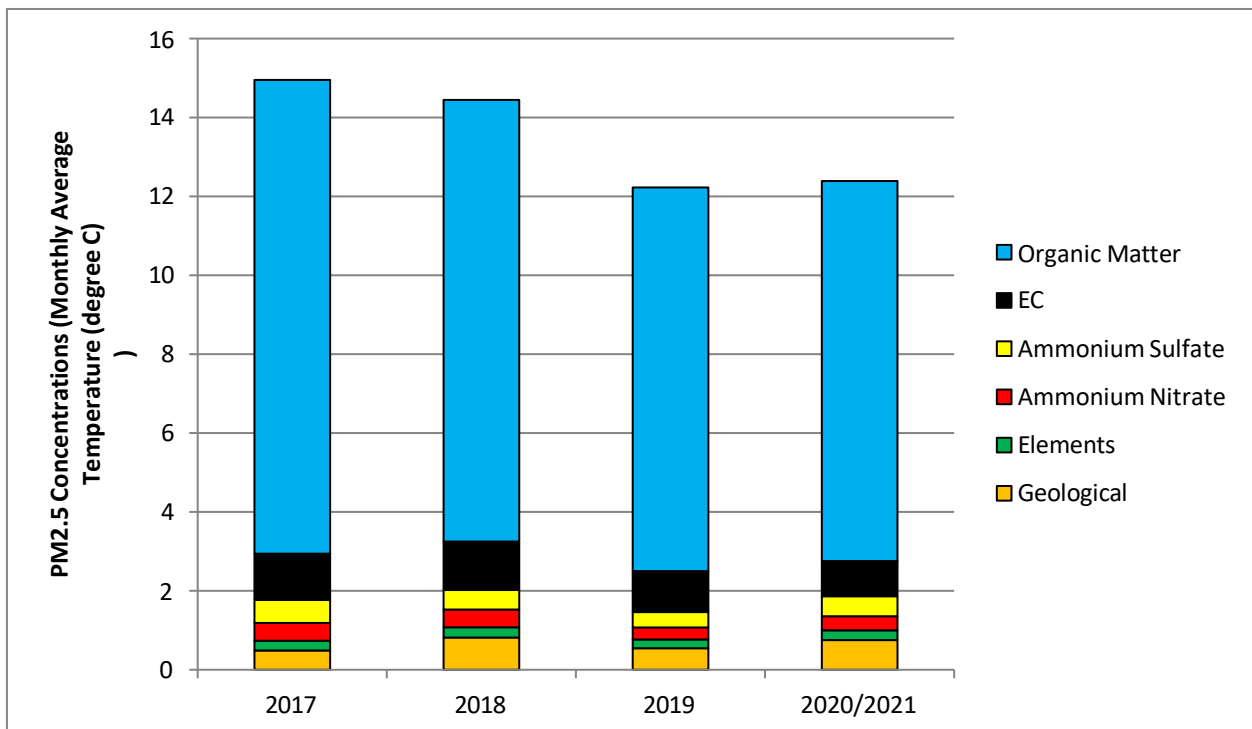
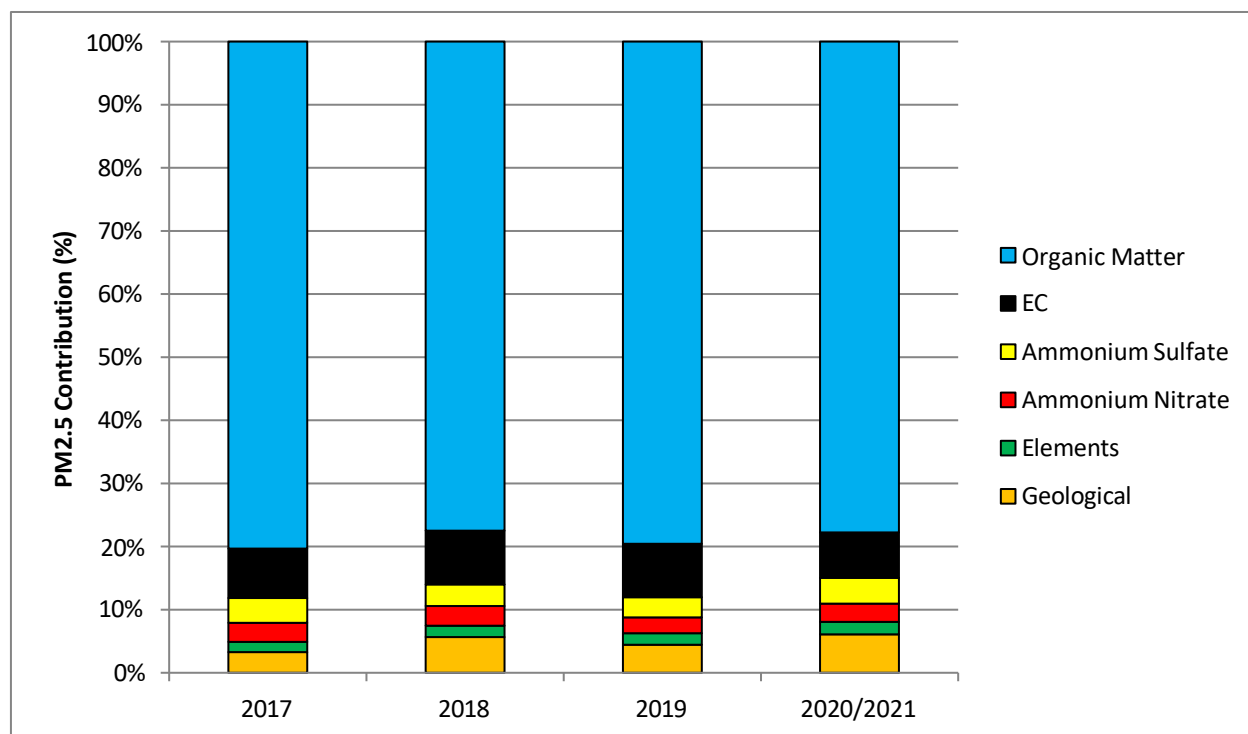


Figure 24. Trends in PM_{2.5} Percent Composition



J. Background Concentrations

Background concentrations are concentrations that would occur in the airshed in the absence of local anthropogenic emissions and represent local natural emissions and transported pollutants. The rollback model assumes that atmospheric concentrations in excess of background are proportional to local emissions. The purpose of this analysis is to determine what portion of the PM_{2.5} mass at the Portola NAA could be subject to controls. This is calculated by subtracting background concentrations from PM_{2.5} concentrations measured at the Portola monitoring site.

In the previous plan, background PM_{2.5} concentrations were determined using IMPROVE data from the D.L. Bliss monitoring site (AQS ID: 060179000), located on the west shore of Lake Tahoe. While the D.L. Bliss monitoring site is the closest IMPROVE site – in terms of distance – to the Portola monitoring site, it is in the Lake Tahoe Air Basin whereas the Portola monitoring site is located in the Mountain Counties Air Basin. Both Air Basins feature complex terrain and are relatively rural in nature; however, the Lake Tahoe Air Basin is a major tourist destination. Recent estimates¹⁵ indicate that more than 2 million unique annual visitors spend an average

¹⁵Lake Tahoe Destination Stewardship Plan: <https://stewardshiptahoe.org/wp-content/uploads/2023/06/Lake-Tahoe-Stewardship-Plan-6-19-23-FINAL.pdf>

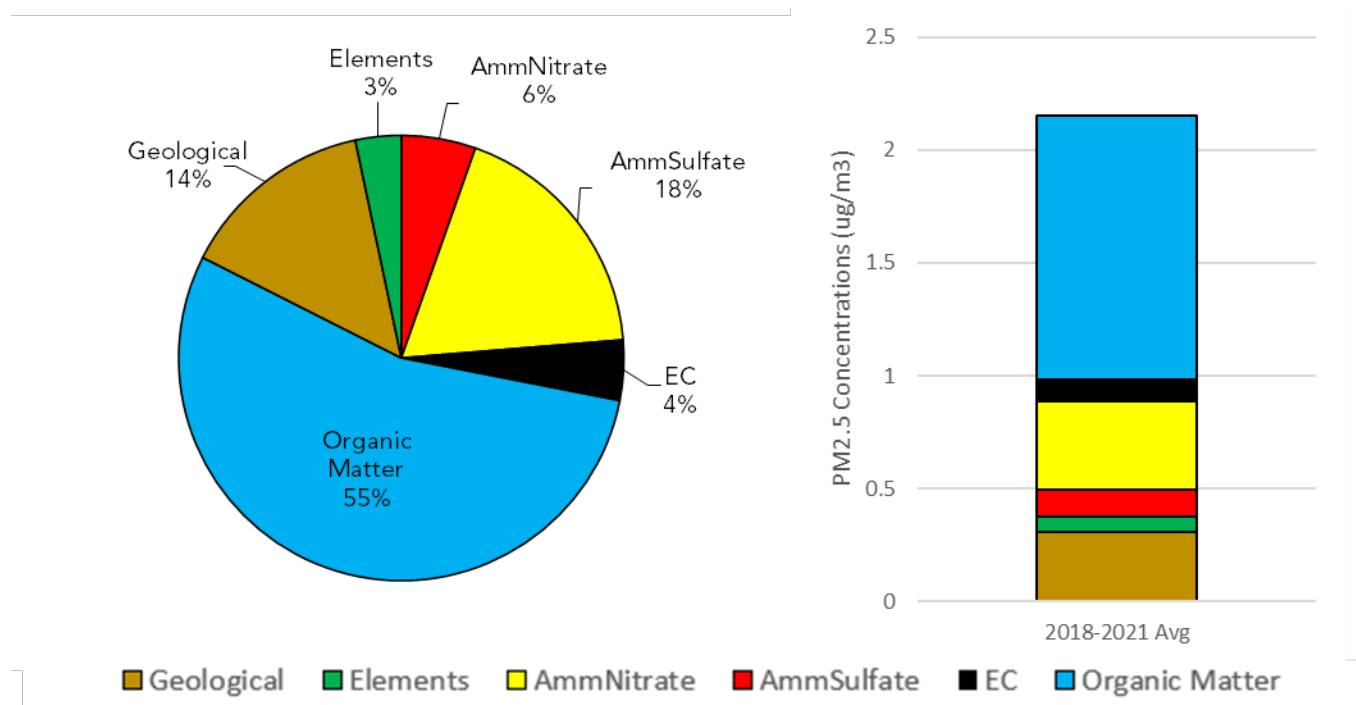
of nearly 15 million visitor days in the region. As explained in the Lake Tahoe Destination Stewardship Plan, “...the region’s land mass is roughly one-third the size of Yosemite National Park yet receives approximately three times the amount of visitation.” This high concentration of visitor usage results in periods of heavy traffic and strained resources that is in stark contrast to land use and visitor activity in Portola and the surrounding vicinity.

For this plan, background PM_{2.5} concentrations were determined using IMPROVE data collected at the Lassen Volcanic National Park monitoring site (AQ5 ID: 0608993003), located north of Portola in the Lassen Volcanic National Park (Lassen) and within the Mountain Counties Air Basin. The annual background concentrations were calculated based on 332 data points collected between 2018 and 2021. Prior to averaging, 59 atypical data points were removed from calculations. In addition to excluding data points that coincided with atypical events at Portola, days with organic matter concentrations exceeding 3 µg/m³, which suggest impact of wildfires, were also excluded. The organic matter concentrations on 59 atypical days ranged from 3.1 µg/m³ to 60.7 µg/m³ with an average of 22.6 µg/m³, over twenty times the 2018-2021 average calculated without atypical events. Table 15 and Figure 24 show the annual background concentrations for Portola.

Table 15. 2018-2021 Annual Average Background PM_{2.5} Concentrations for Portola NAA

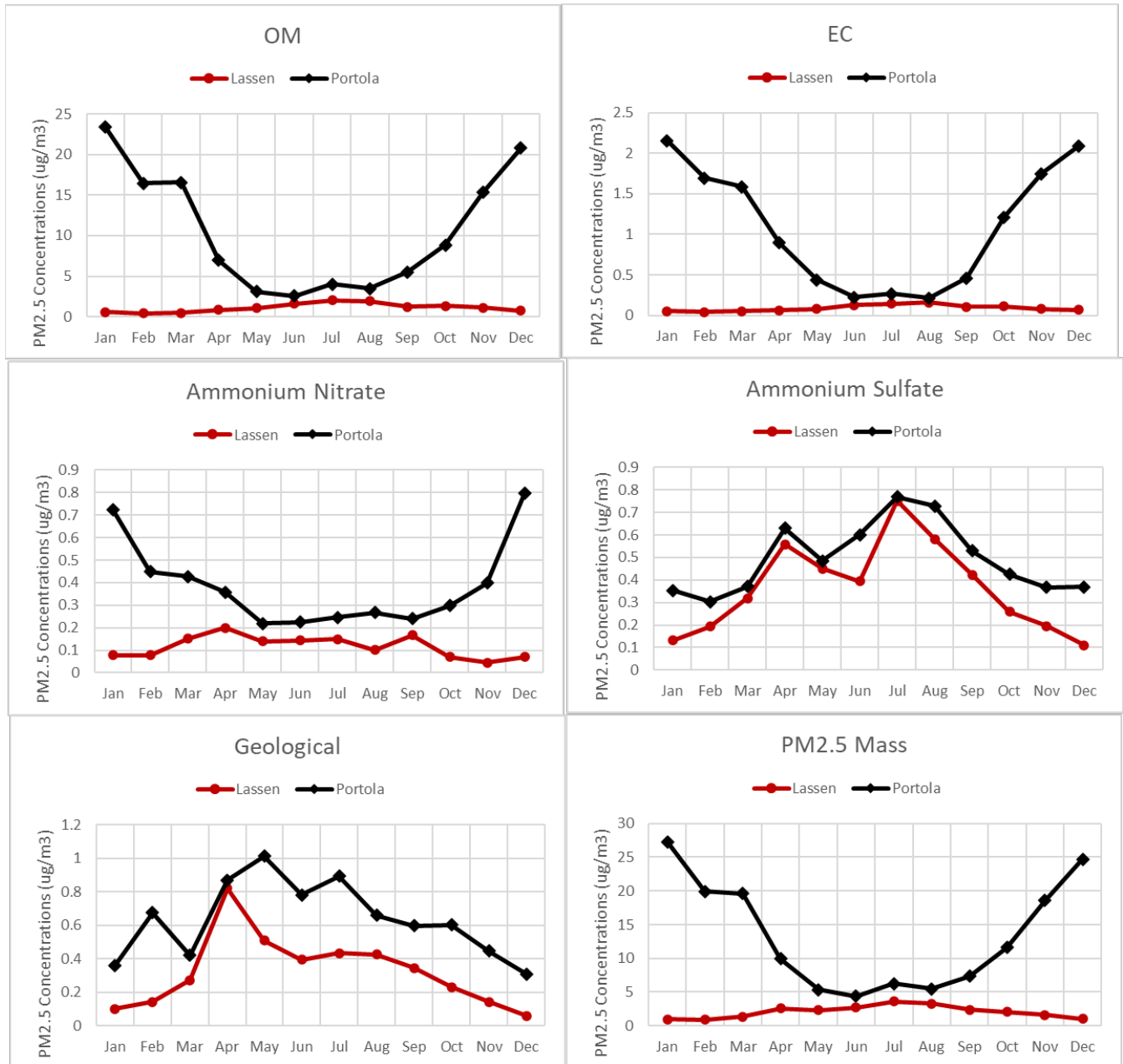
PM _{2.5} Component	Concentrations (µg/m ³)
Ammonium Nitrate	0.12
Ammonium Sulfate	0.39
Carbonaceous aerosols	1.26
OM	1.17
EC	0.09
Geological	0.31
Elements	0.07
Sum of Species	2.15

Figure 25. 2018-2021 Annual Average Composition of Background PM_{2.5} Concentrations for Portola NAA



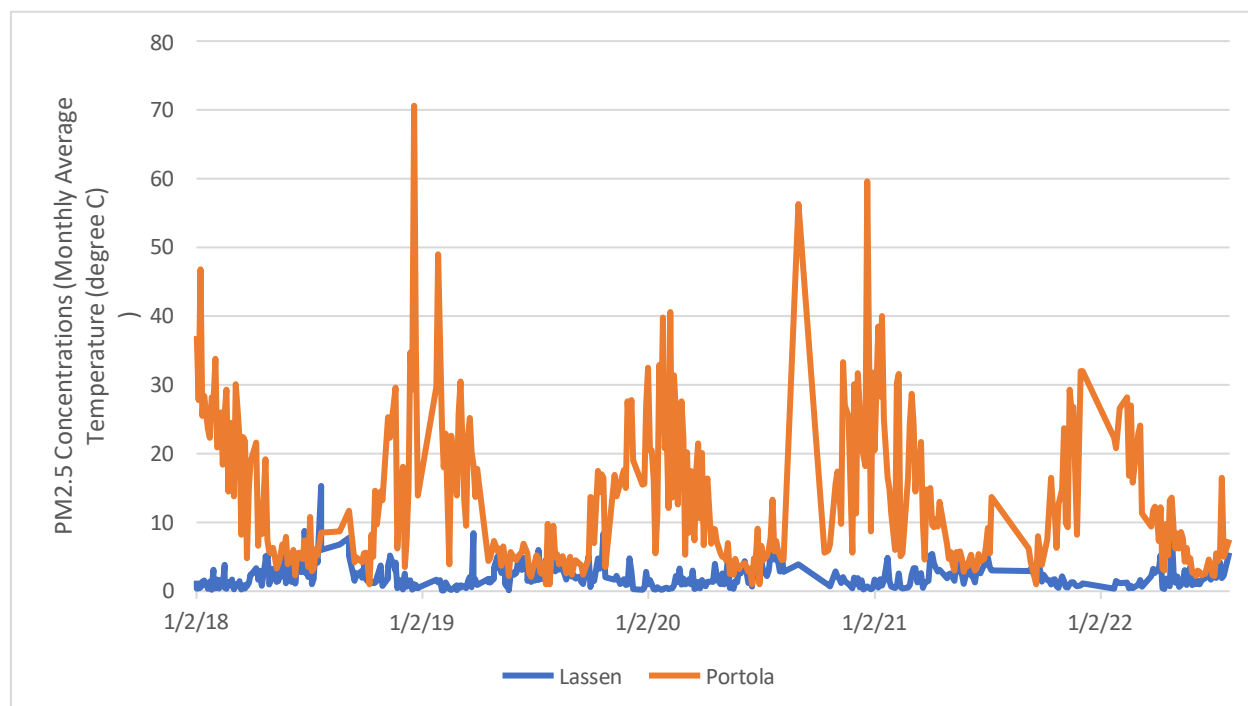
To further verify that ambient PM_{2.5} concentrations measured at the Lassen site could serve as an accurate estimate of background concentrations for the Portola NAA, we compared monthly average concentrations for the PM_{2.5} mass and its components for the two sites. The relationship varies depending on the component (Figure 25). Burning wood for residential home heating is a predominant source of organic matter and elemental carbon in the Portola NAA. During peak summer months, from June through August, when homes in the Portola NAA don't need heating, concentrations are similar at the two sites. Outside of peak summer months, concentrations increase at Portola due to wood burning and localized temperature inversions that trap pollution close to the ground, promoting the accumulation of organic matter and elemental carbon. At the Lassen site, concentrations remain low during the winter months. Ammonium nitrate concentrations exhibit similar patterns but the period where the two sites track each other is longer, from May through September. Ammonium sulfate concentrations have similar magnitudes and seasonal patterns, with concentrations only slightly higher at the Portola NAA. The two sites also have similar seasonal patterns in geological material, with summer highs and winter lows; however, since concentrations are influenced by local sources, the two sites don't track as well as they do for other components.

Figure 26. Comparison of Portola NAA Seasonal Profiles to the Background Concentrations



The Lassen IMPROVE site is an appropriate background site for the Portola NAA. The two sites have similar concentrations during summer months, while winter concentrations increase at the Portola NAA but remain low at Lassen. Figure 26 further illustrates the daily differences between the two sites from January 2018 to December 2022.

Figure 27. Comparison of PM_{2.5} Concentrations at Portola and Lassen



K. Evaluation of Significant Precursors

PM_{2.5} is made up of many constituent particles that are either directly emitted, such as soot and dust, or formed through complex reactions of gases in the atmosphere. NO_x, sulfur dioxide (SO₂), VOCs, and NH₃ are gases that are precursors to PM_{2.5}, transforming into particles through physical and chemical atmospheric processes.

The PM_{2.5} Implementation Rule¹⁶ identifies the four PM_{2.5} precursor pollutants—NO_x, SO₂, VOCs, and ammonia—that must be evaluated for potential control measures in any PM_{2.5} attainment plan. As described in the PM_{2.5} Precursor Demonstration Guidance¹⁷ (Guidance) finalized by EPA in May 2019, the PM_{2.5} Implementation Rule permits air agencies to “submit an optional precursor demonstration designed to

16 81 FR 58010 (August 24, 2016)

17 U.S. EPA. PM_{2.5} Precursor Demonstration Guidance. 30 May 2019.

https://www.epa.gov/sites/default/files/2019-05/documents/transmittal_memo_and_pm25_precursor_demo_guidance_5_30_19.pdf

show that for a specific PM_{2.5} nonattainment area, emissions of a particular precursor from sources within the nonattainment area do not or would not contribute significantly to PM_{2.5} levels that exceed” the NAAQS. Per Section 51.1006 of the Guidance, if the agency’s demonstration is approved by EPA, the attainment plan “may exclude that precursor from certain control requirements under the CAA.”

This document includes precursor demonstrations that the District is requesting to be excluded from certain control requirements specified in the CAA for four PM_{2.5} precursors: NH₃, NO_x, SO_x, and ROG. The CARB inventory tracks SO_x rather than SO₂ specifically, but SO_x consists mostly of SO₂. ROG is similar, although not identical to EPA’s term “VOC.”¹⁸ CARB’s inventory tracks ROG as a subset of total organic gases (TOG).

In this section we analyze “the relationship between precursor emissions and the formation of secondary PM_{2.5} components”.

1. Emission Inventory Analysis

The PM_{2.5} Implementation Rule recommends evaluating emissions inventories. However, in the case of the Portola NAA, evaluation of the emission inventories does not appropriately characterize the main contributors to the PM_{2.5} problem in the area. As listed in Table 16, emissions of directly emitted PM_{2.5} are similar to NO_x but much smaller than VOC/ROG emissions.

Table 16. Make-up of 2021 Portola NAA Attainment Demonstration Base Year Emissions

Pollutant	Emissions (tpd)
PM _{2.5}	0.370
NO _x	0.379
SO _x	0.013
Ammonia	0.125
ROG	2.492

The emission inventories suggest that PM_{2.5} precursors, particularly VOC/ROG and NO_x, are important contributors to the total emissions; however, chemical composition data suggests otherwise. Table 17, for example, shows that approximately three quarters of emissions are from precursors, but chemical

¹⁸ See: California Air Resources Board. “FACT SHEET #1: Development of Organic Emission Estimates For California’s Emission Inventory and Air Quality Models.” Aug. 2000. Web. 24 May 2018. www.arb.ca.gov/ei/speciate/factsheetsmodeleispeciationtog082000.pdf

composition data illustrated in this section indicates that only 6 percent of the mass is from secondary formation and the remaining 94 percent is from direct PM_{2.5} emissions.¹⁹ This apparent inconsistency is the result of meteorological conditions which favor accumulation of direct PM_{2.5} over secondary formation. Furthermore, Portola NAA precursor emissions are so low in comparison to other areas of the State, that there could be a lot of noise in the data.

Table 17. Comparison of Portola 2021 NO_x Emission to Other Areas in California

Area	NO _x Emissions (tpd)
Portola NAA	0.379
Yuba City Marysville PM _{2.5} Nonattainment Area	8.398
San Joaquin Valley PM _{2.5} Nonattainment Area	182.703
South Coast PM _{2.5} Nonattainment Area	314.322

1. Concentration-based Contribution Analysis

Concentration-based analysis considers ambient data to determine whether precursor emissions contribute significantly to total PM_{2.5} concentrations. This section relies on chemical speciation data, summarized in Chapter II.C.1, Chemical Composition, to demonstrate contribution of a particular precursor to the PM_{2.5} design value. Each precursor’s impact on total PM_{2.5} mass is compared to contribution thresholds. EPA recommends values for these thresholds, or air quality concentrations below which air quality impacts are not statistically significantly different from “the inherent variability in the measured atmospheric conditions,” and thus do not contribute to PM_{2.5} concentrations that exceed the NAAQS. These thresholds are ≥0.2 micrograms per cubic meter (µg/m³) for the 2012 annual PM_{2.5} standard.

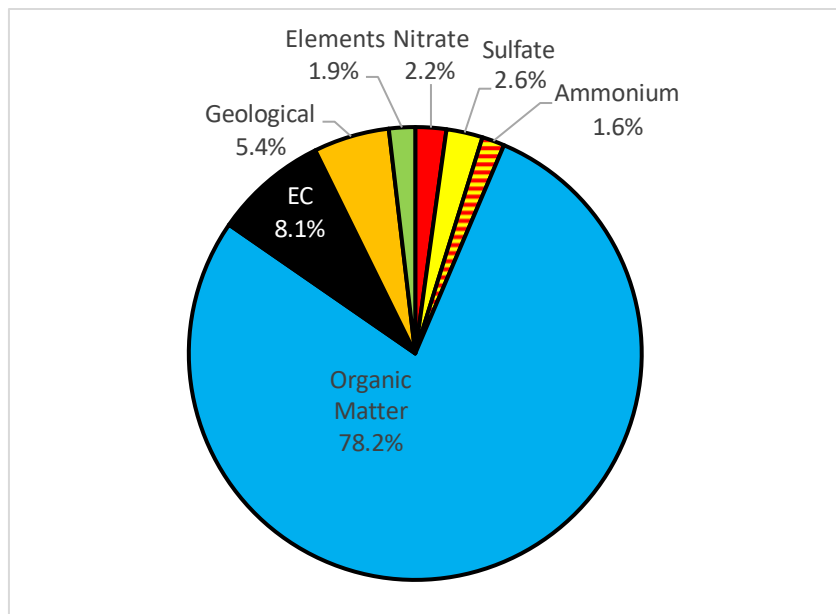
Figure 27 shows that directly emitted PM_{2.5} (organic matter, elemental carbon, geological material, and elements) contribute 94 percent of PM_{2.5} mass. For the Portola NAA, it is appropriate to assume that most of the organic matter is directly emitted since diurnal profiles in Figure 29 point to an overwhelming contribution of PM_{2.5} during nighttime hours, consistent with the time most households burn wood for heat. Although wood burning could lead to formation of Secondary Organic

¹⁹ 94 percent of PM_{2.5} mass is directly emitted assuming that all of organic matter is primary in nature. Some organic matter is secondary in nature but since most of it originates from wood burning, control strategies aimed at reducing wood burning emissions will also reduce emissions of secondary organics.

Aerosols (SOAs), relatively little is known about its formation, composition, and potential contribution to PM_{2.5} mass. It is safe to assume that controls aimed at reducing wood burning emissions would also reduce SOA formation.

The paragraphs that follow examine each precursor.

Figure 28. 2018-2021 Annual Average Composition



Sulfur Oxides - SO_x

Since sulfate can exist in the atmosphere in the form of sulfuric acid if it's not neutralized by ammonia, the SO_x contribution to PM_{2.5} design value is evaluated by estimating sulfate contribution to the PM_{2.5} design value. Sulfate contributes 0.33 µg/m³ or 2.6 percent of the PM_{2.5} mass.

Nitrogen Oxides - NO_x

Since NO_x contributes directly to ammonium nitrate formation, its impact on the PM_{2.5} design value was evaluated by estimating the ammonium nitrate contribution. Ammonium nitrate contributes 0.36 µg/m³ or 2.8 percent to the PM_{2.5} annual design value.

Ammonia – NH₃

Since in the absence of ammonia, nitrate would only exist as a gas, ammonia contribution to the PM_{2.5} design value is represented by all measured ammonium plus nitrate ion. The two components together contribute 0.48 µg/m³ or 3.8 percent

to the PM_{2.5} annual design value. Therefore, based on chemical speciation data, ammonia could potentially contribute 0.48 µg/m³ or 3.8 percent to the annual design value.

Volatile Organic Compounds - VOC

There are two routes by which VOCs can contribute to ambient PM_{2.5}. The first is through various chemical reactions leading to the formation of SOAs. The second is through photochemical reactions that create oxidants such as ozone and hydroxyl radicals, which in turn oxidize NO_x emissions leading to the formation of particulate ammonium nitrate. As noted above, ammonium nitrate is a minor component of PM_{2.5}. Therefore, the impact of VOC emissions on the PM_{2.5} design value through nitrate formation is likely to be small. If there is any contribution of SOAs to ambient PM_{2.5} levels, it would be mostly from biogenic emissions and mainly formed during summer when temperatures are warmer and concentrations are lowest. Man-made sources of SOA precursors include solvents, catalyst gasoline engines, wood smoke, and non-catalytic gasoline engines. Due to the lack of SOA data specific to the Portola NAA, we examined broader aspects of SOA concentrations in California:

- 1) San Joaquin Valley – CARB air quality modeling exercises conducted as part of the SJV 2024 PM_{2.5} Plan attainment demonstration analysis using the CMAQ model showed that SOA derived from anthropogenic VOC emissions contribute about 20 percent to organic aerosol concentrations with 80 percent of SOA from biogenic sources. In the Portola NAA, the PMF model identified two sources of organic aerosols: wood burning and motor vehicles. Any controls targeting directly emitted PM_{2.5} from wood burning would also reduce VOC emissions. Motor vehicle emissions contribute 1 µg/m³ to the 2021 design value. If 20 percent of that mass is from secondary formation, the total SOA mass would be no more than 0.2 µg/m³ and the mass from anthropogenic SOA would only be 20 percent of that, which would be equivalent to 0.04 µg/m³.

The NASA DISCOVER-AQ study conducted in the San Joaquin Valley during January and February 2013 provided information about diurnal patterns in SOA²⁰. Two factors were characterized as secondary organic aerosols: semi

20 Characterization of PM_{2.5} Episodes in the San Joaquin Valley Based on Data Collected During the NASA DISCOVER-AQ Study in the Winter of 2013; Report to the California Air Resources Board; <https://ww2.arb.ca.gov/sites/default/files/classic/research/apr/past/14-307.pdf>

volatile organic aerosols (SV-OOA) and low volatility- oxygenated organic aerosols (LVOOA). The fractional contribution of SOA to total organic aerosol mass was greatest during the day whereas- primary organic aerosol (POA) dominated in the evening until mid-morning (Figure 28), indicating the influence of boundary layer dynamics, local anthropogenic emissions, and photochemical activity. Portola NAA PM_{2.5} concentrations are lowest midday (Figure 29). The reversed diurnal patterns of PM_{2.5} concentrations and SOA suggest that SOA is a minor contributor to PM_{2.5} at Portola.

- 2) There is discontinuity between the seasonal patterns seen in SOA formation and PM_{2.5} concentrations at Portola (Figure 30). The CMAQ model demonstrates that SOA are formed mostly during summertime and are primarily derived from biogenic emission sources. During summer, when the conditions are optimal for SOA formation, PM_{2.5} organic carbon concentrations at the Portola NAA are very low and essentially indistinguishable from background levels (Figure 31).
- 3) Based on evaluation of seasonal and diurnal patterns and applying percentages derived from SJV 2024 PM_{2.5} Plan we conclude that VOC is a minor contributor to the PM_{2.5} mass at Portola and is estimated to be below the threshold of 0.2 µg/m³.

Figure 29. Diurnal Mass Contribution of Organic Aerosol Factors to Organic Mass in San Joaquin Valley

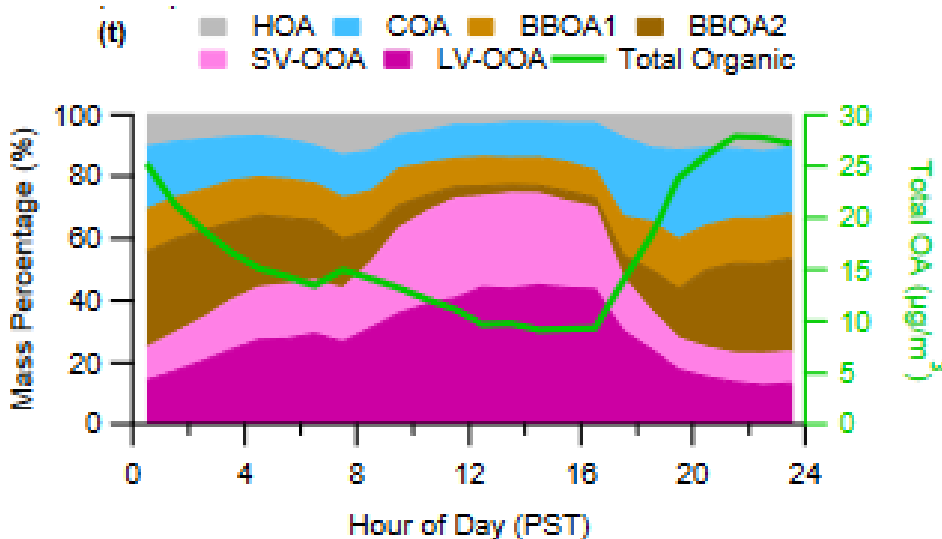


Figure 30. Diurnal Patterns in PM_{2.5} Concentrations at Portola

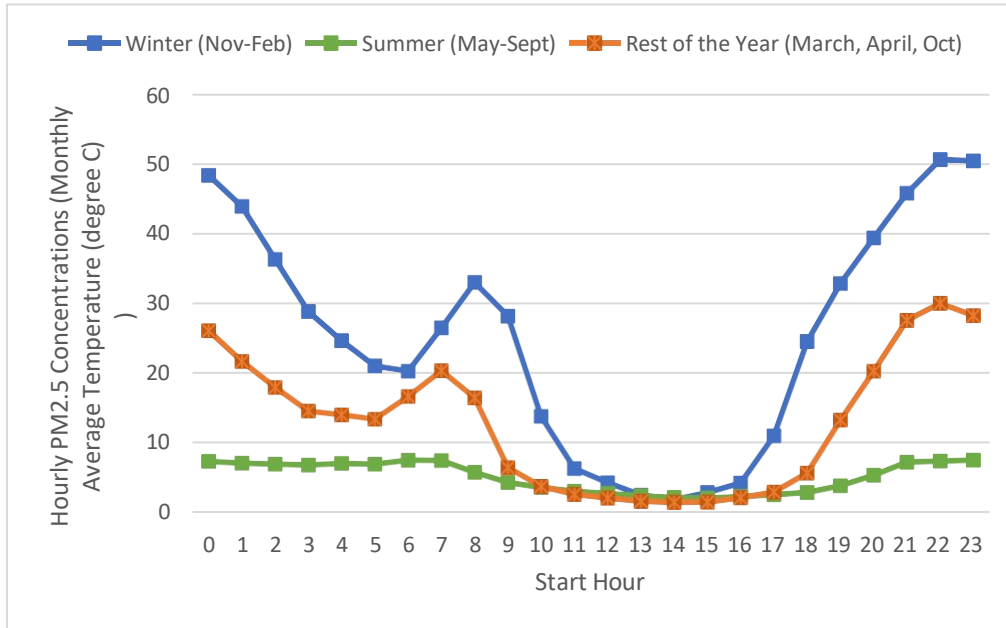


Figure 31. Seasonality in PM_{2.5} Concentrations at Portola Compared to SOA/OA Ratio at Bakersfield

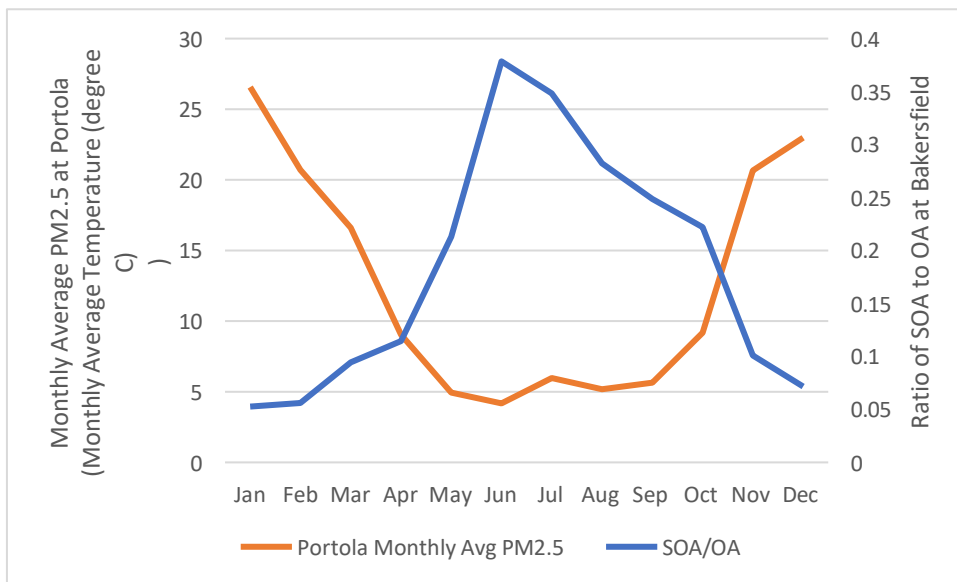
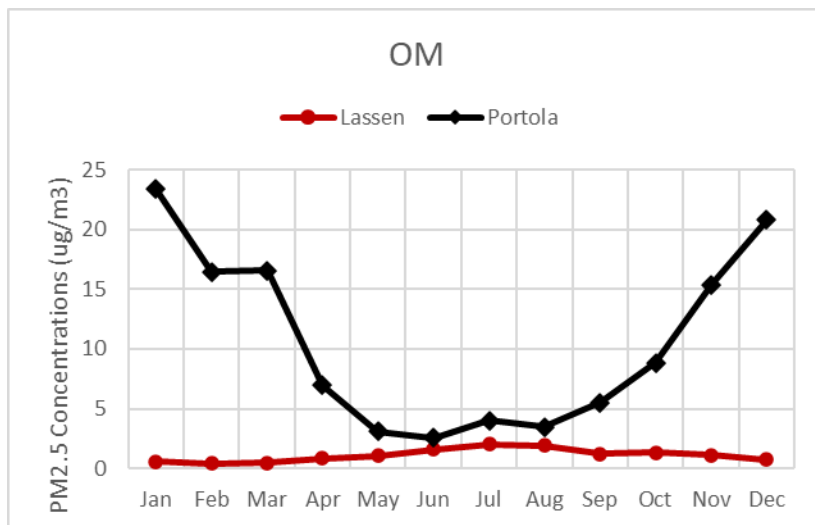


Figure 32. Seasonal Trends in Organic Matter Concentrations at Portola and Lassen Volcanic National Park



Based on the concentrations alone, as shown below in Table 18, ammonia, SO₂, and NO_x contribute to total PM_{2.5} mass in amounts that exceed EPA’s recommended thresholds.

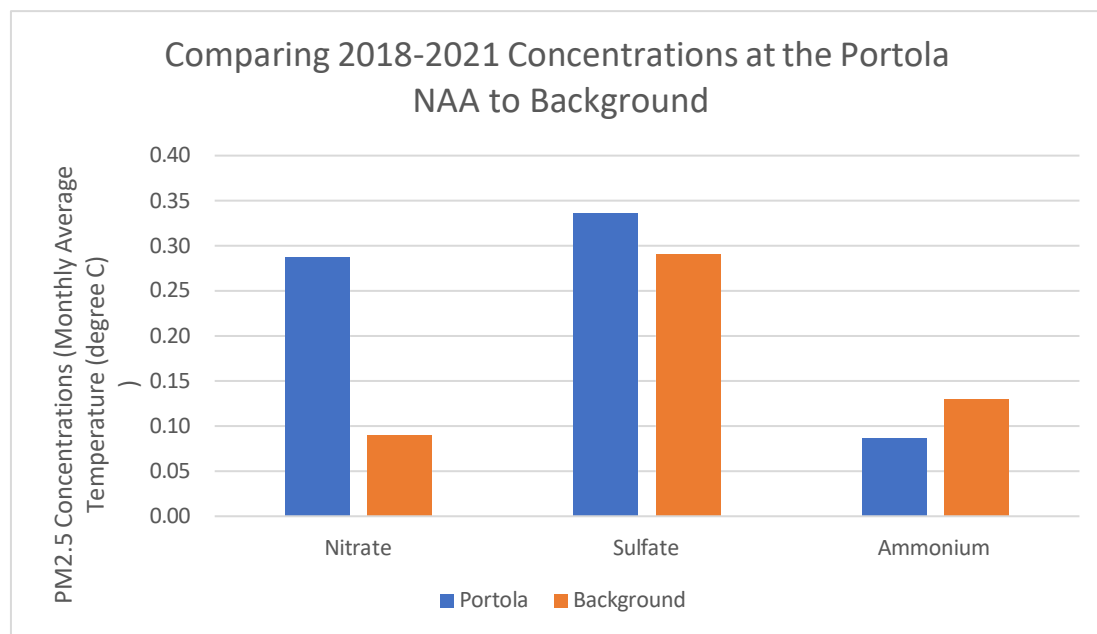
Table 18. Contribution to the 2021 PM_{2.5} design value based on chemical composition data.

PM _{2.5} Precursor	Assigned to PM _{2.5} Species	Scaled to DV (µg/m ³)	% Of DV
NO _x	Nitrate + Ammonium	0.36	2.8
SO _x	Sulfate Ion	0.33	2.6
NH ₃	Ammonium	0.20	3.8
	Nitrate	0.28	
	Total	0.48	
VOC	SOA	0.04	0.3

It is important to note that concentrations of ammonium nitrate and sulfate are very low and are unlikely to decrease much. Figure 32 compares concentrations measured at the Portola NAA to background levels with the assumption that the difference is an indicator of the local Portola emissions. The difference between sulfate measured at the Portola NAA and background concentrations is 0.05 µg/m³ and the ammonium is higher at the background site. Since local SO_x emissions contribute significantly less than the 0.2 µg/m³ threshold and local ammonia

emissions have no impact on PM_{2.5} concentrations, SO_x and ammonia are considered insignificant precursors and are excluded from control requirements in the SIP. The difference between nitrate measured at Portola and background concentrations is 0.2 µg/m³. Therefore, all anthropogenic sources of nitrate would have to be eliminated to reach a 0.2 µg/m³ threshold. This suggests that NO_x may also be an insignificant precursor.

Figure 33. Comparison of Measured Concentrations to Background Levels for Select Secondary Components.²¹

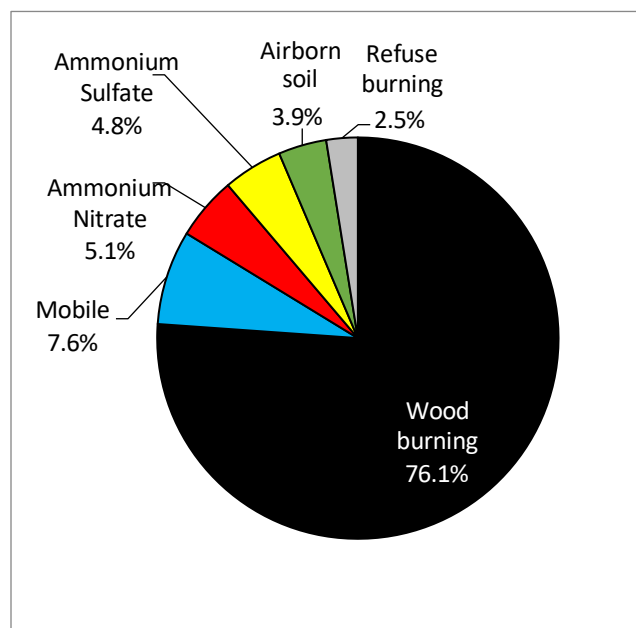


3. Sensitivity-based Contribution Analysis

Since sulfate and ammonium concentrations at the Portola NAA were determined to be insignificant precursors based on the comparison to the background levels, only NO_x emissions were considered in the sensitivity analysis. The sensitivity-based analysis was used to demonstrate the degree to which PM_{2.5} concentrations in the nonattainment area are sensitive to 30, 50, and 70 percent decrease in NO_x emissions. The PMF results which were used in the proportional rollback to demonstrate attainment were also used in the sensitivity analysis. (Figure 33).

²¹ This comparison is based on measured concentrations rather than PMF results.

Figure 34. 5-Year Weighted Average Annual PMF Source Contribution.



The study of the effect of NO_x controls in the San Joaquin Valley on ammonium nitrate formation²² concluded that remote areas had up to 70 percent NO_x to nitrate conversion, prompting CARB to use the ratio of 1 to 0.7 for NO_x to nitrate conversion as one of the Portola test scenarios. For the second scenario, the 2002–2021 emissions and speciation trends were used to derive a NO_x to nitrates response factor by relating the percent change in nitrate concentration to percent change in NO_x emissions. Relating the changes in nitrate concentrations to NO_x emissions between 2002 and 2021 yielded a response factor of 0.372. The two factors, 0.7 and 0.372 were tested in a rollback to estimate the potential impact on the design value. Assuming a 1-to-0.7 and 1-to-0.372 ratio for NO_x to nitrate, precursor emissions were reduced in the rollback model to evaluate the impact on the design value. As illustrated in Table 19, at 70 percent reduction and 1-to-0.7 ratio NO_x is at the 0.2 µg/m³ threshold level. Even at the high end of the range of reductions recommended in EPA’s Precursor Demonstration Guidance, and with a conservative estimate of the response to NO_x emissions reductions, the response does not appear significant. However, when applying the ratio developed using Portola-specific data, the impact of reducing NO_x by 70 percent diminishes to 0.1 µg/m³.

22 Michael J. Kleeman, Qi Ying, Ajith Kaduwela, Control strategies for the reduction of airborne particulate nitrate in California's San Joaquin Valley, Atmospheric Environment, Volume 39, Issue 29, 2005, Pages 5325-5341, ISSN 1352-2310, <https://doi.org/10.1016/j.atmosenv.2005.05.044>

Table 19. Impact of Reducing Precursor Emissions on Attainment Year Design Value

Reductions (%)	NOx 1:0.7	NOx 1:0.444
30%	0.1	0
50%	0.1	0.1
70%	0.2	0.1

Emissions of NOx were reduced 26 percent from 2012 through 2021 particularly through aggressive controls on mobile sources. During the same time frame, nitrate concentrations declined 15 percent or 0.05 $\mu\text{g}/\text{m}^3$. This further signifies that even the most aggressive controls on precursor emissions have a negligible impact on the annual $\text{PM}_{2.5}$ concentrations at the Portola NAA and emission controls should focus on directly emitted $\text{PM}_{2.5}$.

CARB has followed the Guidance to evaluate whether NOx contributes significantly to $\text{PM}_{2.5}$ levels that exceed the 12 $\mu\text{g}/\text{m}^3$ annual $\text{PM}_{2.5}$ NAAQS. Using sensitivity-based analysis in the base and future years, CARB determined that emissions of NOx do not contribute significantly to $\text{PM}_{2.5}$ levels that exceed the 12 $\mu\text{g}/\text{m}^3$ annual $\text{PM}_{2.5}$ NAAQS in the area. Therefore, CARB has excluded NOx from control requirements in the SIP.

4. Relating Changes in Secondary $\text{PM}_{2.5}$ Contribution to Emissions

We present a series of charts relating changes in NOx, SOx, and ammonia emissions to reduction in concentrations of nitrate, sulfate, and ammonium (Figure 34, Figure 35, and Figure 36). Despite the steep decline in NOx and SOx emissions, the impact on concentrations was insignificant. For example, a 51 percent decline in NOx from 2002 through 2021 lead to a 0.16 $\mu\text{g}/\text{m}^3$ decrease in nitrate concentrations. Similarly, a 71 percent decline in SOx lead to 0.2 $\mu\text{g}/\text{m}^3$ decrease in sulfate concentrations. Despite the insignificant changes in ammonia emissions, concentrations of ammonium declined 0.21 $\mu\text{g}/\text{m}^3$ in response to reductions in nitrate and sulfate. As described in Section 2 of this Chapter, any further decline in emissions will have a negligible impact on already very low concentrations of secondary $\text{PM}_{2.5}$ contribution.

Figure 35. Three-Year Average Trends in PM_{2.5} Nitrate and NOx Emissions

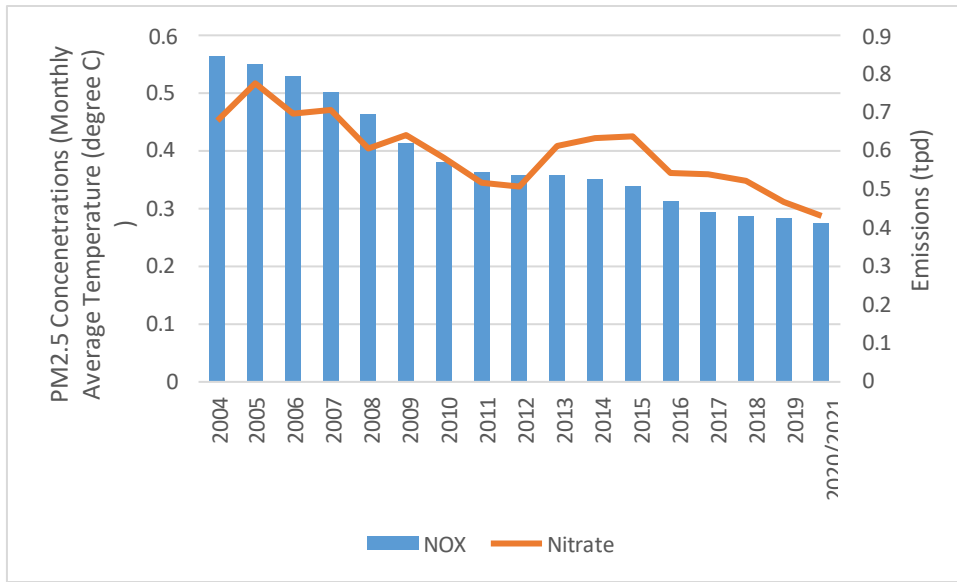


Figure 36. Three-Year Average Trends in PM_{2.5} Sulfate and SOx Emissions

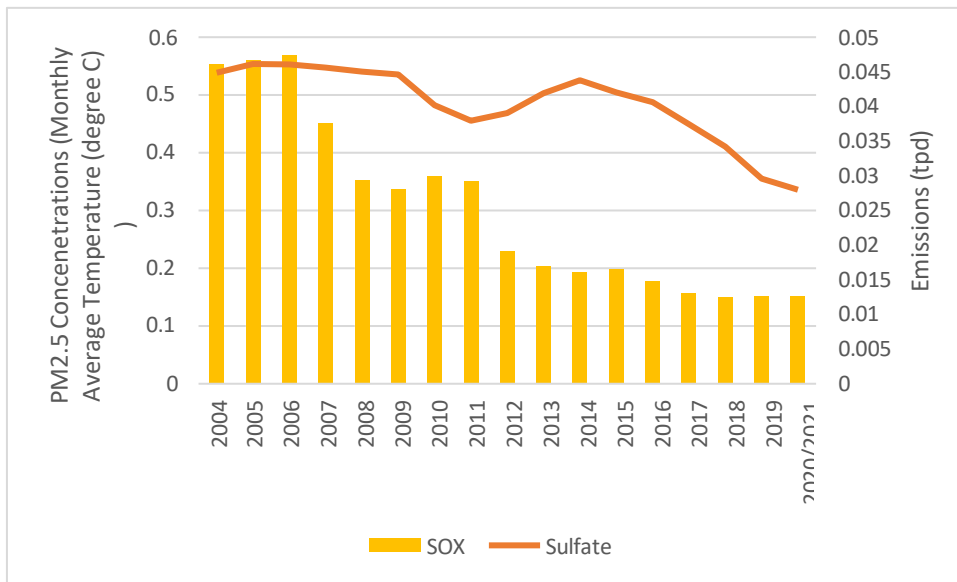
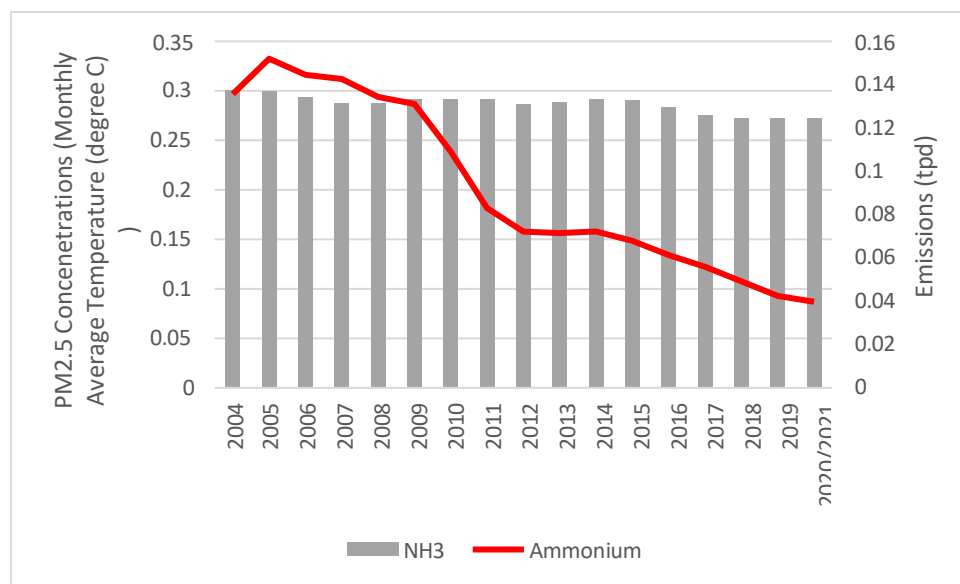


Figure 37. Three-Year Average Trends in PM_{2.5} Ammonium and Ammonia Emissions



5. Precursor Analysis Conclusions

CARB has followed the Guidance to evaluate whether NO_x, SO_x, ROG, and ammonia contribute significantly to PM_{2.5} levels that exceed the 12 µg/m³ annual PM_{2.5} NAAQS. By analyzing emissions, precursor concentrations, and precursor sensitivity CARB determined that emissions of NO_x, SO_x, ROG, and ammonia contribute less than 0.2 µg/m³, threshold recommended by EPA, to PM_{2.5} levels that exceed the 12 µg/m³ annual PM_{2.5} NAAQS in the area. Therefore, CARB has excluded these precursors from control requirements in this SIP.

PM_{2.5} concentrations in the Portola NAA are dominated by primary PM_{2.5} emissions rather than secondarily formed PM_{2.5}. The comprehensive analysis of emissions, precursor contributions, and sensitivity-based contributions demonstrates that secondary formation is negligible compared with directly emitted PM_{2.5} and reductions in emissions of PM_{2.5} precursors would not expedite attainment. The Portola NAA will attain the standard by the end of 2025 by targeting directly emitted PM_{2.5}. Implementing additional controls on precursors would not be effective in reducing PM_{2.5} concentrations and would lead to insignificant air quality changes.

L. Rollback Model

The method chosen to demonstrate attainment of the 12 µg/m³ annual PM_{2.5} NAAQS is a rollback proportional model using emissions from the Portola NAA. Emissions sources are similar throughout the Portola NAA. However, reductions at locations nearer the monitor are expected to be greater since the amount of incentives to

change out woodstoves are greater. The proportional rollback model assumes a linear relationship between emissions and measured concentrations. It further assumes that any reduction or increase in emissions will result in a corresponding reduction or increase in the ambient concentration measured at the monitoring station. For example, if emissions from a source are reduced by 10 percent, the corresponding pollutant concentrations measured at the monitoring station will be reduced by 10 percent. Because PM_{2.5} precursors were found to be insignificant contributors to the PM_{2.5} concentrations and requested to be excluded from control requirements in the SIP, only directly emitted PM_{2.5} will be estimated using the rollback model. Concentrations of directly emitted PM_{2.5} in a future year (2025) will be predicted based on reductions in direct PM_{2.5} emissions, and their corresponding ambient concentrations, from the attainment demonstration base year (2021). In the proportional rollback the anticipated percent increase or decrease in emissions from each source is applied to the relative contribution from the corresponding source. The rollback model is an appropriate tool for demonstrating attainment in the Portola NAA for the following reasons:

- 1) The PM_{2.5} mass in the Portola NAA is dominated by carbonaceous aerosols from wood smoke. Lack of natural gas and reliance on wood for heat, combined with frequent temperature inversions and stagnant air, leads to elevated PM_{2.5} concentrations, particularly in winter months.
- 2) Photochemistry plays a minor role in PM_{2.5} formation in the Portola NAA.
- 3) Secondary PM_{2.5}, including sulfate, nitrate, and SOAs are minor constituents of the total PM mass.
- 4) Since the PM_{2.5} problem in the Portola NAA is driven by local emissions sources and the small Portola NAA is in a valley region with highly complex terrain, the use of a photochemical grid model is not appropriate. Specifically, the strong PM_{2.5} spatial gradient resulting from local emissions sources and complex terrain would not be well characterized in a grid model and a model such as CMAQ would not reliably simulate the impacts of wood burning on PM_{2.5} in the region.

Secondary PM_{2.5}, including sulfate and nitrate will be included in the rollback model but with the assumption that any decline in emissions will not have any impact on PM_{2.5} mass. However, any increase in emissions will result in a corresponding increase in PM_{2.5}. This is the most conservative approach. The SOA was not identified as a separate source using PMF. Any contribution from SOA would be very small and it would be included as part of another source.

1. PM_{2.5} Emission Categories

Each PM_{2.5} component was matched to the appropriate background concentration and the corresponding emission category as illustrated in Table 20.

Table 20. PM_{2.5} Components, Background Concentrations, and Emission Categories used in Rollback Analysis.

PM _{2.5} Component	PM _{2.5} Contribution (µg/m ³)	Background		Emission Category
		Component	Concentrations (µg/m ³)	
Ammonium Nitrate	0.64	Ammonium Nitrate	0.11	NO _x but kept constant
Ammonium Sulfate	0.60	Ammonium Sulfate	0.39	SO _x but kept constant
Airborne Soil	0.49	Fugitive Dust	0.32	PM _{2.5} Airborne Soil
Mobile	0.96	EC	0.09	PM _{2.5} Mobile but kept constant
Wood Burning	9.59	Organic Matter	1.15	PM _{2.5} Total Burning
Refuse Burning	0.32	Elements	0.07	Kept constant
Total	12.60		2.14	

2. Relating Changes in Emissions to Changes in Concentrations

The rollback model assumes a direct correlation between emissions of a pollutant and measured concentrations of that pollutant in the same air shed, and that changes in emissions will result in corresponding changes in concentrations. This correlation is then used to predict future concentrations based on future emissions. The rollback model has two main parts: the emissions table and the concentrations table. The first step in calculating the attainment year PM_{2.5} concentrations and design values is to estimate the anticipated increase or decrease in emissions from each source between 2021 (attainment demonstration base year) and 2025 (the attainment year). The same percentage of increase or decrease in emissions from each source is then applied to the modeling baseline year contribution to estimate the attainment year contribution. The future PM_{2.5} design value is determined by summing attainment year contributions for all components.

The emission reductions necessary to demonstrate attainment will be achieved by an enforceable commitment to change out wood stoves via the Portola Area Change-out Program. Changing out 100 uncertified devices with less polluting and more energy efficient home heating devices is estimated to reduce PM_{2.5} emissions by 0.025 tpd or 9 percent from the modeling baseline year emissions. Table 21 lists estimated emission reductions achieved from each type of change-out as well as total emission reductions.

Table 21. Estimated Emission Reductions.

Change-out Type	Estimated Number	Emissions Before (tpy)	Emissions After (tpy)	Emissions Saved (tpy)	Emissions Saved (tpd)
Wood Stove Uncertified to Heat Pump	20	1.951	0	1.951	0.005
Wood Stove Uncertified to Certified Stove	50	4.878	0.506	4.372	0.012
Wood Stove Uncertified to Pellet Stove	30	2.927	0.133	2.794	0.008
Totals	100	9.757	0.639	9.118	0.025

3. Future Year Estimate

Table 22 illustrates annual attainment demonstration using the traditional proportional rollback model. The columns on the left list emissions, including 2021 modeling baseline year emissions, 2025 projected attainment year emissions, anticipated reductions from the change-outs, and 2025 projected emissions after the change-outs have been completed. The percent change from the modeling baseline year is calculated as follows:

$$\begin{aligned}
 & \textit{Percent Change from the Base Year} \\
 & = (2021 \textit{ Base Year Emissions} - 2025 \textit{ Emissions with Change - outs}) \\
 & \div 2021 \textit{ Base Year Emissions} \times 100\%
 \end{aligned}$$

The columns on the right show PM_{2.5} concentrations for each component identified using PMF, scaled to 2021 design value, followed by the background concentrations of that component. The mass affected by local emission sources is estimated by subtracting background concentration from the mass assigned to each source. For

example, the PM_{2.5} mass originating from local wood burning emissions is calculated by subtracting the background concentrations of organic carbon from the total wood burning contribution. This rollback model only considers reductions achieved from implementing the woodstove change-out program with a marginal increase in fugitive dust emissions. All other contributors to the PM_{2.5} mass were kept constant despite the estimated decrease in emissions. These additional reductions, for which no credit was taken, including ten percent reduction in NO_x and twelve percent reduction in directly emitted PM_{2.5} from mobile sources, will provide a safety margin.

The future year contributions of total burning and airborne soil were calculated by applying the percent change to the PM_{2.5} mass originating from local emission sources, mass available for rolling, and then adding background concentrations back, as shown in the equation below:

Future Year Contribution

$$= \text{Mass Available for Rolling} \times (1 - \text{Percent Change from Base Year}) + \text{Background Concentrations}$$

The future year annual average concentrations were estimated by summing ‘Future Year Contribution’ for all components to estimate the 2025 design value.

Table 22. Annual Rollback

Category	Emissions (tpd)					Concentrations (ug/m3)				
	2021 Base Year	2023-2025 Projected Attainment Year	Reduction from Change-outs	2025 with Change-outs	% Change from Base Year	Sources	PMF Contribution Scaled to DV	Background Conc.	Mass Available for Rolling	Future Year Contribution
NOx	0.379	0.379		0.379	0.0%	Ammonium nitrate	0.64	0.11	0.52	0.64
SOx	0.013	0.013		0.013	0.0%	Ammonium sulfate	0.60	0.39	0.21	0.60
Airborne Soil	0.079	0.079		0.079	-0.3%	Airborne soil	0.49	0.32	0.17	0.49
Mobile	0.013	0.013		0.013	0.0%	Mobile	0.96	0.09	0.87	0.96
Total Burning	0.278	0.278	0.025	0.253	9.0%	Wood burning	9.59	1.15	8.44	8.83
						Refuse Burning	0.32	0.07	0.25	0.32
						Total	12.60	2.14	10.46	11.84

4. Projected 2025 Design Values

The rollback demonstrates attainment of the 12 µg/m³ annual PM_{2.5} NAAQS by December 31, 2025. Changing out 100 uncertified wood burning devices with less polluting and more energy efficient home heating devices is estimated to reduce PM_{2.5} emissions by 0.025 tpd or 9 percent from the modeling baseline year emissions. These reductions are estimated to reduce PM_{2.5} design value from 12.6 µg/m³ in 2021

to 11.8 $\mu\text{g}/\text{m}^3$ in 2025. This estimate is considered conservative as it does not factor in the following emission reductions from the Statewide Mobile Source Strategy²³:

- 1) Ten percent reduction in NO_x emissions; and
- 2) Twelve percent reduction in directly emitted PM_{2.5} from mobile sources.

5. Unmonitored Area Analysis

Spatial variations in PM_{2.5} concentrations in Portola PM_{2.5} NAA are evaluated using Purple Air (PA) Sensor²⁴ data collected during the 2023/2024 winter season (i.e., October 1, 2023 to March 31, 2024) at Portola and Graeagle. While 18 PA sensors operated in the Portola NAA during the period of interest, only 12 had sufficiently complete data for evaluating spatial variations. Hourly data are first corrected using the EPA-recommended method²⁵, and then averaged into daily values using a 75 percent completeness criterion. Figure 37 shows the location of the 12 PA sensors in relation to the Portola NAA zones, and Table 23 lists sensor information and seasonal PM_{2.5} averages for the 2023/2024 winter season.

²³ <https://ww2.arb.ca.gov/resources/documents/mobile-source-strategy>

²⁴ [Purple Air sensor](#)

²⁵ Johnson, K., A. Holder, S. Frederick, AND A. Clements. PurpleAir PM_{2.5} U.S. Correction and Performance During Smoke Events 4/2020. International Smoke Symposium, Raleigh, NC, April 20 - 24, 2020.

Figure 38. Location of the 12 Purple Air sensors (black dots) within Portola NAA. Green boundary indicates Zone 1A - Portola city limits, blue Zone 1 - greater Portola area, and orange Zone 2 - Graeagle Area.

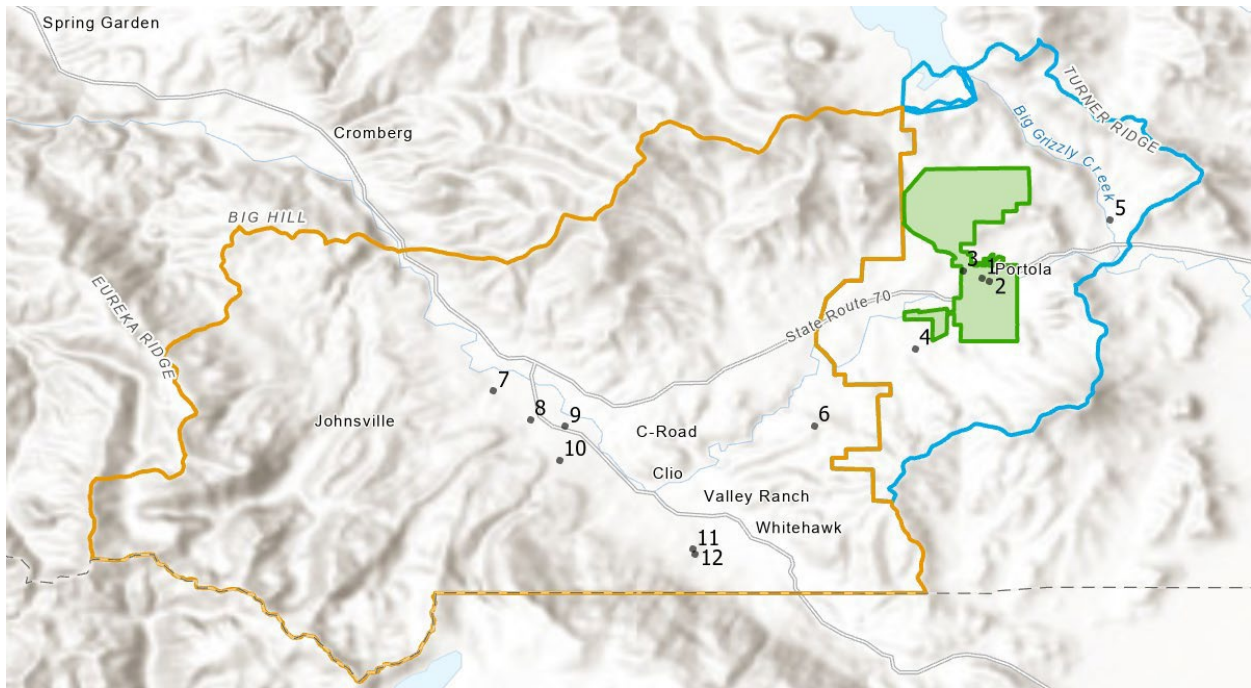


Table 23. Information of the 12 Purple Air sensors, and seasonal PM_{2.5} averages developed based on their measurements during the 2023/2024 winter season.

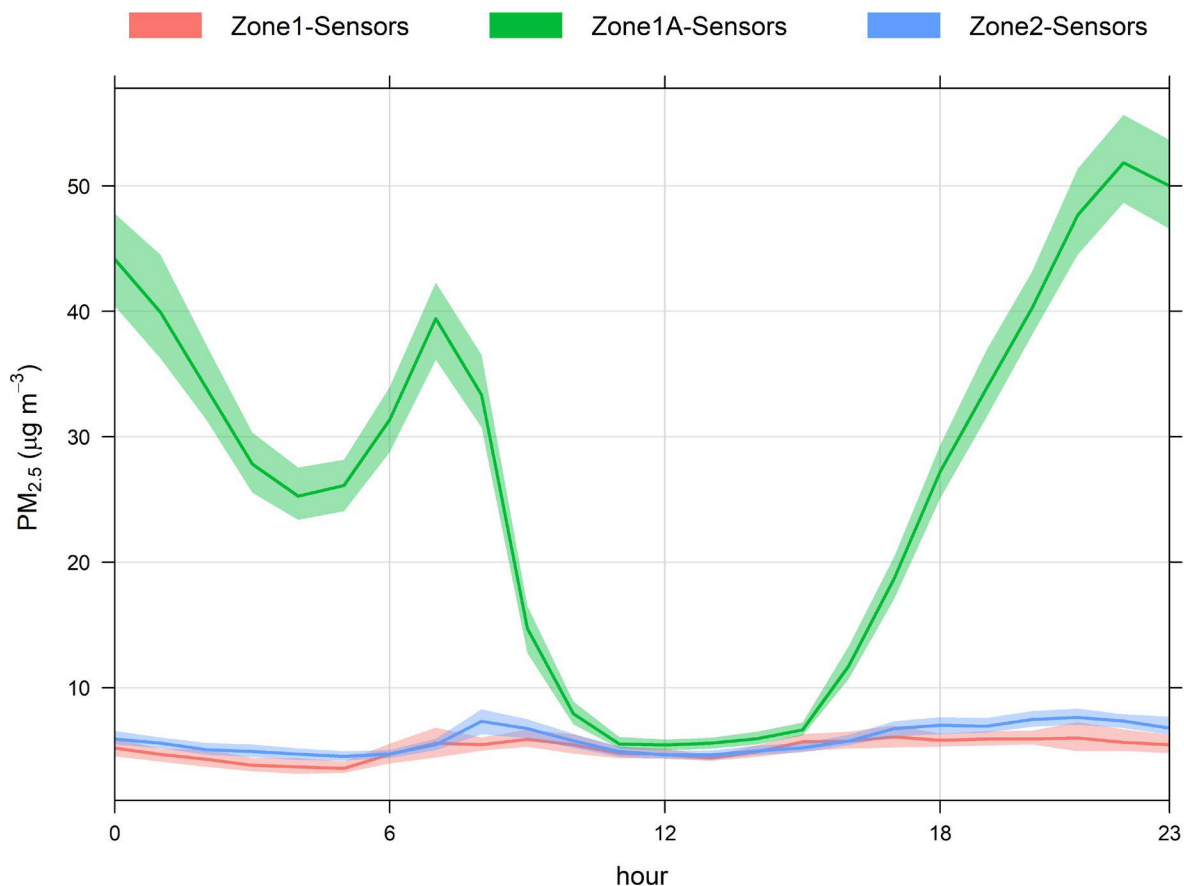
Sensor #	Lat	Long	Name	Zone	Season	Number of Days	PM _{2.5} Season Average (µg/m ³)
1	39.813	-120.469	Ponderosa Ave, Portola Ca	1A	2023 winter	179	32.6
2	39.812	-120.467	NSAQMD Office	1A	2023 winter	180	24.0
3	39.816	-120.476	West St	1A	2023 winter	178	21.3
4	39.789	-120.492	Iron Horse	1	2023 winter	179	6.0
5	39.833	-120.426	Lower Grizzly Road	1	2023 winter	182	4.1
6	39.763	-120.526	Steve	2	2023 winter	182	3.1

7	39.775	-120.634	Graeagle Goldridge	2	2023 winter	182	5.3
8	39.765	-120.622	Graeagle 29	2	2023 winter	182	7.7
9	39.763	-120.610	Graeagle Meadows	2	2023 winter	183	6.8
10	39.751	-120.612	CARB_SMOKE_ NSAQMD_GRAEAGLE	2	2023 winter	180	8.5
11	39.721	-120.567	Clio Mohawk Meadows	2	2023 winter	179	4.7
12	39.720	-120.566	Mohawk Meadows	2	2023 winter	183	4.2

As listed in Table 23, the number of complete days range from 178 to 183 among the 12 sensors. Seasonal PM_{2.5} average concentrations during the 2023/2024 winter season are the highest in Zone 1A, ranging from 21.3 – 32.6 µg/m³ among the 3 sensors. Immediately outside of the city limits in Zone 1, seasonal PM_{2.5} average concentrations drop to an average of 5.1 µg/m³ between the two sensors (i.e., Sensor #4 & #5). Concentrations in Zone 2 are similar to those in Zone 1 i.e., seasonal PM_{2.5} average concentrations among the 7 sensors averaging at 5.8 µg/m³. The fact that winter PM_{2.5} concentrations within Portola city limits are ~4 times higher than those outside indicates that the elevated concentrations are limited to the City of Portola and the air is much cleaner in the rest of the Portola NAA.

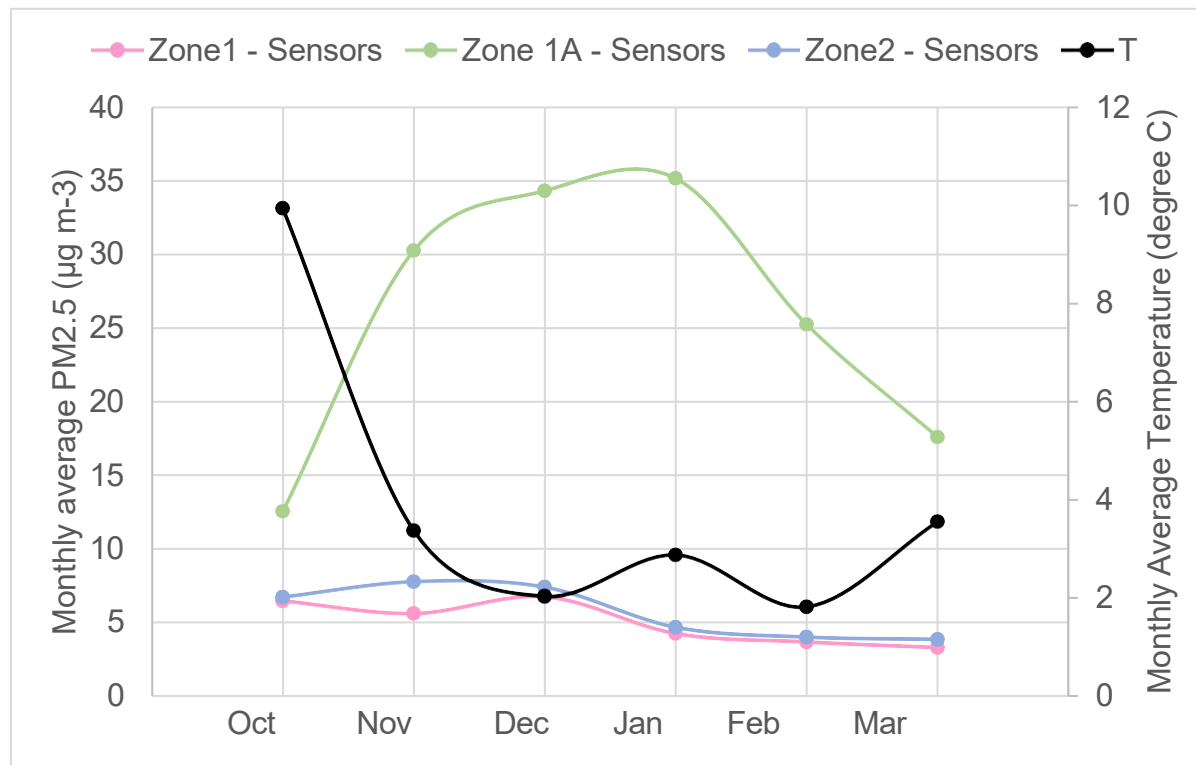
In addition to seasonal average, hourly PM_{2.5} diurnal patterns are explored at the 3 zones within the Portola NAA. Data from 172 matching days across the 12 sensors are used for the analysis. Figure 38 shows the diurnal pattern of sensor-averaged PM_{2.5} concentration and its 95 percent confidence interval at the 3 zones. Purple Air PM_{2.5} concentrations within the Portola city limits exhibit a very strong diurnal pattern with highest concentrations observed at nighttime when the demand for heat is the greatest and the winter air temperature inversion prevents the vertical dispersion of pollution. The situation is very different outside of the city limits and at Graeagle, where concentrations are lower, and the diurnal pattern is less pronounced.

Figure 39. Diurnal Patterns of Sensor-averaged Hourly PM_{2.5} Concentrations



Monthly PM_{2.5} average concentrations (together with their 95 percent confidence interval) in the 3 zones from October 2023 until March 2024 are plotted in Figure 39. As expected, the monthly PM_{2.5} average concentrations during the 6 months are the highest in Zone 1A, starting at 12.6 µg/m³ in October, increasing drastically to 30.2 µg/m³ in November, and maintaining around 35.0 µg/m³ throughout December and January. The concentration then drops steadily in February at 25.2 µg/m³ and March at 17.6 µg/m³. This is consistent with the monthly average temperature variation during these winter months, i.e., local residents tend to use their wood stoves more often during colder months, contributing to high PM_{2.5} readings from Nov 2023 to Jan 2024. The monthly PM_{2.5} average concentrations in Zone 1 and Zone 2 remain low, at below 8.0 µg/m³ during the entire 6 months.

Figure 40. Monthly PM_{2.5} average concentrations in the 3 zones within the Portola NAA based on PA sensor measurements from Oct 2023 to March 2024, together with monthly average temperatures (at the Portola-Gulling Street site) plotted against the right y-axis.



In summary, the portion of the Portola NAA located outside of the City of Portola does not experience elevated PM_{2.5} concentrations at the magnitude seen in the City of Portola. This is evident as seen in the significant differences in concentrations and diurnal patterns.

VI. Additional Plan Elements

A. Quantitative Milestones and Reasonable Further Progress

Under the PM_{2.5} Implementation Rule²⁶, Serious area attainment plans must include the following:

- 1) A Reasonable Further Progress Plan (RFP) containing the following:
 - a. An implementation schedule for control measures on sources in the nonattainment area;

²⁶ <https://www.gpo.gov/fdsys/pkg/FR-2016-08-24/pdf/2016-18768.pdf>

- b. RFP projected emissions for each applicable quantitative milestone year based on the anticipated control measure implementation schedule; and
 - c. An analysis demonstrating that the schedule of aggregate emissions reductions achieves sufficient progress toward attainment between the applicable modeling baseline year and the attainment year.
- 2) For an area that is classified as Serious under Act section 188(b)(2), the 7.5-year quantitative milestones that were submitted with the Moderate area plan are still required and would be sufficient for the EPA to evaluate the area's progress toward attaining the NAAQS while the Serious area plan is being developed. All Serious area plans must also include quantitative milestones to be achieved every three years thereafter until the milestone date that falls within three years after the applicable attainment date. If the area fails to attain, this post-attainment date milestone provides the EPA with the tools necessary to monitor the area's continued progress toward attainment while the state develops a new attainment plan.

Analyses for this plan demonstrate that 2025 is the most expeditious attainment date practicable for the Portola area. The modeling baseline year is 2021 and the first quantitative milestone year submitted with the Moderate plan was 2022. The Serious milestone year is 2025 and the post-attainment milestone year is 2028.

This attainment plan is unusual because all emission reductions necessary for demonstrating attainment come from the Portola Change-out Program. The District and CARB began working towards improving air quality in the Portola NAA shortly after the PM_{2.5} designations became effective in 2015. However, it was not until 2016 when the District finally had the necessary funding and the program infrastructure in place to implement a wood stove change-out program. By December 31, 2020, 370 uncertified wood burning devices operating in the Portola NAA were replaced with less polluting certified home heating alternatives. Replacing an additional 100 devices between January 1, 2021, and December 31, 2024, is estimated to reduce PM_{2.5} emissions by 0.025 tpd resulting in estimated 2025 design value of 11.8 µg/m³.

Because the Portola Change-out Program has been in place since 2016 and is well established, we expect linear progress towards attaining the standard. Table 24 shows projected changes in emissions from the modeling baseline year, 2021, to 2025, attainment/milestone year, and 2028, post-milestone year.

Table 24. Directly Emitted PM_{2.5} Inventory with Plan Control and RFP Calculations (tpd)

Category	2021	2025	2028
Baseline PM _{2.5} Emissions	0.370	0.368	0.367
Subtract Reductions from Wood Stove Change-out (RFP Increment)		0.025	0.025
PM _{2.5} Inventory After Plan Control Strategy	0.370	0.343	0.342
RFP Target	0.370	0.345	0.345
Excess Emission Reductions	0.000	0.002	0.003

The baseline inventory of direct PM_{2.5} emissions includes continuing reductions from the CARB’s Mobile Source Control Program. The emissions saved by changing-out wood stoves are subtracted from the baseline emissions to estimate PM_{2.5} inventory after the plan control strategy. The RFP increment was estimated by multiplying the emission reductions needed to demonstrate attainment (0.025 tpd) by the ratio of years since baseline to the number of years between baseline and attainment, assuming a uniform rate of progress over a four-year window. We refer to this value as the RFP increment. The following formula was used to calculate the RFP increment:

$$RFP\ Increment = Estimated\ Reductions\ from\ Change - out\ Program \times \frac{x}{4}$$

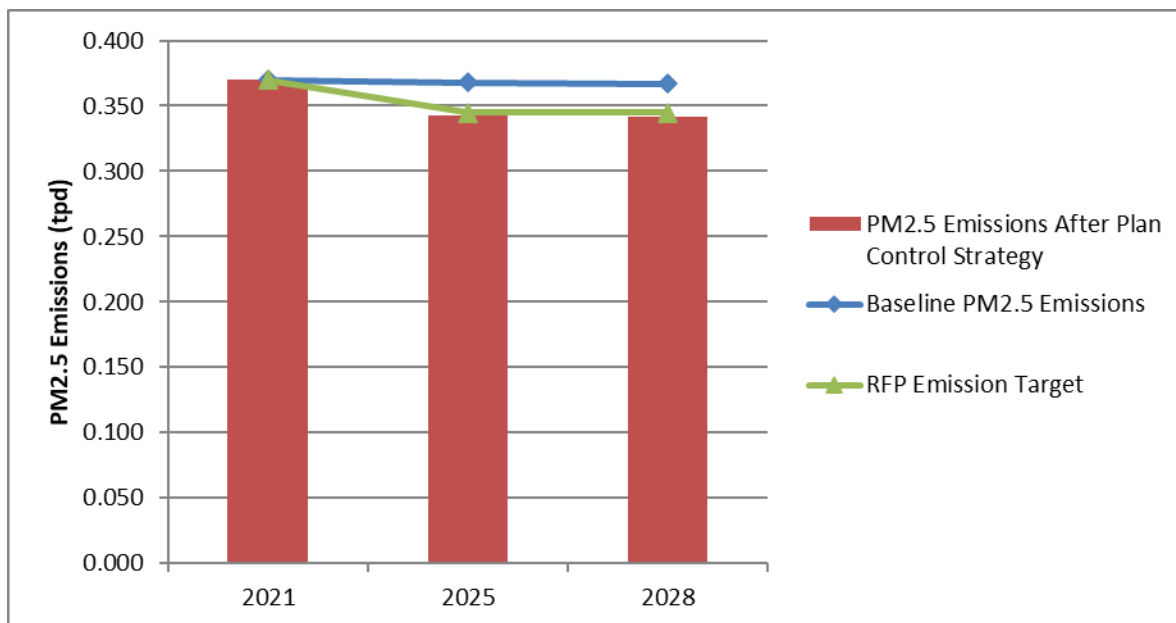
Where x represents the number of years since the modeling baseline year. For example, the RFP Increment for 2025 was calculated as follows:

$$RFP\ Increment = Estimated\ Reductions\ from\ Change - out\ Program \times \frac{4}{4}$$

The RFP increment includes only the effects of wood stove change-outs and represents annual emission reductions required for demonstrating linear progress in replacing older wood heaters with less polluting and more energy efficient home heating alternatives between the modeling baseline year and the attainment year. The RFP target, on the other hand, represents maximum total emissions meeting the demands of linear progress. The RFP target was calculated by subtracting the RFP increment from the 2021 baseline inventory (0.370 tpd) without taking credit for emission reductions included in the baseline inventory. The area is estimated to achieve emission reductions beyond what’s needed for attainment. These reductions are listed in the last row, Excess Emission Reductions, in Table 21.

Figure 40 compares the baseline emission inventory, inventory after control strategies are implemented, and RFP target. As illustrated in Figure 40, we expect a generally linear progress between 2021 and 2025 as specified in the PM_{2.5} Implementation Rule. Additional reductions from the mobile sector between 2021 and 2025 for which the plan did not take credit will provide an additional buffer.

Figure 41. Relationship between Baseline Inventory, Inventory After Plan Control Strategy, and RFP Target.



The control strategy included in the attainment plan is projected to provide direct PM_{2.5} air quality benefits resulting in a 0.76 µg/m³ reduction in the annual design value, to a 2025 modeled value of 11.8 µg/m³.

EPA requires that all Serious area PM_{2.5} attainment plans must define appropriate quantitative milestones to be achieved every three years thereafter until the milestone date that falls within three years after the applicable attainment date. The first Serious quantitative milestone is October 15, 2025, with the report due January 13, 2026. The second quantitative milestone is October 15, 2028, with the report due January 13, 2029. The District commits to tracking, quantifying, and submitting the required reports to the EPA by the applicable deadlines. Each report will include the following information:

- Certification that the SIP strategy is being implemented consistent with the RFP, including update on adoption of District Rule as outlined in Section IV, Control Strategy and Implementation;
- Progress in implementing SIP control measures, including BACM;

- Technical support, including calculations to document completion statistics for each quantitative milestone; and
- Discussion of whether the PM_{2.5} NAAQS will be attained by the projected attainment day.

Replacing 100 older wood burning home heaters with less polluting and more energy efficient alternatives is estimated to reduce direct PM_{2.5} emissions 0.025 tpd by 2025 milestone. This milestone could be met by replacing fewer stoves with even less polluting devices to meet the emission reduction commitment. The District and the State are committed to implementing the wood stove change-out program to achieve milestone and attainment obligations. The emission reductions estimated to be achieved from the wood stove change-out are subject to enforceable commitments as outlined in Section IV.C.

In summary, the Portola NAA faces a unique challenge, with 100 percent of reductions needed to meet the 12 µg/m³ annual PM_{2.5} standard in 2025 achieved solely through the wood stove change-out program. The District has been implementing a comprehensive wood stove change-out program since 2016 and will continue to do so through 2025 by replacing an additional 100 older wood stoves and fireplaces between January 1, 2021 and December 31, 2024. The program is estimated to bring a steady decrease in directly emitted PM_{2.5} between 2021 and 2024. By the first milestone, 2025, the area is expected to reduce directly emitted PM_{2.5} by 0.025 tpd. This reduction in emissions will be maintained through 2028 post-attainment milestone since the District is not including an enforceable commitment past 2025. Additional change outs will occur past December 31, 2024.

A. Contingency Measure

Under EPA's PM_{2.5} Implementation Rule,²⁷ contingency measures adopted as part of a PM_{2.5} attainment plan must meet these requirements:

1. The contingency measures shall consist of control measures not otherwise included in the control strategy or that achieve emissions reductions not otherwise relied upon in the control strategy for the area;
2. Each contingency measure shall specify the timeframe within which its requirements become effective following a trigger; and
3. The SIP submission shall contain a description of the specific trigger mechanisms for the contingency measures and specify a schedule for implementation.

²⁷ 81 Fed. Reg., 58,101, 58,161 (August 24, 2016).

By the end of 2025, the District will adopt a rule to control wood burning in the nonattainment area. The rule will also include a contingency measure trigger that would be activated should EPA issue a final rulemaking that the Portola NAA failed to:

1. Attain the 12 $\mu\text{g}/\text{m}^3$ annual $\text{PM}_{2.5}$ NAAQS by the Serious area attainment deadline of December 31, 2025;
2. Meet RFP towards attainment or a quantitative milestone in the Portola Serious Plan; or
3. Submit a quantitative milestone report for the 12 $\mu\text{g}/\text{m}^3$ annual $\text{PM}_{2.5}$ NAAQS.

The District rule will impose a wood burning curtailment prohibiting using uncertified wood stoves or fireplaces in Zone 1 when $\text{PM}_{2.5}$ concentrations are forecast to exceed 20 $\mu\text{g}/\text{m}^3$ from September 1 through the April 30 of the following year. For contingency measure purposes, the District rule would include a trigger that effective 60 days after EPA's final action that the Portola NAA failed to attain the 12 $\mu\text{g}/\text{m}^3$ annual $\text{PM}_{2.5}$ NAAQS, failed to meet a RFP or quantitative milestone or failed to submit a quantitative milestone report, the trigger would impose lower residential wood burning curtailment level of 12 $\mu\text{g}/\text{m}^3$ in Zone 1. Households in Zone 1 would be prohibited from using uncertified wood stove or fireplace on any day during woodburning curtailment season, September 1st through April 30th of the following year, when concentrations are forecast to exceed 12 $\mu\text{g}/\text{m}^3$.

Effective 60 days after the contingency measure is triggered by EPA, the District rule would impose lower residential wood burning curtailment levels from 20 to 12 $\mu\text{g}/\text{m}^3$, as follows:

1. The District will issue a mandatory burning curtailment in Zone 1 whenever District staff determine that the 24-hr average $\text{PM}_{2.5}$ concentrations may exceed 12 $\mu\text{g}/\text{m}^3$; and
2. Mandatory wood-burning curtailment will be in effect during the months of January, February, March, April, September, October, November, and December

EPA developed the Draft Guidance on the Preparation of State Implementation Plan Provisions that Address the Nonattainment Area Contingency Measure Requirements for Ozone and Particulate Matter (Draft Guidance) on March 16, 2023²⁸. The Draft

28 Guidance on the Preparation of State Implementation Plan Provisions that Address the Nonattainment Area Contingency Measure Requirements for Ozone and Particulate Matter. March 16, 2023; <https://www.epa.gov/system/files/documents/2023-03/CMTF%202022%20guidance%203-17-23.pdf>

Guidance contains three main concepts: (1) revising the quantity of emissions

reductions that contingency measures should provide to account for declining emissions inventories over time; (2) allowing for an infeasibility justification if an area is unable to identify feasible contingency measures in sufficient quantities due to a scarcity of available, qualifying measures and/or (3) revising the time period within which emissions reductions from contingency measures should occur.

EPA recommends using the following equation to calculate One Year Worth (OYW) of progress for the purpose of assessing the adequacy of the reductions provided by the submitted contingency measure (CM):

$$\frac{(base\ year\ EI - attainment\ year\ EI)}{(attainment\ year - base\ year)} \div base\ year\ EI \times attainment\ year\ EI = OYW\ of\ Progress$$

$$\frac{(0.370\ tpd - 0.345\ tpd)}{(2025 - 2021)} \div 0.370\ tpd \times 0.345\ tpd = 0.006\ tpd$$

The number of days subject to curtailment was estimated using daily PM_{2.5} data collected between 2016 and 2023 at the Portola air monitoring site. Table 25 shows numbers used in calculating percentage of days triggered by curtailment. On average, 24 percent of monitoring days between September 1 and April 30 fall within the concentration range between 12 µg/m³ and 20 µg/m³. The compliance rate for residents complying with the curtailment is forecast to be 50 percent.

Table 25. Estimating percent of contingency triggered days subject to curtailment

Year	Total Sampling Days	Days 12 µg/m ³ to 20 µg/m ³	Percent of Total
2016	80	19	24%
2017	66	16	24%
2018	83	19	23%
2019	72	22	31%
2020	77	16	21%
2021	74	20	27%
2022	128	27	21%
2023	223	57	26%
Average			24%

The number of devices subject to curtailment was estimated as follows:

1. The total number uncertified wood stoves and fireplaces remaining in the nonattainment area was estimated by subtracting the sum of the number of change-outs of uncertified devices completed through June 30, 2024 and change-outs estimated to take place during the second half of 2024 (July through December) from the initial number of estimated uncertified wood stoves and fireplaces. Data in Table 26 were used to calculate change-outs completed through June of 2024 and to estimate the change-outs for the second half of 2024.
2. The number of uncertified wood stoves and fireplaces in Zone 1 was estimated by applying the percentage of devices changed out in Zone 1 to the total number of change-outs. Table 27 includes estimates of devices subject to curtailment.

Table 26. Change-outs completed per calendar year and during the second half of the year

Year	Per Calendar Year		July to December	
	Uncertified Wood Stove	Fireplace	Uncertified Wood Stove	Fireplace
2016	111		89	
2017	85		52	
2018	47	13	24	8
2019	58	13	31	9
2020	29	14	19	7
2021	32	19	15	7
2022	42	18	33	12
2023	75	9	43	4
2024	20	5		
Sum	499	91		
Average			27	7

Table 27. Estimating devices subject to curtailment

Status	Nonattainment Area	
	Uncertified Stoves	Fireplaces
Operating before Change-out Program	809	156
Replaced through 6/30/2024	499	91
Estimated Replacements During Second Half of 2024	27	7
Uncertified Remaining in Nonattainment Area	283	65
Subject to Curtailment in Zone 1	195	19

Table 28 presents emission reductions expected from lowering the curtailment threshold from 20 µg/m³ to 12 µg/m³. To be conservative, the calculation assumes that 50 percent of the residents would comply with the curtailment.

Table 28. Estimating emission reductions from the contingency measure

Category	Stove	Fireplace	Total
Emission Factor (lb PM ₁₀ /ton of wood)	30.6	34.6	
PM _{2.5} Emission Fraction of PM ₁₀	96.3	96.3	
Emission Factor (lb PM _{2.5} /ton of wood)	29.5	33.3	
Wood use annual (cords)	4.3	6	
Wood density (ton/cord)	1.54	1.54	
Conversion from lb to ton	2000	2000	
Number of Devices	<u>195</u>	<u>19</u>	<u>214</u>
Emissions (tpy)	19.0349	2.8588	21.8938
Emissions (tpd)	0.0522	0.0078	0.0600
50% compliance on 24% of days	0.0063	0.0009	0.0072

EPA has generally recommended that the contingency measures for attainment demonstration should provide PM_{2.5} emission reductions approximately equivalent to OYW. The Portola Serious SIP estimated this amount to be 0.006 tpd. As demonstrated in Table 28, the emission reductions from the contingency will reduce PM_{2.5} emissions by 0.0072 tpd, more than OYW of reductions.

B. Transportation Conformity

Introduction

CARB) has prepared the motor vehicle emissions budget (MVEB)²⁹ for the Portola Serious SIP for the 12 µg/m³ annual PM_{2.5} NAAQS. The MVEB is the maximum allowable emissions from motor vehicles within a nonattainment area and is used for determining whether transportation plans and projects conform to the applicable SIP.

Transportation conformity is the federal regulatory procedure for linking and coordinating the transportation and air quality planning processes through the MVEB established in the SIP. Under section 176(c) of the CAA, federal agencies may not approve or fund transportation plans and projects unless they are consistent with the regional SIP. In addition, conformity with the SIP requires that transportation activities do not (1) cause or contribute to new air quality violations, (2) increase the frequency or severity of any existing violation, or (3) delay the timely attainment of NAAQS. Therefore, quantifying on-road motor vehicle emissions and comparing those emissions with a budget established in the SIP determine transportation conformity between air quality and transportation planning.

The MVEBs are set for each criteria pollutant or its precursors for each milestone year and the attainment year of the SIP. Subsequent transportation plans and programs produced by transportation planning agencies must demonstrate that the emissions from the proposed plan, program, or project do not exceed the MVEBs established in the applicable SIP. The MVEBs established in this SIP apply as a "ceiling" or limit on transportation emissions for the Portola NAA for the years in which they are defined and for all subsequent years until another year for which a different budget is specified or until a SIP revision modifies the budget. For the Portola Serious SIP, the attainment year (also referred to as the plan analysis year) is 2025, and the post-attainment year is 2028.

Methodology

The MVEB for the Portola Serious SIP is established based on guidance from EPA on the motor vehicle emission categories and precursors that must be considered in

²⁹ Federal transportation conformity regulations are found in 40 CFR Part 51, subpart T – Conformity to State or Federal Implementation Plans of Transportation Plans, Programs, and Projects Developed, Funded or Approved Under Title 23 U.S.C. of the Federal Transit Laws. Part 93, subpart A of this chapter was revised by the U.S. EPA in the August 15, 1997 Federal Register.

transportation conformity determinations as found in the transportation conformity regulation and final rules as described below.

The MVEB must be clearly identified, precisely quantified, and consistent with applicable CAA requirements. Further, it should be consistent with the Portola NAA's emission inventory and control measures.

The Portola Serious SIP establishes the MVEB only for primary emissions of PM_{2.5} from motor vehicle exhaust, tire and brake wear, and paved, unpaved, and construction road dust. This section discusses budgets set for annual average daily emissions in the analysis years 2025 and 2028. The MVEB presented below uses emission rates from California's motor vehicle emission model, EMFAC2021 (V.1.0.2)³⁰ as well as the California Emissions Projection Analysis Model (CEPAM) 2022 v1.00. The activity data are estimated from the 2020 Plumas County Regional Transportation Plan (RTP).³¹ Thus, they are consistent with the attainment demonstration for the SIP.

On November 15, 2022, EPA approved EMFAC2021 for use in SIPs and for demonstrating transportation conformity.³² For the Portola Serious SIP budgets, EMFAC2021 v1.02 was initially used to develop the Plumas County mobile source emissions inventory in CEPAM 2022 v1.00 to account for paved, unpaved, and construction road dust³³ with Plumas County activity data adjusted for the Portola NAA, and a Geographic Information System (GIS) overlay was used to develop emission fractions for the Portola NAA relative to the greater Plumas County. Both the EMFAC and CEPAM models estimate emissions, with EMFAC calculating emissions from two combustion processes (running and start exhaust) and four evaporative processes (hot soak, running losses, diurnal, and resting losses) and CEPAM calculating emissions from mobile-adjacent area sources, including paved, unpaved, and construction road dust. Because the CEPAM model uses emissions from the EMFAC model in addition to calculating these area sources emissions, the budget is developed primarily using the CEPAM model.

30 More information on data sources can be found in the EMFAC technical support documentation at: <https://ww2.arb.ca.gov/our-work/programs/mobile-source-emissions-inventory/msei-road-documentation>

31 [2020 Plumas County Regional Transportation Plan](#)

32 U.S. EPA approval of EMFAC2021 can be found at 87 FR 68483: [federalregister.gov](https://www.federalregister.gov)

33 More information on data sources can be found at: <https://ww2.arb.ca.gov/criteria-pollutant-emission-inventory-data>

The MVEB for the Portola Serious SIP was developed to be consistent with the on-road emissions inventory³⁴ and attainment demonstration using the following method:

- 1) Used the CEPAM2022 v1.00 model to estimate emissions from motor vehicle exhaust, tire and brake wear, and paved, unpaved, and construction road dust (average annual day) for PM_{2.5} using the 2020 Plumas County RTP activity data adjusted for the Portola NAA.
- 2) Rounded the totals for PM_{2.5} emissions to the nearest hundredth ton.

Motor Vehicle Emissions Budget

The MVEB in Table 29 was established according to the methodology outlined above and in consultation with the District, EPA, Federal Highway Administration (FHWA), and Federal Transit Administration (FTA). The MVEB is consistent with the emission inventories and control measures in the Portola Serious SIP. These budgets will be effective once the EPA approves them.

Table 29 contains detailed MVEB for each milestone and attainment year for the Portola NAA. In addition, it provides emissions from the CEPAM2022 model. The final MVEB is rounded upwards to the nearest hundredth tpd.

³⁴ More information about the on-road motor vehicle emission inventory can be found in Section III of the plan.

Table 29. Summary MVEB for Portola Serious SIP

Portola NAA (tons per day)	2025	2028
	PM_{2.5}	PM_{2.5}
Vehicular Exhaust (including brake/tire wear for PM _{2.5})	0.011	0.010
Construction Road Dust	0.003	0.003
Paved Road Dust	0.009	0.009
Unpaved Road Dust	0.025	0.025
Total ^a	0.048	0.047
Motor Vehicle Emission Budget^b	0.05	0.05

^a Values from CEPAM2022 v1.00 may not add up due to rounding

^b Motor Vehicle Emission Budgets calculated are rounded up to the nearest hundredth of a tpd.

Source: CEPAM2022 v1.00

C. Best Available Control Technology/Measures Analysis

Overview and Requirements

The CAA requires that the control strategy for a serious nonattainment area not only provide for attainment through emission reductions but also meets the obligations of BACM and BACT. EPA interprets BACM/BACT as “generally independent” of attainment³⁵, meaning that control strategy demonstrating attainment is not sufficient alone to meet BACM/BACT requirements. Section 189(b)(2) of the CAA says that states submit BACM provisions 18 months following reclassification to Serious. Implementation of BACT/BACM is required 4 years after reclassification to serious per section 189(b)(1)(B) of the Act. EPA published the final rule reclassifying Portola NAA to serious for the 12 ug/m³ annual PM_{2.5} NAAQS on December 29, 2022 with an effective date of January 30, 2023³⁶. The BACM implementation deadline is January 30, 2027.

BACM is a five step process as outlined in the PM_{2.5} Implementation Rule³⁷:

35 59 FR 42011 (August 16, 1994)
 36 87 FR 80076 (December 29, 2022)
 37 81 FR 58083 (August 24, 2016)

- Develop a comprehensive emissions inventory for all sources of PM_{2.5} and its precursors in the nonattainment area;
- Identify potential control measures and technologies for consideration;
- Analyze the technological feasibility of each measure;
- Evaluate the economic feasibility of each measure; and
- Determine the implementation date of each technologically and economically feasible measure.

Best Available Control Technology

Major stationary sources in a Serious nonattainment area are required to implement BACT. Major stationary sources are defined as stationary sources with the potential to emit 70 tons per year of PM_{2.5} or PM_{2.5} precursors. All sources in the Portola NAA emit less than 70 tons per year of PM_{2.5} or PM_{2.5} precursors. The emission inventory analysis shows that there are no major stationary sources located within the nonattainment area. Therefore, the BACT requirement has been met.

Best Available Control Measure

BACM is required on direct PM_{2.5} and PM_{2.5} attainment precursors. As included in Chapter V: Attainment Demonstration, CARB conducted a comprehensive precursor demonstration to determine the relevant attainment precursors that should be included in the attainment strategy and BACM process in addition to directly-emitted PM_{2.5}. The precursor demonstration documented that only directly emitted PM_{2.5} was significant for the Portola NAA. Thus, the BACM process will only focus on measures addressing sources of directly emitted PM_{2.5}. NO_x, SO_x, VOCs, and ammonia emissions are not considered attainment precursors for the Portola NAA.

Step 1: Comprehensive Emissions Inventory

CARB and the District developed a comprehensive inventory for the Portola NAA. In the Portola NAA, the largest source of PM_{2.5} emissions is residential wood combustion followed by unpaved roads. As discussed in Chapter II, the PM_{2.5} composition and source attribution identify residential wood combustion as the causes of high PM_{2.5} levels in the Portola NAA. The emissions source breakdown in the Portola NAA is shown in Table 30.

Table 30. 2025 Annual Average Direct PM_{2.5} Emissions Sources Portola NAA

SOURCE CATEGORY	PM_{2.5} (TPD)	PM_{2.5} (%)
RESIDENTIAL FUEL COMBUSTION	0.267	72.6%
MANAGED BURNING AND DISPOSAL	0.003	0.8%
COOKING	0.008	2.1%
MINERAL PROCESSES	0.006	1.7%
CONSTRUCTION AND DEMOLITION	0.005	1.3%
PAVED ROAD DUST	0.009	2.4%
UNPAVED ROAD DUST	0.055	15.0%
FUGITIVE WINDBLOWN DUST	0.004	1.1%
STATIONARY	0.000	0.0%
TRAINS	0.002	0.5%
OFF-ROAD - ALL OTHER	0.008	2.2%
ONROAD MOBILE	0.001	0.3%
TOTAL	0.368	100%

In order to satisfy the BACM requirements, sources beyond the residential wood combustion will be considered. EPA did not include a de minimis option when considering sources for BACM in the PM_{2.5} Implementation Rule³⁸ Table 31 contains a list of the existing measures in the Portola NAA related to the control of PM_{2.5} emissions.

38 FR Vol. 81, No. 164, Aug 24, 2016, 58082-58083

Table 31. Existing Measures in Portola NAA

Strategy	Effective Date	Rule	Sources
Wood Stove Change Out Program	April, 2016	N/A	Residential Fuel Combustion
Prohibit Installation Uncertified Devices	June, 2016	City of Portola Ordinance No. 344	Residential Fuel Combustion
Prohibit Installation EPA Unqualified Fireplaces	June, 2016	City of Portola Ordinance No. 344	Residential Fuel Combustion
Limit number EPA Unqualified fireplaces	June, 2016	City of Portola Ordinance No. 344	Residential Fuel Combustion
Remove uncertified stoves on sale	June, 2016	City of Portola Ordinance No. 344	Residential Fuel Combustion
Prohibit Sole Source of heat as wood burning device in new construction	June, 2016	City of Portola Ordinance No. 344	Residential Fuel Combustion
Prohibit installation of hydronic heaters in Portola	June, 2016	City of Portola Ordinance No. 344	Residential Fuel Combustion
Limit number of EPA certified wood stoves to no more than two devices in new construction	June, 2016	City of Portola Ordinance No. 344	Residential Fuel Combustion
Limit number of EPA certified wood stoves to no more than two devices in homes	June, 2016	City of Portola Ordinance No. 344	Residential Fuel Combustion

Prohibit burning of garbage or unseasoned wood	June, 2016	City of Portola Ordinance No. 344	Residential Fuel Combustion
Require wood stove retailers to provide public education material	June, 2016	City of Portola Ordinance No. 344	Residential Fuel Combustion
Mandatory curtailment uncertified wood burning appliances on poor AQ days	January, 2021	City of Portola Ordinance No. 359	Residential Fuel Combustion
District and city open burning rules in nonattainment area	October, 1991 October, 2021	District Rule 300-317 City of Portola Ordinance No 359	Managed Burning and Disposal
District visible emissions rule	October 1991	District Rule 202	Unpaved Roads
District dust control rule	May 1994	District Rule 226	Paved Roads

Step 2: Potential Control Measures for Consideration

To identify potential control measures and technologies for consideration, CARB and District staff reviewed measures implemented in other areas related to reducing directly-emitted PM_{2.5}. The regulatory agencies over these areas include the San Joaquin Valley Air Pollution Control District (APCD), South Coast Air Quality Management District (AQMD), Alaska Department of Environmental Conservation (DEC), Puget Sound Clean Air Agency, and the Bay Area AQMD. For each emission inventory category, this BACM analysis will separate the analysis into three categories, emission standards, in-use requirements and fuels and then look at the categories in aggregate for each source category.

The Portola NAA is located in southern end of Plumas County at an elevation of 4,890 feet. The city of Portola has a population of about 2,100 people. The city of Portola

experiences higher unemployment, lower median incomes, and lower median home prices than the state averages. The median income is 25% below state average levels. The poverty rate in Portola as of 2022 was 21.1% compared to 12.0% statewide³⁹. As mentioned earlier, the Portola NAA is located in an intermountain basin isolated by rugged mountains, transitioning from conifer-dominated forests to the north, west and south, to grassland/high desert to the east. The mountain chains that dominate the topography of Plumas County drastically affect the climate of the Portola NAA. First, as the Portola NAA is on the leeward side of the Sierra range, it receives much less precipitation than areas further west and averages only 20 inches annually⁴⁰. Even Quincy, less than 30 miles to the northwest receives twice the amount of precipitation, averaging 40 inches a year. Second, the Portola NAA's high elevation, 4,890 feet, affects the temperature and precipitation patterns. Third, the Portola NAA has very cold temperatures - the average daily low temperature for the 6-month period of October through March is 21.8 degrees Fahrenheit, and the Portola area sees frost an average of 218 days per year. Fourth, the simple fact that the Portola area is tightly surrounded on three sides by mountains that impairs pollution dispersion, especially when there is a low temperature inversion, as is often the case in the winter. In addition, Portola NAA receives on average about 60 inches of snow annually⁴¹.

1. Residential Fuel Combustion

Emission Standard

The CAA requires EPA to set New Source Performance Standards (NSPS) for categories of stationary sources of pollution that cause, or significantly contribute to, air pollution that may endanger public health or welfare. The law requires EPA to review these standards every 8 years. EPA issued the first NSPS for residential wood heaters in 1988. The rule applied to adjustable burn-rate wood stoves, including a type of adjustable burn-rate wood stove known as a fireplace insert, and some pellet stoves. Since that time, technology for reducing emissions from wood heating devices has significantly improved and is available to make new units less polluting. The agency amended the standards in 2015. The 2015 standards include a phase-in of requirements to build cleaner wood heating devices that meet more stringent standards. The 2015 final NSPS requirements updated PM emission limits for newly

³⁹ *2022 American Community Survey 5-Year Estimates*

https://data.census.gov/profile/Portola_city,_California?g=160XX00US0658352#income-and-poverty

⁴⁰ Based on data from the Western Regional Climate Center (<http://www.wrcc.dri.edu/>) Cooperative Climatological Data Summaries (<http://www.wrcc.dri.edu/climatedata/climsum/>).

⁴¹ [PORTOLA, CALIFORNIA - Climate Summary \(dri.edu\)](#)

manufactured adjustable burn-rate wood stoves and set the first federal air standards for several other types of wood heating devices, including: all pellet stoves; indoor and outdoor wood-burning hydronic heaters; wood-burning forced-air furnaces; and a type of previously unregulated wood stove known as a “single burn-rate” stove. The 2015 NSPS also included updated test methods, an updated certification process, and a requirement that operators of wood heating devices burn only the fuel specified in the owner’s manual, including pellet fuel, that meet certain minimum requirements. EPA amended the 2015 NSPS in 2020. The current EPA certification rates for wood stoves are 2.5 g/hr for cord wood and 2.0 g/hr crib wood test. Table 32 lists out the potential control measures that will be reviewed.

In 2023, Attorneys General of 10 states and one local air agency submitted a notice of intent (NOI) to sue EPA regarding the NSPS for residential wood burning heaters⁴². The notice highlights problems with devices failing to meet emissions limits. The failures result from a combination of testing, third-party certifications, and lack of audits⁴³. The review of certification reports by the Northeast States for Coordinated Air Use Management (NESCAUM) revealed that of the 131 cord wood stove certification reports approved by EPA, two could not be located and none of the remaining 129 reports was determined to be complete. Furthermore, when the reported certification test procedures were followed, measured stove emission rates were 3 to 17 times higher than reported to EPA in the certification reports. Regulatory revisions are not planned until November 30, 2027, at the earliest, though this was not a firm commitment⁴⁴. The NOI requests a timely proposal and finalization of revised test standards for residential wood heaters.

On May 22, 2024, the Office of the Inspector General released a report⁴⁵ that identified concerns regarding the EPA’s failure to properly oversee and administer its Wood Heater Program. Specifically, the EPA lacked robust oversight mechanisms—such as compliance monitoring of EPA-approved labs, of third-party certifiers, and of wood heater manufacturers—to ensure that the Wood Heater Program facilitates compliance with the CAA. As a result, wood heaters that do not meet CAA standards

42 Attorneys General of New York, Alaska, Illinois, Maryland, Massachusetts, Minnesota, New Jersey, Oregon, Vermont, and Washington, and the Puget Sound Clean Air Agency –RE: New Source Performance Standards for Residential Wood Burning Heaters – Notice of Intent to Sue Pursuant to 42 U.S.C. § 7604(b)(2) <https://law.alaska.gov/pdf/press/230629-final.pdf>

43 Northeast States for Coordinated Air Use Management, Assessment of EPA’s Residential Wood Heater Certification Program (Mar. 2021) <https://www.nescaum.org/documents/nescaum-review-of-epa-rwh-nsps-certification-program-rev-3-30-21.pdf>

44 U.S. EPA Office of Inspector General, The EPA’s Residential Wood Heater Program Does Not Provide Reasonable Assurance that Heaters Are Properly Tested and Certified Before Reaching Consumers, At a Glance (Feb. 28, 2023) <https://www.epa.gov/system/files/documents/2023-03/epaig20230228-23-E-00122.pdf>.

45 [Management Implication Report: The EPA’s Wood Heater Program \(epaig.gov\)](#)

may end up in the marketplace, increasing risks to public health and the environment.

Until the deficiencies of woodstove emissions testing and certification NSPS are fully addressed there is additional uncertainty in the effectiveness of measures.

Table 32. Potential Control Measures for Consideration for Wood Burning Devices

Strategy	Sources
Stricter wood burning appliance emission requirements	Wood Burning Appliances
Wood stove requirements at time of construction, home sale, or remodel	Wood Burning Appliances
State weatherization and energy efficiency programs	Wood Burning Appliances

Stricter wood burning appliance emission requirements and requirements at time of construction, home sale, or remodel

Statewide and applicable to the Portola NAA, the California State Building Codes currently require the installation of woodstoves that meet the EPA emission standards in new buildings.

City of Portola Ordinance 15.10.030⁴⁶ requires that all sales and installation of woodstoves must be EPA certified wood burning devices meaning any wood-burning heater with a Phase II certification or a more stringent certification as currently enforced in the NSPS. Current EPA certification rates for wood stoves are at 2.5 g/hr for cord wood and 2.0 g/hr crib wood test. Further, the City of Portola Ordinance 15.10.040 requires it is prohibited for any person to complete, or allow the completion of any escrow transaction upon any residence or mobile home, or other parcel containing a building within the city limits unless each building on the parcel has been issued a certificate of compliance by the control officer as having no more than two wood-burning heaters which are EPA-certified and no uncertified wood-burning heaters.

46 Portola, California Municipal Code Title 15 Chapter 15.10

List of similar measures

Santa Rosa Title 17 Chapter 35.060, 35.070, 35.080, 35.090, 35.100

Noncertified devices are prohibited from new installations and must be removed at the time of permitted remodels when a wall is removed within 12 inches of the appliance (17-35.060 and 17-35.070)⁴⁷. City code 17-35.090 recommends the removal of noncertified wood heaters at the time of sale, and 17-35.100 requires a disclosure at time of sale of wood burning appliances. Operation of noncertified devices is prohibited, 17-35.080, with exception of sole source of heat and no adequate alternative source of heat either temporarily or permanent. The mechanism of enforcement is unclear beyond citizen complaints.

Bay Area Air Quality Management District – Regulation 6, Rule 3⁴⁸

The sale, resale, installation, and transfer of new or used uncertified devices is banned for retailers and individuals. Certified devices for sale must meet a 2.5 g/hr crib test or 2.0 g/hr cordwood test as of May 15, 2020. Uncertified devices installed as a fixture can be included with a property sale or transfer. Rental properties for lease or rent where natural gas is available are required to have a permanently installed device that does not burn wood. New building construction cannot install a wood-burning device. Remodeling fireplaces and chimneys where the cost exceeds \$15,000 is prohibited unless a gas, electric, or EPA certified device is installed. Operation of wood stove during curtailment requires registration of certified stove.

Alaska Department of Environmental Conservation – 18 AAC 50.07749

According to Alaska state regulation (18 AAC 50.077(a)) a person may not “install, reinstall, sell, lease, distribute, or convey” wood stoves in PM_{2.5} nonattainment areas unless they are certified to meet a 2.0 g/hr emission limit.

18 AAC 50.077(c) – 2.0 g/hr emission rate for cordwood and pellet stoves

1-hr filter pull from EPA certification test <= 6.0 g/hr (Sept 1 2020)

47 <https://ecode360.com/42966393https://www.srcity.org/DocumentCenter/View/2255/Woodburning-Appliances-Instructional-Brochure-PDF>

48 <https://www.baaqmd.gov/rules-and-compliance/rules/reg-6-rule-3-woodburning-devices>

49 <https://casetext.com/regulation/alaska-administrative-code/title-18-environmental-conservation/chapter-50-air-quality-control/article-1-ambient-air-quality-management/section-18-aac-50077-standards-for-wood-fired-heating-devices>

identifies 2.0 g/hr as the emission rate used as a requirement for cordwood stoves and pellet fueled stoves, as well as an additional emission requirement that the 1-hr filter pull from the EPA certification test shall not exceed 6.0 g/hr (starting September 1, 2020).

Alaska Department of Environmental Conservation – 18 AAC 50.077⁵⁰

According to Alaska state regulation (18 AAC 50.077(a)) a person may not “install, reinstall, sell, lease, distribute, or convey” wood stoves in PM_{2.5} nonattainment areas unless they are certified to meet a 2.0 g/hr emission limit. Wood and pellet stoves that do not meet the stated requirements in 18 AAC 50.077(c) or on the state’s approved list must be rendered “inoperable before December 31, 2024; or before the device, leased or conveyed as part of a structure, whichever is earlier.” (18 AAC 50.077(l)). 18 AAC 50.077(n) was a contingency measure and was triggered on October 2, 2020 with EPA’s finding of failure to attain the 2006 35 ug 24-hour PM_{2.5} standard (85 FR54509)⁵¹. All wood heating devices with greater than 2.0 g/hr emission rating are subject to removal if they are 25 years or older. Waivers are allowed under 18 AAC 50.077(g) based on financial hardship and technical feasibility with additional consideration for sensitive sources near the operation of the wood-fired heating device. Section 18 AAC 50.077(g) was not approved by EPA⁵².

South Coast Air Quality Management District – Rule 445⁵³

South Coast AQMD rule 445(d)(2) prohibits the sale, supply, and installation of wood-burning devices except for certified phase II or pellet burning device. Uncertified devices when permanently installed can be included as part of a property sale or transfer. Rule 445(d)(1) prohibits installation of any wood-burning device in new developments with exemptions for developments without access to natural gas or those above 3,000 ft of sea level.

San Joaquin Valley Unified Air Pollution Control District – Rule 4901

Section 5.1 of Rule 4901 prohibits the sale, transfer, and installation of new or used uncertified wood burning heaters. Uncertified devices must be rendered inoperable

50 18 AAC 50.077 - <https://dec.alaska.gov/air/anpms/sip/18aac50-reference-materials/>
<https://casetext.com/regulation/alaska-administrative-code/title-18-environmental-conservation/chapter-50-air-quality-control/article-1-ambient-air-quality-management/section-18-aac-50077-standards-for-wood-fired-heating-devices>

51 <https://www.federalregister.gov/documents/2020/09/02/2020-17541/determination-of-failure-to-attain-by-the-attainment-date-and-denial-of-serious-area-attainment-date>

52 40 CFR 52.70(c)

53 <https://www.aqmd.gov/docs/default-source/rule-book/rule-iv/rule-445.pdf>

at the time of property sale or transfer (5.2). No person may install an uncertified device as part of a significant remodel of a fireplace or chimney (5.2). Uncertified devices cannot be operated during the district’s level one or level two curtailment unless the device is a sole source of heat including temporary service interruptions of electric or natural gas utilities (5.7.4.2).

Measure Comparison

The Portola NAA includes requirements similar to the other areas where the sale and transfer of uncertified stoves are not allowed. Currently the population of uncertified stoves in the Portola NAA is estimated 479 out of 2,460 households. The Portola Wood Stove Change-Out Program⁵⁴ offers incentives fully covering the cost of replacing an uncertified stove or insert within the Greater Portola Area. Incentive amounts vary by the zone and replacement device (see Table 33) with greater incentives available for cleaner heating technologies up to a maximum of \$13,500 for an electric heat pump. The district offers incentives to install electric heat pumps as a primary source of heat in homes with a registered EPA-compliant woodstove⁵⁵ while allowing for backup and supplemental heating from the existing certified woodstove.

Table 33. Portola Woodstove Change Out Program Incentives by Zone and Device

Zone	Electric Heat Pump	Pellet Stove	Kerosene Monitor	Propane Heater	Wood Stove
Zone 1	\$13,500	\$6,500	\$6,500	\$6,500	\$5,000
Zone 2	\$13,500	\$4,500	\$4,500	\$4,500	\$3,500

Although only 100 additional devices must be replaced for air quality to meet 2025 attainment deadline, based on the 2021-2023 data 50 devices were on average replaced per year. If the rate of replacement is maintained through 2024 and 2025, by December 31, 2025 only 229 uncertified devices would remain in the entire nonattainment area. Those remaining uncertified devices will continue to be subject to curtailment restrictions.

⁵⁴ <https://www.myairdistrict.com/portola-woodstove-change-out-program>

⁵⁵ <https://www.myairdistrict.com/files/2a3d06272/NSAQMD-Application-Zone-1-A-2023-MB-.pdf>

Device Installations and Removal

As discussed above, a common requirement for addressing uncertified stoves is the banning of sale, transfer, and installation for any device not certified or meeting certain emission limits. In a few instances, Santa Rosa, Bay Area AQMD and South Coast AQMD, uncertified devices can be included with property sales or transfers, however, there are some areas require removal of uncertified devices with a home sale or transfer.

Requirements for replacement of uncertified woodstoves at the time of a significant remodel are common in the measures reviewed. The term “significant”, the remodel cost, or the proximity of the remodel to an existing wood burning appliance are thresholds for triggering the replacement of the certified stove. The District rule will adopt language from the Portola City Ordinance to limit the installation of devices during remodel to EPA certified devices.

Removal of uncertified devices is required by a specified date for measures in Puget Sound and Alaska. Alaska DEC’s measure goes further to require older, higher emitting certified devices to be removed. Homes where there are no other adequate sources of heat are exempt from the ban. An estimated 18 percent of the 35,060 households in the PM_{2.5} Fairbanks nonattainment area use wood as the primary source of heat, and 4 percent have no alternative source of heat, according to supporting materials⁵⁶ from 2019 Fairbanks PM_{2.5} Serious Plan⁵⁷. Alaska DEC also considers financial hardship as part of the waiver for removal. Both areas operate woodstove change out programs to offset the cost of replacement. It’s unclear to what extent enforcement of the ban in Puget Sound has led to additional uncertified wood stove turnover. The Alaska DEC set removal date for uncertified stoves has not yet passed at the time of developing the control strategy.

The availability of alternative heating sources varies between these nonattainment areas. Natural gas is available in many areas of Tacoma-Pierce while fuel oil is a common heating fuel in Fairbanks. Other less commonly used alternatives are electric, propane, and kerosene. These alternatives can be cost-prohibitive fuels for low-income households, especially in colder climates.

56Fairbanks PM_{2.5} 2020 Amendment SIP Control Measure Benefits.xlsx last accessed 04/25/2024
<https://dec.alaska.gov/media/21493/appendixiii77-2020-amendment-sip-control-measures-cost-effectiveness-analysis-spreadsheet.xlsx>

57State Air Quality Control Plan Vol. II: III.D.7.7 Control Strategies. Page III.D.7.7-23
<https://dec.alaska.gov/media/22029/iii-d-7-07-control-strategies-adopted-11-18-20.pdf>

Rental properties are covered under the existing requirements for removal of uncertified devices at the time of sale. The BAAQMD rule does require a permanently installed device that does not burn wood where natural gas is available. Portola does not have a natural gas infrastructure. Rental properties are also subject to curtailment where they have an uncertified wood burning device installed.

Lastly, the status of the NSPS for residential wood burning heaters introduces some uncertainty with respect to banning uncertified devices. Given the certification and testing issues for wood stove replacements, homeowners cannot be assured that a replacement stove is operating up to EPA standards.

A ban of either the nonoperation or date-certain removal of uncertified woodstoves is unlikely to increase the rate of removal. A ban would be counterproductive to community engagement while applying an additional burden to those struggling economically in the community. Natural gas is not an available alternative and no alternative fuels are as cost-effective or reliably supplied without disruption in the region. While some households can afford to use alternative heating sources, over 20% of the community lives below the poverty line making a higher cost heating source infeasible. Community outreach has been established by District staff and their chimney voucher program to increase knowledge about proper wood burning techniques and device maintenance. A complete ban on uncertified device operation would be a setback to the progress made with the wood stove change out program and community outreach. An opacity test cannot distinguish between emissions from an improperly operated certified stove or uncertified stove. Verification of the device type requires reporting by the device owner or an inspection.

A ban would not have an immediate impact on air quality. Homes operating uncertified stoves require these devices for heating. The existing wood stove change out program is the best path to verifiable removal of uncertified stoves and installations of certified stoves into the community. Due to the lower median income and higher than state average poverty rate outright banning all operation would have low compliance due to the necessity of home heating and lack of low cost alternatives.

Weatherization

California has in place programs to ensure weatherization and energy efficiency of new buildings. The State of California's Building Energy Efficiency Standards for Residential and Nonresidential Buildings (California Energy Code, Title 24, Part 6) are in effect Statewide and affect both new builds and alterations of existing buildings.

The Building Energy Efficiency Standards were last updated in 2022 (effective as of January 1, 2023); the 2022 updates set in place new standards to encourage building decarbonization, emphasizing in particular on heat pumps for space heating and water heating, and extended the benefits of photovoltaic and battery storage systems and other demand flexible technology to work in combinations with heat pumps.

California also has a number of funding programs, including the California Department of Community Services and Development’s (CSD) Low Income Weatherization Program to provides low-income households with solar photovoltaic systems and energy efficiency upgrades at no cost to residents, including specific components to support low-income farmworkers and multi-family properties. The California CSD also provides additional resources and administers certain federal weatherization programs including the U.S. Department of Energy’s Weatherization Assistance Program, and the U.S. Department of Health and Human Services’ Low Income Home Energy Assistance Program; California CSD works with local energy services providers throughout the state installing weatherization and energy efficiency measures for low-income homeowners and renters to facilitate these programs. Further, the California Public Utilities Commission has an Energy Savings Assistance Program which provides no-cost weatherization services to consumers who meet the income limits under the California Alternate Rates for Energy program.

In-Use Operations

Control measures considered for this category are listed in Table 34.

Table 34. Potential control measures for Consideration for In-Use Operations

Strategy	Sources
Curtailed programs	Wood Burning Appliances
Uncertified stove restrictions	Wood Burning Appliances
Wood stove sale surcharges, prohibitions, and disincentives	Wood Burning Appliances
Home heating emissions crossing property lines	Wood Burning Appliances

Curtailment Programs

Mandatory curtailment programs are another common measure used to limit the operation of uncertified devices during high PM_{2.5} concentration episodes. For the measures listed, a common exemption exists for homes where the uncertified device is the sole source of heat. Bay Area AQMD and San Joaquin Valley APCD require registration of a certified device for a burn ban exemption. Registration is valid for a specified period; five years in case of Bay Area AQMD and three wood burning seasons in case of San Joaquin Valley APCD. Low income and property elevation are two other examples of exemptions for device operations during curtailment.

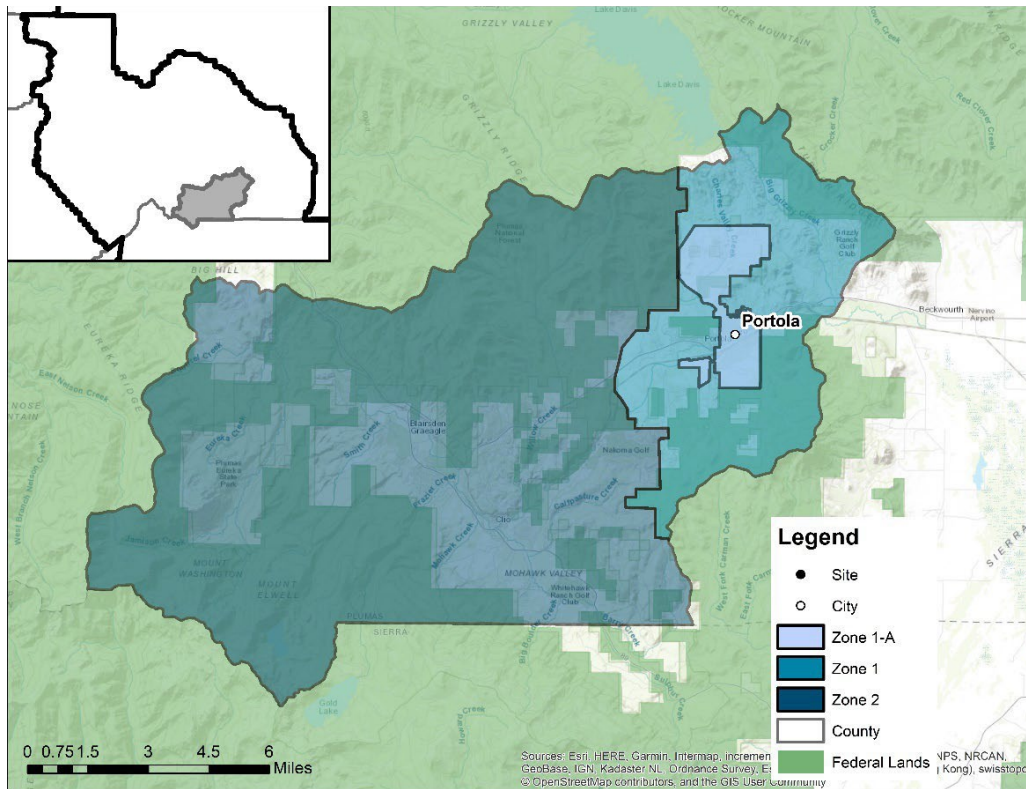
For the more stringent curtailment and nonoperation programs, Bay Area AQMD and Santa Rosa, no financial hardship or income-based exemptions are included. The much milder winter of the Bay Area, access to alternative sources of heat, and socioeconomic factors are important considerations when comparing these measures to other areas.

Portola NAA's current curtailment program defined in Chapter 15.10 of the City of Portola Municipal Code, revised in October 2021⁵⁸, operates from the months of September through April in Zone 1-A of the Portola NAA. The program requires mandatory curtailment of unregistered devices when PM_{2.5} concentrations are projected to exceed 20 ug/m³ during periods of harsh meteorological conditions as determined by District. Exemptions are allowed for properly maintained and operated EPA-Certified devices registered to the District.

The Portola NAA is divided into separate Zones, 1A, 1, and 2, as illustrated in Figure 41. Zone 1A is defined by the boundary of the city of Portola and the immediate areas around the city, the city's sphere of influence. Zone 1 encompasses the eastern portion of the nonattainment area including Zone 1A. Zone 2 is the remaining nonattainment area outside of Zone 1.

⁵⁸ Portola City Municipal Code - 15.10.060

Figure 42. Zones in Portola NAA



List of Similar Measures

San Joaquin Valley Episodic Wood Burning Curtailment - Rule 4901 5.7⁵⁹

The San Joaquin Valley APCD implemented a two-stage episodic curtailment program for the San Joaquin Valley for the months of November through February. Stage 1 curtailment is set to 20 ug/m³ for San Joaquin, Stanislaus, Merced, Kings, and Tulare counties; a 12 ug/m³ threshold is set for Madera, Fresno, and Kern counties. During Stage 1 unregistered wood burning heaters cannot be operated in locations with available natural gas service. Stage 2 sets thresholds of 65 ug/m³ for San Joaquin, Stanislaus, Merced, Kings, and Tulare counties and 35 ug/m³ Madera, Fresno, and Kern counties. During a Stage 2 curtailment no burning from solid fuel burning appliances is permitted so long as natural gas service is available. In addition to the exemption for no natural gas service, exemptions are also made for sole source of heat and service outages of gas or electric utility.

⁵⁹ <https://ww2.valleyair.org/media/uj2h5fqj/04-clean-rule-4901.pdf>

Alaska Department of Environmental Conservation - Reduced Use of Solid Fuel-Fired Heaters during Air Pollution Episodes –

Alaska Department of Environmental Conservation operates a two-stage curtailment program for the Fairbanks PM_{2.5} nonattainment area⁶⁰. The curtailment program does not specify an operating season⁶¹, though the conditions leading to PM_{2.5} formation are typically a concern in October through March⁶². Curtailment for the past three winter seasons Stage 1 sets a threshold at 20 ug/m³ and only allows devices with stage 1 waiver, state-listed and EPA-certified devices, to be used. Stage 2 sets a threshold at 30 ug/m³ and only devices with a NOASH (No Other Adequate Source of Heat) waiver to be used. There is a third zone in the nonattainment area that is not subject to any curtailment.

Puget Sound Clean Air Agency Regulation I, Article 13 - SOLID FUEL BURNING DEVICE STANDARDS⁶³

Puget Sound Clean Air Agency operates a two-stage curtailment program for solid fuel burning appliances. Stage 1 is called when forecasted PM_{2.5} is expected to exceed 24-hour average of 35 ug/m³ within 48 hours. Stage 2 is enacted when concentrations persist above 25 ug/m³ following a Stage 1. A Stage 2 alert may also be called at 25 ug/m³ under specific meteorological conditions without issuing a prior Stage 1 alert. During a Stage 1 alert, burning is prohibited if an adequate source of heat is available, or if a device is a pellet stove, certified EPA wood stove, wood stove meeting Oregon DEQ Phase 2 emission standards, or approved by Washington State Department of Ecology.

Also, this article specifies that wood stoves that are not certified must be removed and disposed or rendered permanently inoperable by September 30, 2015. Exemptions are made for homes or commercial establishments without an adequate alternative source of heat. The ban is enforced through the curtailment enforcement program conducting visual observations of home chimneys. Staff do request entry to homes. Engagement with the occupant is required to determine the type of stove and operations leading to excess smoke. The stated goal is to lead residents to utilizing the wood stove change out incentive funding.

60 18 AAC 50.075 and 50.246

<https://dec.alaska.gov/air/anpms/communities/fbks-pm2-5-curtail-details>

61 <https://dec.alaska.gov/media/22034/iii-d-7-12-emergency-episode-plan-adopted-11-18-20.pdf>

62 <https://dec.alaska.gov/air/anpms/communities/fbks-particulate-matter/>

63 [Reg I, Article 13 \(pscleanair.gov\)](#)

South Coast AQMD Rule 445 (e) – Wood-Burning Season PM_{2.5} Mandatory Burning Curtailment

Mandatory curtailment of wood-burning devices for areas below 3,000 feet elevation from sea level unless exempted. Wood-burning devices are defined as fireplaces, wood-burning heaters, pellet-fueled wood-burning heater, or any similar installed devices indoor and outdoor⁶⁴. Basin-wide curtailment threshold is 29 ug/m³ when forecasted at any receptor⁶⁵.

Bay Area AQMD Regulation 6, Rule 3 – 301 Burning prohibited during mandatory burn ban⁶⁶

Operation of wood-burning devices is not allowed when particulate matter concentrations are forecasted to exceed 35 ug/m³, a Mandatory Burn Ban, unless exempted. Exempted sources are limited to registered certified wood stoves.

Measure Comparison

Curtailment area:

The District will adopt a rule to replace the City of Portola Ordinance and expand the mandatory curtailment program in the Portola NAA from Zone 1-A to the Zone 1 region (see Figure 41). This would increase the size of the curtailment area from Portola City's mandatory curtailment that is limited to the Zone 1-A or City of Portola Limits. Limiting curtailment to specific zones in a nonattainment area is consistent with other curtailment measures. The Fairbanks and San Joaquin Valley programs apply different thresholds to different geographics areas. Fairbanks PM_{2.5} nonattainment area has three zones, one of which is not subject to curtailment. This focusing of programs allows for enforcement resources to be concentrated in areas with the highest number of sources and impacted populations. During high PM_{2.5} episodes there is little to no transport between Zone 2 and Zone 1 due to atmospheric stagnation. That's not to say there is no transport on an annual average basis, however, for the purposes of curtailment the focus is on high concentrations that coincide with cold temperatures and a strong stagnation events that effectively shut down transport between the areas. Zone 2 is less densely populated with fewer wintertime sources of wood smoke. In part this is due to the seasonal nature of residence within Zone 2.

64 SCAQMD Rule 445 (c)(22) <https://www.aqmd.gov/docs/default-source/rule-book/rule-iv/rule-445.pdf>

65 SCAQMD Rule 445 (e) <https://www.aqmd.gov/docs/default-source/rule-book/rule-iv/rule-445.pdf>

66 [Reg 6 Rule 3 Woodburning Devices \(baaqmd.gov\)](https://www.baaqmd.gov)

Thresholds:

The current threshold of 20 ug/m³ is equivalent to or lower than thresholds in other PM_{2.5} nonattainment areas with curtailment programs. Only the San Joaquin Valley APCD program establishes a lower threshold for a stage 1 curtailment, 12 ug/m³ in Madera, Fresno, and Kern counties. However, the San Joaquin Valley APCD curtailment only applies to unregistered devices with natural gas service. Portola does not have a natural gas infrastructure.

Duration:

The curtailment season in Portola covers the months of September through April. This is a longer effective curtailment season than seen in any other measures reviewed for BACM. The home heating season in Portola is comfortably contained in the current curtailment program. There would be no additional reductions expected by extending the duration of the program. The duration of the curtailment program is as stringent or more stringent than other measures.

Exemptions:

The curtailment programs reviewed provide exemptions due to financial hardship, lack of alternative heating sources, high elevation, and device registration. Portola experiences a higher unemployment and lower median income than the State averages. The city of Portola sits at 4890 feet elevation. There is no infrastructure for natural gas heating, and other alternatives such as propane have not been widely adopted due in part to fuel cost and potential disruptions to fuel supplies. An exemption for households experiencing a disruption in service to their primary heating device is consistent with the rules in other nonattainment areas. The District plans to incorporate a service disruption exemption from curtailment into the rule. Electric, gaseous fuel, registered certified wood heaters, and registered wood pellet heaters are exempt from curtailment though visible emissions restrictions still apply. Registered device exemptions are a common feature of most curtailment programs.

The current curtailment program for the city of Portola will be adopted as rule for the District and expanded to cover Zone 1. The curtailment season of September through April and threshold of 20 ug/m³ will be retained. Exemptions to curtailment will be allowed for temporary service outages and for District-registered wood burning, electric, and gaseous devices.

Visible Emissions

District Regulation II Rule 202 Visible Emissions prohibits emissions for more than three minutes in one hour as dark a shade as No. 1 on the Ringelmann Chart or at an opacity obscuring one's view to that same degree.

San Joaquin Valley Unified Air Pollution Control District (SJVAPCD) – Rule 4901

The San Joaquin Valley APCD rules prohibit the operators from causing or allowing any visible smoke from registered wood burning heaters under normal operating conditions. Uncombined water vapor emissions are permitted, other visible contaminants must not exceed No. 1 on the Ringelmann Chart or 20 percent opacity for more than three minutes in any hour.

Alaska Department of Environmental Conservation - 18 AAC 50.075(f). Solid fuel-fired heating device visible emission standards

The Alaska DEC rule prohibits the emissions of black smoke or visible emissions exceeding 20 percent opacity for more than six minutes in any one hour when an air quality advisory is active. Exceptions are made for the first 15 minutes of operation after the startup of the device. During the first 15 minutes of operation opacity must be less than 50 percent. Visible emissions observed with 40 C.F.R. Part 60, Appendix A, Method 22⁶⁷ may not cross property lines.

The current district rule matches the stringency of the San Joaquin Valley and Alaska Department of Environmental Conservation rules. The added exemption for the 15 minute startup period in the ADEC rule is less stringent. The added provision of visible emissions crossing property lines would not provide additional reductions. The current District rule is not specifically tied to home heating devices or mandatory curtailment. The District is proposing to adopt a rule in the Regulation II: Prohibitions⁶⁸ to apply visible emissions testing to the operation of wood burning devices. The visible emissions limit would be used to determine violations of the mandatory curtailment program.

Fuel Requirements

Measures for consideration are listed in Table 35.

67 <https://www.epa.gov/emc/method-22-visual-determination-fugitive-emissions>

68 <https://www.myairdistrict.com/rules>

Table 35. Potential Control Measures for Consideration for Fuel Requirements

Strategy	Sources
Wood moisture requirements	Wood Burning Appliances

City of Portola municipal code 15.10.050 prohibits the use of any fuels or materials in wood burning devices except for seasoned wood less than 20% moisture content, uncolored paper, manufactured logs, pellets, and similar products (e.g. fire starters). There are no commercial wood sellers present in Portola.

List of Similar Measures

Alaska Department of Environmental Conservation - 18 AAC 50.076

Operators are permitted to burn only the following fuels in a wood-fired heating device according to 50.076(a)(a): dry wood and wood products (wood pellets, compressed wood logs, bricks, and pucks), and starter fuels (heating oil, propane, natural gas, or wood-based materials), biomass approved by manufacturers, and any fuel approved by manufacturers that are not wet wood or otherwise prohibited from between October 1 – March 31 per 50.076(b). Other specific prohibitions are made in 50.076(c) for stained, painted, coated, treated woods, petroleum contaminated materials, waste, debris, flooring products, and several other compounds.

Commercial wood sellers are required to register under sections 50.076(d-f) to sell wood to persons located in or intends to burn in a PM_{2.5} nonattainment area. The registration with the department must be renewed every three years. Sellers are required to test the moisture content using a department approved test meter at time of sale or time of delivery. Sections 50.076(g)(1 - 4) specifies the test methods and documentation. Documentation of the wood moisture content is to be provided to the purchaser and the department 50.076(g)(5-10). Exemptions for the selling of wet wood in 50.076(j) are provided for round logs 8ft with proof of the buyer’s ability to dry wood for the next winter season. Section 50.076(k) describes the methods for drying wood, documentation of the seasoning, and enforcement actions for failing to comply. Lastly section 50.076(l) prohibits the sales of wet wood from non-commercial wood sellers in any PM_{2.5} nonattainment areas.

South Coast Air Quality Management District – Rule 445(d)(4)

Commercial wood sellers are required to sell only seasoned wood between July 1 and the end of February. Non-seasoned wood may be sold the remainder of the year. Seasoned wood is defined as containing 20% or less moisture content by weight through approved methods defined in 445(c)(15).

San Joaquin Valley Unified Air Pollution Control District – Rule 4901 (5.5-5.6)

The following fuels are prohibited from use in a wood burning fireplace, wood burning heater, or outdoor wood burning device: garbage, treated wood, non-seasoned wood, plastic products, rubber products, waste petroleum, paints, paint solvents, coal, or any other material non intended by manufacturers of the device.

Wood advertised as seasoned must meet a moisture content of 20 percent or less by weight. The testing of wood moisture content may be delegated by the APCO to another agency.

Measure Comparison

The year-round restrictions on fuels in the city of Portola are as stringent as or more stringent than found in the similar measures for PM_{2.5} nonattainment areas. The fuel restrictions for Portola apply year-round. Alaska DEC prohibits unseasoned wood during the months of October through March rather than year-round. South Coast does not express a prohibition on the use of unseasoned wood. The current Portola City rule only covers operations of stoves in the city limits.

There are no commercial wood sellers within the Portola NAA. The provisions on commercial wood sales do not apply. Alaska does prohibit wet wood sales from non-commercial wood sellers in the Fairbanks PM_{2.5} nonattainment area. However, in the Portola NAA they can only use seasoned wood. Also, due to ensuring defensible space, Portola NAA residents need to dispose of downed trees and may need to store the wood on their property.

The prohibition on fuels other than seasoned wood less than 20 percent moisture content, uncolored paper, manufactured logs, pellets, and similar products (e.g. fire starters) in wood burning devices will be established as a district rule covering Zone 1, expanding beyond the boundary of the city of Portola. Given the absence of commercial wood sellers in the Portola NAA a rule targeting non-seasoned wood sales would be ineffective.

Residential Fuel Combustion Conclusion

With the upcoming District Rule addressing residential fuel combustion that will take place of the Portola City Ordinance and considering the lack of natural gas service in the area, this source is controlled at a BACM level for the conditions in the Portola NAA. The District has and continues to effectively reduce emissions from uncertified wood stoves similar to other areas by requiring the change out of uncertified wood stoves during home sales, incentivizing the changeout of wood stoves in the Portola NAA, including an enforceable measure for the emission reductions, and curtailing the use of woodstoves during high PM_{2.5} levels for uncertified stoves. The District is requiring the use of seasoned wood and the State is promoting weatherization to ensure homes use less wood. This suite of measures is the best available control measure for the Portola NAA to control emissions from residential fuel combustion.

2. Open Burning Restrictions

District rules 300-317 regulate open burning⁶⁹. The open burning rules cover different types of burning including agricultural, range improvement, forest management, wildlands vegetation management, land development clearing, ditch, road and right-of-way maintenance, hazard reduction, and residential. The District's open burning rules have requirements specific to different categories of allowed open burning; agricultural, range improvement, forest management, wildland vegetation management, land development clearing, road maintenance, hazard reduction, and residential maintenance. Open burning can be the burning of yard debris in open burn piles on residential properties, or the disposal of timber harvest waste, promoting fire safety and maintaining forest health for land management burning (Forest Service, Bureau of Land Management, State Parks, etc.). The District enforces these regulations by issuing notices of violations to residents which include monetary penalties.

In general, open burning is only allowed on a permissive burn day (Rule 313) and it is illegal to cause a smoke nuisance (Rule 315). The District declares each day either a permissive burn day or a "no-burn" day for all open burning. These declarations are based upon a daily burn decision by the CARB's Meteorology section. CARB makes these decisions based upon factors related to the ability of smoke from open burning to rise and disperse adequately. These factors include surface and upper-air temperatures and wind velocities, relative humidity, and anticipated forecast changes. For example, the presence of a strong temperature inversion is likely to result in a No-Burn day determination. The ability of smoke from open burning to rise

⁶⁹ Northern Sierra Air Quality Management District Rules accessed 05/24/2024 - <https://myairdistrict.com/index.php/rules/>

and disperse adequately depends largely upon atmospheric stability at any given time and the influence of surrounding terrain.

Smoke Management Plans are required for burning over 10 acres in one day (Rule 316). It is prohibited for anyone to transport material from one location to another for the purpose of burning (Rule 311). It is prohibited to burn vegetation which has not undergone a minimum drying time (Rule 314) or to burn garbage (Rule 302).

The District has proactively worked with local biomass facilities and waste management agencies and fire agencies to reduce the smoke impacts from open burning. Sierra Pacific Industries located in Loyalton was a biomass facility located just 26 miles from the nonattainment area. Due to the Air District's recommendation, this facility received and processed yard waste from local residents until the facility shut down in 2011. Due to a recommendation from the District, the U.S. Forest Service purchased a large industrial grinder to process forest waste in lieu of burning specifically for land within the Portola NAA. Intermountain Disposal provides residential and commercial green and yard waste pickup service in the City of Portola and Eastern Plumas County. The District has an extensive residential open burning public education program which discusses open burn requirements, proper methods of burning, alternatives to burning, and a focus on the illegal burning of garbage. To disseminate this information, the District regularly pays for advertisements in local papers, distributes various educational brochures throughout local fire agencies and community sites, and maintains extensive public education information on the District website. The District has also provided for a green waste month for free green waste drop off annually in June⁷⁰.

Portola City Ordinance No. 359 sections 15.10.025 prohibits open burning of yard waste within city limits. Exceptions are made for cooking with wood, recreation, and ceremonial fires in section 15.10.026. These exceptions are waived when burning has been suspended by California Department of Forestry and Fire (Cal Fire) Protection or United States Forest Service. Cal Fire suspends all burning during the months of July through September. The rule allows training burns for the fire department and special permits for health and safety purposes.

List of Similar Measures

[Alaska Department of Environmental Conservation – 18 AAC 50.065⁷¹](#)

⁷⁰ <https://www.cityofportola.com/green-waste-month-will-be-in-june>

⁷¹ <https://dec.alaska.gov/air/anpms/sip/18aac50-reference-materials/>

The Alaska DEC prohibits open burning between November 1 and March 31 in PM_{2.5} nonattainment areas. The rule does allow for local permit programs to replace the prohibition if it is part of an adopted SIP and does not contribute to exceedances of the NAAQS.

Klamath County, Oregon – 406.150⁷²

Prohibits residential open burning in air quality control zones except for two 15-day periods in the Spring and Fall. Exemptions are allowed for ceremonial and recreational fires.

San Joaquin Valley APCD Rule 413

The San Joaquin Valley APCD Rule 4103 prohibits burning on days when PM_{2.5} concentrations are projected to exceed 20 µg/m³.

Sacramento Metropolitan AQMD Rule 407

Rule 407 prohibits open burning in urbanized area but allows burning on a permissive burn days outside of the urbanized areas.

Open Burning Conclusion

Based on the measures in other areas the District and City of Portola are proposing updates to the open burning rules. During mandatory curtailment days open burning is prohibited in Zone 1. Burning will be prohibited in the City of Portola. With these updates, the District will be controlling open burning in the Portola NAA at a BACM level.

3. Paved/Unpaved Road and Construction Dust

Unpaved and Paved roads are controlled by District Rules 226 and 202. District Rule 226 requires paved entry aprons or other effective cleaning techniques (e.g., wheel washers), may be required by the Air Pollution Control Officer to prevent tracking onto paved roadways. Paved entry aprons may include road section or coarse aggregate or steel grate to "knock off" dirt which accumulates on the vehicle and/or vehicle wheels. Any material which is tracked onto a paved roadway must be removed (swept or washed) as quickly and as safely as possible. Exceptions to this provision may be made by the Air Pollution Control Officer for the construction,

⁷² <https://www.klamathcounty.org/DocumentCenter/View/24309/6305>

maintenance, and/or repair of paved roadways and for the application of de-icing and traction materials for wintertime driving safety.

District Rule 202 requires that a person shall not discharge into the atmosphere from any single source of emission whatsoever any air contaminant for a period or periods aggregating more than three (3) minutes in any one (1) hour which is:

A. As dark or darker in shade as that designated as No. 1 on the Ringlemann Chart, as published by the United States Bureau of Mines, or

B. Of such opacity as to obscure an observer's view to a degree equal to or greater than does smoke described in subsection (A) of this section.

List of Similar Measures

San Joaquin Valley APCD Rules 8011⁷³ and 8061⁷⁴

Rule 8011 establishes definitions, general exemptions, administrative requirements, and a Fugitive PM₁₀ Management Plan for Unpaved Roads. The general exemptions from Rule 8011 also apply to Rules 8061: emergency vehicles, essential service utilities, activities above 3,000 ft or higher, and on-field agriculture.

Rule 8061 applies to unpaved and paved roads with requirements for new or modified paved roads greater than 500 annual average daily vehicle trips (AADT). New or modified paved roads are required to meet shoulder width requirements based on AADT (5.1.1.1): the lesser of 4 feet or limit of right-of-way at 500-3,000 AADT, the lesser of 8 feet or limit of right-of-way over 3,000 AADT. When the shoulder requirements cannot be met curbing must be constructed as well as intersections, auxiliary entry lanes, and auxiliary exist lanes. Exemptions are allowed when requirements conflict with California Environmental Quality Act (CEQA) and National Environmental Policy Act (NEPA) determinations on environmental, cultural, archaeological, historical, or other considerations. Section 5.1.1.2 requires that medians of newly constructed or modified paved roads with AADT of 500 or more meet a minimum width of four feet unless curbing with speed limits below or grass or vegetative or dust suppressants/stabilizers are used.

PM₁₀ efficient street sweepers are required to be purchased and prioritized for use by agencies with responsibility for paved road within an urban area. Sweeping routes covered by PM₁₀-efficient street sweepers shall operate no less than once per month.

73 <https://ww2.valleyair.org/media/xtbcnaht/rule-8011.pdf> Accessed 09/27/2024

74 <https://ww2.valleyair.org/media/rkjms1vh/rule-8061.pdf> Accessed 09/27/2024

Agencies that cannot meet the requirements due to budgetary constraints may submit financial hardship statements to the APCO and EPA.

Post-Event cleanup is required when 1 inch thick layer of mud/dirt accumulates over 50 square meters due to wind/storm/water erosion or runoff. Within 24 hours of finding the accumulated material the responsible agency must remove the mud/dirt or restrict travel. Extensions due to travel safety are possible upon notification and approval by APCO.

Unpaved roads with 26 or more AADT the owner shall limit visible dust emissions (VDE) to 20 percent opacity and is required to apply and maintain one of the following control measures for stabilization: watering, uniform layer of washed gravel, chemical/organic dust stabilizers/suppressants, roadmix, paving, APCO-approved Fugitive PM₁₀ Management Plan from rule 8011, or any other methods demonstrated to effectively limit VDE to 20 percent opacity.

Construction of new unpaved road is prohibited unless it is temporary as defined in section 3.60 of Rule 8011. Section 5.2.3 states that existing unpaved roads are to be catalogued with details on length and AADT and provided to the District by July 1, 2005. 20 percent of all urban unpaved roads are to be paved averaged annually by January 1, 2010 up to a maximum of 5 miles in any one urban area. The District required annual reporting on April 1 of each year of the number of unpaved roads that were paved in the past year. A financial hardship statement may be submitted if budgetary constraints prevent meeting the provisions of 5.2.3.

Section 5.2.4 requires paved public roads with unpaved shoulders are to be catalogued noting the length and AADT of unpaved shoulder segments by January 1, 2005. By January 1, 2010 paving or stabilizing of 4-foot shoulders must be completed on 50 percent of paved public roads with unpaved shoulders with the highest AADT in urban areas. In rural areas 25 percent of existing paved roads with unpaved shoulders with the highest AADT are to be paved or stabilized. A financial hardship statement may be submitted if budgetary constraints prevent meeting the provisions of 5.2.4.

Owners/operators of unpaved roads with 26 AADT or more must establish a speed limit of 25 miles per hour and post a speed limit sign, one in each direction every mile in urban areas and every two miles in rural areas. Compliance is required within one year of the adoption date of the rule.

Rule 8061 contains the following exemptions in addition to those in 8011: unpaved roads less than 26 annual average daily trips (AADT), maintenance and resurfacing

activities of paved roads, agricultural sources exempt from rule 8081, equipment removing debris beyond the capabilities of PM₁₀-efficient street sweepers.

EPA Menu of Control Measures for NAAQS Implementation

Paved and unpaved road control measures^{75,76} are summarized in EPA's Menu of Control Measures website⁷⁷. Paved road control measures include gravel bed trackouts, pipe grid trackouts, pave interior roads, pave existing shoulders, and trackout control devices. These measures vary in effectiveness for PM_{2.5} from 46 percent to 80 percent with cost effectiveness estimates of \$159,310 per ton to \$985,122 per ton in 2018 dollars. Unpaved road emission control measures include chemical stabilizers, dust suppressants, application of gravel, paving, and applying water. Control efficiencies range from 18.1 percent to 95 percent for PM_{2.5} with cost effectiveness estimates between \$31,478 per ton to \$713,640 per ton. These estimates are before considering the vehicle passes in the nonattainment area and impact of winter precipitation and snow accumulation on activity and road dust emissivity.

Construction dust measures include chemical stabilizers, dust control plan, sprinkler system for soil moisture, and truck system for soil moisture^{78,79}. Control efficiencies range from 25 percent to 68.6 percent for PM_{2.5}. The cost effectiveness for PM_{2.5} ranges from \$379,557 per ton to \$2,845,176 per ton in 2018 dollars.

Paved/Unpaved Road and Construction Dust Conclusion

The Portola NAA is at an elevation of 4,890 feet. Further, the current unpaved emissions inventory estimates an average of 10 vehicle passes per day, well below 26 AADT threshold for the unpaved road control measures. 55 percent of the unpaved emissions come from U.S. Forest and Park roads. Portola receives 60 inches of snowfall annual with conditions that allow for accumulation throughout the winter months⁸⁰. Unpaved road travel is likely to be much lower November through April

75 Houston Advanced Research Center and Texas Environmental Research Consortium. Fine Particulate Matter in Harris County. April 30, 2015. <https://pm25.harcresearch.org/assets/FinalReport.pdf>

76 GDIT, 2020: General Dynamics Information Technology, CoST PM_{2.5} Nonpoint Control Measures Report, prepared for U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, March 2020.

77 <https://www.epa.gov/air-quality-implementation-plans/menu-control-measures-naaqs-implementation>

78 Houston Advanced Research Center and Texas Environmental Research Consortium. Fine Particulate Matter in Harris County. April 30, 2015. <https://pm25.harcresearch.org/assets/FinalReport.pdf>

79 GDIT, 2020: General Dynamics Information Technology, CoST PM_{2.5} Nonpoint Control Measures Report, prepared for U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, March 2020

80 [PORTOLA, CALIFORNIA - Climate Summary \(dri.edu\)](https://www.dri.edu/PORTOLA_CALIFORNIA_Climat_e_Summary)

than currently estimated due to snow fall and accumulation leading to travel restrictions. While emissions estimates account for precipitation, accumulated snow depth and reduced travel due to impassible roads are not factored into the inventory.

The current District rules for unpaved and paved roads are as stringent or more stringent than the rules reviewed when considering sources above 3,000 ft are exempt from the San Joaquin Valley APCD Rule 8011 and 8061 and are a best available control measure level.

Additional control measures for paved roads, unpaved roads, and road construction dust are not cost effective at reducing PM_{2.5}. At the low end unpaved road dust controls would cost \$31,478 per ton, paved road dust controls \$159,310 per ton, and construction dust controls \$379,557. By comparison the wood stove change out program in Portola operates at a cost effectiveness of \$2,232 per ton⁸¹.

4. Commercial Cooking

The City of Portola has approximately eight restaurants and sandwich delis. There are currently no District rules applicable in the Portola NAA for reducing cooking emissions from restaurants.

List of Similar Measures

San Joaquin Valley APCD Rule 4692

The San Joaquin Valley APCD Rule 4692 requires the installation and operation of PM control devices on chain-driven commercial charbroilers that cook 400 pounds of meat or more per week. The rule requires that the emissions control devices achieve 83 percent control efficiency for PM and 86 percent control efficiency for VOC.

South Coast AQMD Rule 1138

The South Coast AQMD Rule 1138 requires restaurants be equipped with a catalytic oxidizer control device on chain-driven commercial charbroilers that cook 875 pounds of meat or more per week.

Conclusion

The Portola NAA does not have any restaurants equipped with chain-driven or underfired charbroilers.

⁸¹ Based on information compiled in the Targeted Airshed Grants Final Reporting for the Residential Wood Stove Changeout Project in the Portola PM_{2.5} Nonattainment Area FY 2023.

5. Mineral Processing

The City of Portola has one source in the mineral processing, sand and gravel excavation processing category. The source is a portable concrete batch plant and the emissions below the 70 tons per year threshold for a BACT analysis. The source does have a district air quality permit that requires and district Regulation V: Permit to Operate rules⁸² apply. The permit has an emission limit of 7.0 tons per year of total suspended particulate (after controls) from all stationary sources listed under this permit to operate.

List of Similar Measures

CARB reviewed the state district rules database⁸³ and did not find rules in other districts for portable concrete batch plants.

Conclusion

The single source in the mineral process category has a permit is controlled at a BACM level.

6. Off-Road Mobile Sources

Off-road mobile sources include a wide variety of engines ranging from locomotives, ships, and aircraft, to equipment used in the agricultural, construction, mining, and freight / goods movement industries. This category is composed of off-road compression ignition (diesel) engines and equipment, small spark ignition off-road engines and equipment less than 25 hp (including lawn and garden equipment, and small industrial equipment), and off-road large spark ignition (gasoline and liquefied petroleum gas) engines and equipment 25 hp and greater (including industrial equipment, forklifts, and portable generators).

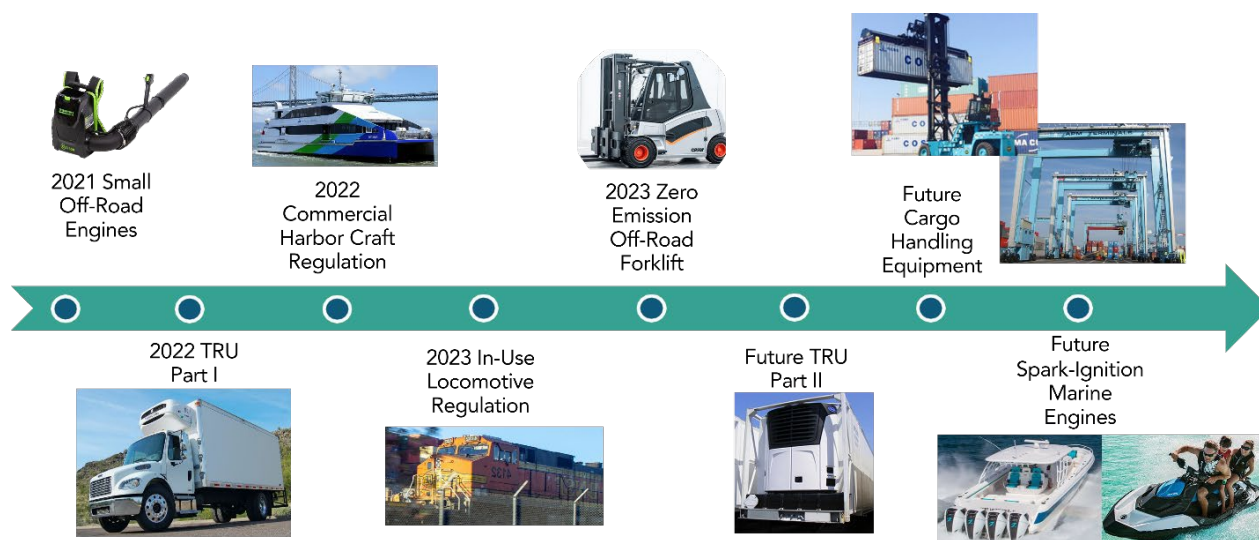
While emission standards for locomotives are set by EPA, CARB has accelerated reductions from these sources through efforts that have focused on cleaner fuel requirements, and increasing use of cleaner locomotives. CARB staff and the Class I railroads have also been implementing a memorandum of understanding to accelerate the introduction of cleaner locomotives since 2005. The recently adopted In-Use Locomotive Regulation accelerates the adoption of advanced, cleaner technologies for locomotive operations, including zero-emission technologies.

⁸² [Rules - Northern Sierra Air Quality Management District \(myairdistrict.com\)](http://myairdistrict.com)

⁸³ [Current Air District Rules | California Air Resources Board](#)

Emission reductions from ongoing implementation of the current control program are projected to reduce emissions of direct PM from the off-road sector by 16 percent between 2020 and 2025. Achieving reductions in the off-road sectors remains a greater challenge than in the on-road sector due to the diverse nature of these sources, regulatory authority that rests outside of CARB in many cases, and the length of time sources remain in the fleet. Figure 42 illustrates the progression of current and future off-road control measures from CARB.

Figure 43. Off-Road Control Measures



The major regulatory and programmatic control measures that provide these emissions reductions are described below.

Emission Standards

To control emissions from off-road equipment, CARB adopted in 2004 a fourth tier of increasingly stringent PM and NOx standards based on the use of advanced aftertreatment emission controls. U.S. EPA also adopted the Tier 4 standards in 2004. California’s current standards are equal in stringency to current federal standards. These “Tier 4” standards apply to new off-road compression-ignition engines, and were phased-in across product lines from 2008 through 2015 and reduced exhaust emission levels by up to 95 percent compared to previous control strategies. New engine standard requirements vary according to the power rating of engines. Table 36 shows the schedule for phasing in tiered requirements for new off-road engines with a power rating between 175 and 300 hp. Beginning in 2014, new Tier 4 construction equipment must emit about 96 percent less PM than new Tier 1 equipment sold in the year 2000.

Table 36. Phase-in of Off-Road Engine Standards

Model year	Level of Control	Applicable Emission Standard for New Off-road Engines 175<hp<300 g/bhp-hr	
		NOx	PM
1996-2002	Tier 1	6.9	0.4
2003-2005	Tier 2	4.9*	0.15
2006-2010	Tier 3	3.0*	0.15
2011-2013	Tier 4 interim	1.5	0.015
2014+	Tier 4 final	0.3	0.015
Under development	Tier 5 Standards	TBD	TBD

*Reflects combined limit for non-methane hydrocarbons and NOx

List of Similar Measures

No other state has more stringent exhaust emission standards for off-road equipment than California.

Conclusion

CARB Tier 4 Off-Road Equipment Standards are nearly identical to those finalized by EPA in its Clean Air Nonroad Diesel Rule. These regulations require engine manufacturers to meet aftertreatment-based exhaust standards for PM and NOx starting in 2011 that are over 90 percent lower than the previous engine generation’s emission levels. CARB’s new engine standards for off-road equipment is thus aligned with most stringent control program of any in the nation.

Due to constraints in the CAA, California is the only state that can set new engine standards (including control measures such as emission standards, sales mandates, warranty provisions, and OBD requirements) that are more stringent than EPA’s national standards. Other states can adopt California programs for which EPA has provided California with authorizations. While the CAA allows other states to adopt

CARB's regulations for off-road engine or off-road vehicles (provided that such standards are identical to the CARB standards for which an authorization has been obtained), other states have not yet adopted off-road engine emission standards equivalent to the California off-road regulation, although there are some states currently considering doing so. CARB's off-road engine standards are at a BACM level.

In-Use Operations

Large diesel off-road equipment typically remains in use for long periods of time. As with heavy-duty trucks, this long life means that newer, lower-emitting engines would be introduced into fleets relatively slowly. To address this, the Cleaner In-use Off-Road Equipment Regulation (Off-Road Regulation) was adopted in 2007, and amended in 2009 and 2010. The regulation covers all self-propelled off-road diesel vehicles 25 horsepower or greater used in California and most two-engine vehicles (except on-road two-engine sweepers). The Off-Road Regulation requires off-road fleets to reduce their emission by retiring, replacing, or repowering older engines. This Regulation expanded the penetration of existing clean technology to ensure that the engines and vehicles used today are as clean as possible. EPA approved this regulation in 2013. The types of off-road equipment controlled by this regulation are used in construction, manufacturing, the rental industry, road maintenance, airport ground support, and landscaping. In December 2011, the Off-Road Regulation was modified to include on-road trucks with two diesel engines.

The Off-Road Regulation is an extensive program designed to accelerate the penetration of the cleanest equipment into California's fleets. This regulation significantly reduces emissions of diesel PM and NOx from the over 150,000 in-use off-road diesel vehicles that operate in California by requiring their owners to modernize their fleets and install exhaust retrofits. The regulation requires that fleets meet an increasingly stringent set of fleet average targets, culminating in 2023 for large and medium fleets (large fleets represent about 54 percent of vehicle ownership) and in 2028 for small fleets. The most stringent fleet average target generally corresponds to roughly a 2012 model year, or a Tier 3 average standard. In 2015, the program reduced emissions from 10,447 vehicles used in 838 fleets by requiring owners to modernize their fleets by replacing older engines or vehicles with newer, cleaner models, retiring older vehicles or using them less often, or by applying retrofit exhaust controls. The Off-Road Regulation imposes idling limits on off-road diesel vehicles, requires a written idling policy, and requires a disclosure when selling vehicles. The Regulation also requires that all vehicles be reported to CARB and labeled, restricts the addition of older vehicles into fleets, and requires

fleets to reduce their emissions by retiring, replacing, or repowering older engines, or installing verified exhaust retrofits. The requirements and compliance dates of the Off-Road Regulation vary by fleet size.

Beyond the general fleet rules controlling emissions from off-road equipment, CARB has also developed and implemented control measures that target specific to categories of sources within the off-road sector, which are described below.

Measure Comparison

Some nonattainment areas have fleet requirements that also require BACT-equivalent levels of controls for some off-road equipment (i.e. construction equipment), which are described below.

- New York City's Local Law 77 requires use of ultra-low sulfur diesel fuel and BACT for reducing emissions from non-road equipment above 37 kW used on city construction projects.
- Chicago (IL) Clean Diesel Construction Ordinance bans high-polluting diesel equipment from City construction sites. While the California program requires fleets to turnover to Tier 4 or equivalent control levels, the Chicago ordinance only requires fleets to turnover to Tier 2 or equivalent control levels (on-road vehicles MY 1998 and earlier and pre-EPA Tier 1 equipment will be banned under the Chicago ordinance.)

No other state or nonattainment area controls in-use off-road equipment fleets more stringently than CARB. Neither of the New York or Chicago programs cover the full suite of off-road equipment engine types and applications that are regulated under CARB's program. Additionally, they do not have as stringent of labeling and reporting requirements as CARB. Finally, the use of ULSD in off-road equipment in New York provides significantly less emission reductions than the use of ULSD inside of California (as is required – see fuels section for more information), as federal USLD specifications allow significantly less stringent caps on sulfur and aromatic hydrocarbon content in fuels than CARB diesel specifications.

Conclusion

In aggregate, CARB's fleet requirements for off-road equipment are the most stringent in the nation. CARB's Off-Road Regulation controls diesel PM and NOx emissions from >150,000 in-use offroad engines by requiring their owners to retire, replace, or repower older engines, and/or installing verified exhaust retrofit control

technologies to BACT-equivalent engines. Additionally, all vehicles are reported and labeled, and older, dirtier vehicles are restricted from entering fleets.

CARB's Off-Road Regulation controls emissions from aerial lifts, aircraft tugs, backhoes, baggage tugs, belt loaders, cargo loaders, crawler tractors (such as bulldozers), excavators, forklifts, graders, loaders, mowers, rollers, rough terrain forklifts, rubber tired loaders, scrapers, skid steer loaders, snow blowers, tractors, trenchers, as well as several types of on-road vehicles, such as two-engine vehicles, and workover rigs.

No other state or nonattainment area controls in-use off-road equipment fleets more stringently than CARB. Neither of the New York or Chicago programs cover the full suite of off-road equipment engine types and applications that are regulated under CARB's program. Additionally, they do not have as stringent of labeling and reporting requirements as CARB. Finally, the use of ULSD in off-road equipment in New York provides significantly less emission reductions than the use of ULSD inside of California (as is required – see fuels section for more information), as federal ULSD specifications allow significantly less stringent caps on sulfur and aromatic hydrocarbon content in fuels than CARB diesel specifications. CARB's in-use requirements for off-road engines are at a BACM level.

7. Off-Highway Recreational Vehicles

Emission Standards

Off-road recreation vehicles, also known as off-highway recreational vehicles (OHRV), primarily include off-highway motorcycles, all-terrain vehicles (ATVs), and utility-terrain vehicles, off-road sport and utility vehicles, sand cars, and golf carts. In 1994, CARB adopted its first OHRV regulation, which established exhaust emission standards for OHRVs. At that time, there were no equivalent federal standards regulating exhaust emissions from the vehicles and engines covered by California's OHRV regulations (EPA first set exhaust emission limits for OHRVs in 2002). EPA granted authorization for CARB's 1994 OHRV regulations in 1996. CARB subsequently amended the regulations to increase the stringency of controls and expand the categories of OHRVs controlled under the program; first in 1999, subsequently in 2003, and again in 2006. All three OHRV Engine Emission Standard amendments were granted authorization concurrently by EPA in 2014.⁸⁴

⁸⁴ U.S. EPA, 2014. "California State Nonroad Engine Pollution Control Standards; Off-Highway Recreational Vehicles and Engines; Notice of Decision" <https://www.gpo.gov/fdsys/pkg/FR-2014-02-04/pdf/2014-02297.pdf> Federal Register, Vol. 79, No. 23

In 2019 the Board approved more stringent exhaust regulations for OHRVs, which set more stringent exhaust emission control standards for ATVs, off-road sport vehicles, and off-road utility vehicles for MY 2022 – 2027, and more stringent evaporative regulations for OHRVs, which harmonize with EPA evaporative emissions standards for OHMC for MY 2020 – 2026. The 2019 Amendments also included provisions to accelerate the development of zero-emission OHRVs, and set more stringent California-specific emissions standards for all new OHRV beginning with MY 2027 for evaporative emission standards, and with MY 2028 for exhaust emission standards.

List of Similar Measures

No other state has the authority to set exhaust emission and/or evaporative emission standards that exceed the stringency of EPA's national standards.

Conclusion

CARB's new engine standards for OHRV are the most stringent of any in the nation. CARB's program sets Exhaust Emissions Standards and Evaporative Emission Standards for OHRVs, together with amendments to the testing procedures to ensure the most stringent level of emission reductions are achieved. CARB's exhaust emission standards control emissions from off-highway motorcycles, all-terrain vehicles, and utility-terrain vehicles at more stringent levels than applicable national standards set by EPA for MY 2022 – 2027+. EPA has issued authorization for CARB's OHRV regulations. No other state or nonattainment area controls emissions from new OHRV more stringently than CARB. CARB's new engine emission standards for OHRV are at a BACM level.

In-Use Operations

In 1994, CARB set exhaust standards for all OHRV that were to go into effect starting in 1998. The exhaust standards were technology forcing, and additional time was needed for manufacturers to produce a full range of compliant vehicles. Dealers expressed concern that certified models would not be available and that California OHRV dealerships would go out of business. In 1998, CARB met with affected stakeholders and developed a temporary compromise that allowed for the certification of vehicles that do not meet emissions standards. CARB adopted this compromise into regulation in 1999, which have become known as the Red Sticker Program. It allows for certification and sale of OHRV that have no emissions control systems.

In order to reduce excess emissions, the 1999 Amendments established a new compliance category beginning with the 2003 model year, and designates OHRVs as either “green sticker” or “red sticker”, depending on whether the engine meets or exceeds the applicable emission standard. Non-emission compliant OHRVs are identified with a red registration sticker issued from the Department of Motor Vehicles (DMV), while emission compliant OHRVs are identified with a green sticker. Red sticker OHRVs are subject to in-use restrictions that do not apply to green sticker OHRVs; namely, the red sticker limits operation at certain off-highway recreational vehicle parks located in ozone nonattainment areas during the summer months (i.e. peak ozone season).

The red sticker program was envisioned as a temporary measure to provide market stability while manufacturers developed a full range of OHRV that complied with California’s emissions standards. This temporary measure has now been in effect for more than twenty years, and the majority of off-highway motorcycles sold in California are red sticker vehicles with no emissions controls. The 2019 Amendments to the OHRV program instituted actions to begin sunseting the Red Sticker Program, including:

- Ending red sticker certification of new OHRV with no emissions controls beginning in model year 2022;
- Establishing transitional standards from 2020 through 2026; and
- Lifting the seasonal riding restrictions on existing red sticker vehicles starting on January 1, 2025.

Currently, this program is being phased-out to allow for more stringent emission control measures. In the meantime, however, the red-sticker program continues to control emissions from the in-use OHRV fleet.

List of Similar Measures

No other state or nonattainment area controls in-use emissions from OHRV more stringently than CARB.

Conclusion

CARB’s In-Use controls for OHRV under the “Red Sticker” program controls in-use emissions from OHRV more stringently than any other state or nonattainment area in the nation. Under this program, engines that do not meet the applicable emission standard for new engines are subject to in-use restrictions that limits operation at

certain off-highway recreational vehicle parks located in ozone nonattainment areas during the summer season. CARB is currently in the process of phasing out the Red Sticker program in favor of more stringent emission controls, and has ended Red Sticker certification of new OHRVs with no emission controls beginning in Model Year 2022. The seasonal riding restrictions on existing red sticker vehicles, however, continues through December 2024, providing for ongoing in-use emission controls for the legacy vehicle fleet. No other state or nonattainment area controls in-use emissions from OHRV more stringently than CARB. CARB's in-use controls for OHRV are at a BACM level.

8. Locomotives

Emission Standards

Under the Act, EPA has the sole authority to establish emissions standards for new locomotives.⁸⁵ Locomotives are self-propelled vehicles used to push or pull trains, including both freight and passenger operations. Union Pacific Railroad (UP) and BNSF Railway (BNSF) are the two Class I, or major, freight railroads operating in California. There are also seven intrastate passenger commuter operators and up to 26 freight shortline railroads currently operating in California. UP and BNSF, however, generate the vast majority (90 percent) of locomotive emissions within the State, with most attributable to interstate line haul locomotives. UP and BNSF operate three major categories of freight locomotives, both nationally and in California. The first category is interstate line haul locomotives, which are primarily ~4,400 horsepower (HP). The second category is made up of medium-horsepower (MHP) locomotives, as defined by CARB as typically between 2,301 and 3,999 HP. MHP locomotives are typically older line haul locomotives that have been cascaded down from interstate service. And lastly, there are switch (yard) locomotives, specifically defined by U.S. EPA as between 1,006 and 2,300 HP. Locomotives operating at railyards and traveling throughout the nation are a significant source of emissions of diesel PM (which CARB has identified as a toxic air contaminant), NO_x, and GHGs. These emissions often occur in or near densely populated areas and neighborhoods, exposing residents to unhealthy levels of toxic diesel PM, plus regional ozone and secondary PM_{2.5}.

EPA has previously promulgated two sets of national locomotive emission regulations (1998 and 2008). In 1998, U.S. EPA approved national regulations that primarily emphasized NO_x reductions through Tier 0, 1, and 2 emission standards. Tier 2 NO_x

⁸⁵ 42 United States Code (U.S.C.) §7547, (a)(5)

emission standards reduced older uncontrolled locomotive NOx emissions by up to 60 percent, from 13.2 to 5.5 g/bhp-hr.

In 2008, U.S. EPA approved a second set of national locomotive regulations. Older locomotives, upon remanufacture, are required to meet more stringent particulate matter (PM) emission standards, which are about 50 percent cleaner than Tier 0-2 PM emission standards. U.S. EPA refers to the PM locomotive remanufacture emission standards as Tier 0+, Tier 1+, and Tier 2+. The new Tier 3 PM emission standard (0.1 g/bhp-hr), for model years 2012-2014, is the same as the Tier 2+ remanufacture PM emission standard. The 2008 regulations also included new Tier 4 locomotive NOx and PM emission standards (2015 and later model years). U.S. EPA Tier 4 NOx and PM emission standards further reduced emissions by approximately 90 percent from uncontrolled levels.

Beyond the currently adopted levels of controls, CARB staff petitioned EPA in 2017⁸⁶ to promulgate by 2020 both Tier 5 national emission standards for newly manufactured locomotives, and more stringent national requirements for remanufactured locomotives, as committed to in the 2016 State SIP Strategy's More Stringent National Locomotive Emission Standards measure. This would reduce emissions of criteria and toxic pollutants, fuel consumption, and GHG emissions. CARB staff estimates that EPA could require manufacturers to implement the new locomotive emission regulations by as early as 2023 for remanufactures and 2025 for newly manufactured locomotives. As documented in the Final Technology Assessment for Freight Locomotives,⁸⁷ CARB staff believes the most technologically feasible advanced technology for near-term deployment is the installation of a compact aftertreatment system (e.g., combination of selective catalytic reduction (SCR) and diesel oxidation catalyst (DOC)) onto new and remanufactured diesel-electric freight interstate line haul locomotives. Newly manufactured locomotives can also be augmented with on-board batteries to provide an additional 10-25 percent reduction in diesel fuel consumption and GHG emissions to achieve the Tier 5 emission levels. On board batteries could also provide zero emission track mile capabilities in and around railyards to further reduce diesel PM and the associated health risks.

A new federal standard could also facilitate development and deployment of zero-emission track mile locomotives and zero-emission locomotives by building incentives for those technologies into the regulatory structure. The compact SCR and

⁸⁶ <https://ww2.arb.ca.gov/resources/documents/us-epa-responds-carbs-petition-strengthen-locomotive-emission-standards>

⁸⁷ Final Technology Assessment for Freight Locomotives available at: <https://www.arb.ca.gov/msprog/tech/report.htm>

DOC aftertreatment system could also be retrofitted to existing Tier 4 locomotives to be able to achieve a Tier 4+ emissions standard, when Tier 4 locomotives are scheduled for remanufacture (every 7 to 10 years). Based on the typical remanufacture schedule, all Tier 4 locomotives could potentially be retrofitted with aftertreatment between 2025 and 2037. Existing locomotives originally manufactured to meet Tier 2 or Tier 3 standards could also be upgraded with the same compact aftertreatment system upon remanufacture to achieve emissions equal to Tier 4 levels.

List of Similar Measures

No state has emission standards for locomotives that differ from EPA's.

Conclusion

EPA sets nationwide emission standards for locomotives, the most recent of which is the Tier 4 NOx and PM Locomotive Emission Standards. No state, including California, has the authority to regulate emission standards for locomotives. Thus, CARB's locomotive controls are equivalent to the controls used in all other nonattainment areas in the nation. Nonetheless, further increases in stringency of locomotive emission controls are needed for California nonattainment areas, including the Portola nonattainment area, to attain federal ambient air quality standards. For this reason, CARB has petitioned EPA to set more stringent emission controls for locomotives. The emissions standards for locomotives in California are at a BACM level.

In-Use Operations

CARB has worked closely with the major railroads in California, together with other stakeholders, to develop innovative measures to reduce in-use emissions from locomotives, a major source of PM emissions in the Portola NAA, but a source category over which CARB has limited regulatory authority.

While emission standards for locomotives are set by EPA, CARB has accelerated reductions from these sources through efforts that have focused on cleaner fuel requirements, and increasing use of cleaner locomotives. CARB staff and the Class I railroads have also been implementing through the 2005 Statewide Rail Yard Agreement for California Rail Yards, a Memorandum of Understanding (MOU) to accelerate the introduction of cleaner locomotives since 2010.⁸⁸ This agreement

⁸⁸ CARB 2005 "ARB/Railroad Statewide Agreement: Particulate Emissions Reduction Program at California Rail Yards"
<https://ww2.arb.ca.gov/sites/default/files/2020-06/2005%20MOU%20Remediated%203102020.pdf>

obligated the railroads to increase the use of idle control devices, lowered locomotive idle times to 15 minutes, and opened a collaboration to produce Health Risk Assessments on 18 major railyards in the State, which was completed in 2015. The UPRR Portola Yard was covered by the 2005 Statewide Rail Yard Agreement for California Rail Yards.

CARB will also increase the stringency of controls on locomotive operations with the recently adopted In-Use Locomotive Regulation, which the Board adopted in April 2023. This regulation will accelerate the adoption of advanced, cleaner technologies for locomotive operations, including zero-emission technologies, and includes:

- Starting in 2024: Spending Account

Locomotive operators will be required to fund their own trust account based on the emissions created by their locomotive operations in California. The dirtier the locomotive, the more funds must be set aside. Spending Account funds would be used in the following manner:

- Until 2030: to purchase, lease, or rent Tier 4 or cleaner locomotives, or for the remanufacture or repower to Tier 4 or cleaner locomotive(s).
 - At any time: to purchase, lease, or rent ZE locomotive(s), ZE capable locomotive(s), ZE rail equipment, or to repower to ZE locomotive(s) or ZE capable locomotive(s).
 - At any time: for ZE infrastructure associated with ZE locomotive(s), ZE capable locomotive(s), ZE rail equipment.
 - At any time: to pilot or demonstrate ZE locomotives or ZE rail equipment technologies.
- Starting in 2030: In-Use Operational Requirements

Only locomotives less than 23 years old will be able to be used in California. Switchers, industrial and passenger locomotives with original engine build dates of 2030 or newer would be required to operate in a ZE configuration in California. Freight line haul locomotives with original engine build dates of 2035 and newer will be required to operate in a ZE configuration in California.

- Starting in 2024: Idling Limit

All locomotives with automatic shutoff devices (AESS) will not be permitted to idle longer than 30 minutes, unless for an exempt reason. Exemptions closely align with those described by EPA, and would be granted for reasons like maintaining air brake pressure to perform maintenance.

- Starting in 2024: Registration and Reporting

Locomotives operating in the State will be required to register with CARB. Reporting includes and annual administrative payment. Locomotive activity, emission levels and idling data will be required to be reported annually.

List of Similar Measures

No other state has a regulation to accelerate the adoption of advanced, cleaner locomotive operations technologies, including zero-emission.

Conclusions

While emission standards for locomotives are set by EPA, CARB has accelerated reductions from this source through efforts that have focused on increasing the use of cleaner locomotives. The 2005 Statewide Rail Yard Agreement for California Rail Yards, a MOU obligated the railroads to increase the use of idle control devices, lowered locomotive idle times to 15 minutes, and opened a collaboration to produce Health Risk Assessments on 18 major railyards in the State which was completed in 2015. The Union Pacific Railroad Company Portola Yard was covered by this MOU.

CARB also recently adopted more stringent in-use locomotive emission controls with the In-Use Locomotive Regulation, which accelerates the adoption of advanced, cleaner technologies for locomotive operations, including zero-emission technologies. No other state or nonattainment area has an agreement with Class I railroads to accelerate the introduction of cleaner locomotive engines, or has achieved similarly significant levels of emission reductions from in-use locomotives than CARB. CARB's in-use locomotive requirements are at a BACM level.

9. Fuels

In addition to new engines and in-use standards, cleaner burning fuels represent an important component in reducing emissions from the off-road mobile fleet. Cleaner fuel has an immediate impact in reducing emissions from the mobile source, and thus represent an important component in reducing PM emissions from off-road engines. California's stringent air quality programs treat mobile sources and their fuels holistically (as a system, rather than as separate components). As a result, CARB's

fuels programs achieve significant reductions in criteria emissions from vehicles and mobile engines used in California.

The California diesel fuel program sets stringent standards for diesel fuel sold in California and produces cost-effective emission reductions from diesel-powered vehicles. More stringent fuel requirements further ensure that diesel engines are operating as cleanly as possible. CARB Diesel Fuel Regulations have, over time, phased in more stringent requirements for fuel mixture specifications for aromatic hydrocarbons and sulfur, and have established a lubricity standard. The program applies to sales of fuel used in on-road vehicles and off-road vehicles and locomotives in California. "CARB diesel" Specifications adopted in 1988 limited the allowable sulfur content of diesel fuel 500 parts per million by weight (ppmw), and the aromatic hydrocarbon content to 10 percent, and became effective in 1993.

EPA began regulating sulfur content in diesel in 1993. At that time, uncontrolled fuels (i.e. non-CARB diesel) contained approximately 5,000 parts per million (ppm) of sulfur. In 2006, EPA began to phase-in more stringent requirements under the federal Ultra-Low Sulfur Diesel (ULSD) regulations, which lowered the amount of sulfur in on-road diesel fuel to 15 ppm. EPA's Nonroad Diesel Fuel Standards were phased in from 2007 to 2014, and require that all off-road engines, including those used in locomotives and off-road equipment, use ULSD fuel (with some exemptions for older locomotives and marine engines). The Nonroad Standards also require that diesel fuel sold into the market for off-road use must be ULSD. It is important to note that while EPA defines ULSD as ≤ 15 ppm for on-road applications, the definition of off-road ULSD is significantly less stringent, defined as ≤ 500 ppm standard.

In 2003, CARB's Ultra Low Sulfur Diesel (ULSD) Regulation increased the stringency of the sulfur content limits to 15 ppm, which began implementation in 2006. CARB's ULSD Regulation had an immediate impact in reducing emissions from the in-use fleet, while also enabling the use of advanced emissions control technologies, including the use of catalyzed diesel particulate filters, NOx after-treatment, and other advanced after-treatment based emission control technologies that higher sulfur levels would have inhibited the performance of (at the time of CARB's ULSD rulemaking, the average sulfur content of California diesel was approximately 140 ppmw). The original applicability of the regulations was to vehicular diesel fuel; however, the applicability of the regulations has been extended by the adoption of ATCMs to non-vehicular diesel fuel, such as fuel for stationary engines, locomotives, and marine harbor craft.

The Low Carbon Fuel Standard (LCFS) and Alternative Diesel Fuel (ADF) Regulations work together to reduce the carbon intensity of the California fuel supply. The regulations also limit criteria emissions from alternative fuels and/or alternative fuel mix blends (a mix of fuels made from renewable feedstocks, which are then blended with conventional gasoline or diesel). The regulations were amended in 2018 to extend the carbon intensity target of 20 percent to 2030. Due to regulatory constraints, the LCFS and ADF do not apply to fossil jet fuel, aviation gasoline, fuels used in interstate locomotives, or fuels used for the propulsion of ocean-going vessels – regulatory control over these fuels lies at the national and international level.

List of Similar Measures

No state requires cleaner burning diesel than California. The California diesel fuel regulations exceed federal requirements in stringency.

CARB staff are aware of only one other state, Texas, who has a boutique diesel fuel program that is approved into the SIP. An independent analysis of The Texas Low Emission Diesel program (TxLED) showed that the TxLED fuel emissions performance does not provide as significant of emission reduction benefits as the California.

Conclusion

EPA began regulating sulfur content in diesel in 1993. At that time, uncontrolled fuels (i.e. non-CARB diesel) contained approximately 5,000 ppm of sulfur. In 2006, EPA began to phase-in more stringent requirements under the federal ULSD regulations, which lowered the amount of sulfur allowed in federal diesel fuels. EPA's Nonroad Diesel Fuel Standards were phased in from 2007 to 2014, and require that all off-road engines, including those used in locomotives and off-road equipment, use ULSD fuel (with some exemptions for older locomotives and marine engines). The Nonroad Standards also require that diesel fuel sold into the market for off-road use must be ULSD. It is important to note that while EPA defines ULSD as ≤ 15 ppm for on-road applications, the definition of off-road ULSD is significantly less stringent, defined as ≤ 500 ppm standard.

For the off-road fleet, CARB's current ULSD regulation is significantly more stringent than the applicable current federal ULSD standards (Phase III):

- Whereas the federal ULSD program differs in requirements for on- and off-road fuels, CARB's ultra-low sulfur diesel program sets the same requirements for fuels burned in on- and off-road applications. CARB limits sulfur content at 15 ppm rather than the federal limit of 500 ppm for off-road ULSD. Compared

with CARB ULSD standards, federal off-road ULSD allows 33 times the sulfur content.

- CARB's ULSD significantly reduces emissions relative to federal on-road ULSD, which is much cleaner than federal off-road ULSD. Both federal on-road ULSD and CARB ULSD limit sulfur content (a precursor to secondary atmospheric formation of PM_{2.5}) to 15 ppm, yet CARB's fuel emits ~25 percent less PM. Given that federal off-road ULSD sulfur content is capped at levels 3,000 percent higher than CARB's ULSD, the California program is significantly more stringent in terms of its ability to control emissions of sulfur oxide emissions.
- In addition, CARB controls hydrocarbons and aromatics, unlike EPA requirements.

As was discussed in the on-road diesel fuel section, only one other state has a boutique fuel program with requirements that differ from federal specifications, the Low Emission Diesel Program in Texas (TxLED). An independent analysis of TxLED, CARB ULSD and federal ULSD shows that the TxLED fuel emissions performance does not provide as significant of emission reduction benefits as the California specifications.⁸⁹ Furthermore, the stringency of Texas' testing requirements are based on the federal Complex Model, which is less stringent and nuanced than the California Predictive Model that is used to determine compliance with California fuel requirements. CARB diesel specifications are more stringent than federal and other states' programs. CARB's ULSD program reduces NOx and PM emissions significantly relative to EPA requirements, providing approximately 7 percent more NOx reductions and 25 percent more diesel PM reductions than federal diesel.

Further, LCFS and ADF regulations work together to reduce the carbon intensity of the California fuel supply while requiring limits on criteria emissions from alternative fuels and/or alternative fuel mix blends. While other states have adopted or are considering adopting similar programs to the California LCFS, no other state has set criteria emission requirements on alternative fuels and alternative fuel blends. The Federal Renewable Fuel Standard (RFS II), which is the most equivalent program type at the federal level, increases the renewable content of the fuel mix nationally (as the LCFS does in California), however it does not specify criteria requirements for alternative fuels. No other state or nonattainment area controls criteria emissions

⁸⁹ American Transportation Research Institute (ATRI) 2008 "Energy and Other Fuel Property Changes with On-Road Ultra-Low Sulfur Diesel Fuel" <http://www.atri-online.org/research/results/environmentalfactors/2008ATRIDiesel.pdf>

from renewable fuels more stringently than CARB. CARB's fuels are at a minimum at a BACM level.

10. Conclusion: Findings of Mobile Source BACM Analysis

California's long history of comprehensive and innovative emissions control has resulted in the strongest mobile source control program in the nation. EPA has acknowledged the strength of these programs in their approval of CARB's regulations and through the waiver and authorization process. In addition, EPA has provided past determinations that CARB's mobile source control programs meet BACM requirements as part of their 2004 approval of the San Joaquin Valley's 2003 PM₁₀ Plan:

"We believe that the State's control programs constitute BACM at this time for the mobile source and fuels categories, since the State's measures reflect the most stringent emission control programs currently available, taking into account economic and technological feasibility."

Additionally, in their 2020 proposed approval of the San Joaquin Valley's PM_{2.5} Serious Area 2018 Plan,⁹⁰ EPA further found that CARB's mobile source control program met the more stringent level of MSM. In their 2020 proposal for that plan, EPA found that,

"CARB's programs constitute the most stringent emission control programs currently available for the mobile source and fuels categories, taking into account economic and technological feasibility."⁹¹

Since then, CARB has continued to enhance and accelerate reductions from our mobile source control programs through the implementation of more stringent engine emissions standards, in-use requirements, incentive funding, and other policies and initiatives as described in the preceding sections. These efforts not only ensure that all source sectors continue to achieve maximum emission reductions through implementation of the cleanest current technologies, but also promote the ongoing development of more advanced zero and near-zero technologies. As a result, California's current mobile source control programs reflect the most stringent

90 85 FR 44192 <https://www.federalregister.gov/documents/2020/07/22/2020-14471/clean-air-plans-2006-fine-particulate-matter-nonattainment-area-requirements-san-joaquin-valley> While elements of this plan were later disapproved and remanded due to a 9th Circuit Court of Appeals decision, the Court's findings nonetheless upheld EPA's approval of mobile source control measure finding of MSM.

91 85 FR 17382 <https://www.federalregister.gov/documents/2020/03/27/2020-05914/clean-air-plans-2006-fine-particulate-matter-nonattainment-area-requirements-san-joaquin-valley>

and feasible level of emissions control in the nation and fully meet the requirements for BACM.

In conclusion, CARB followed the procedures outlined by EPA for determining BACM, and have found that California’s control programs for mobile sources satisfy and, in certain cases, go beyond the applicable requirements for the PM_{2.5} standard in this analysis.

11. Portola NAA BACM Conclusion

The Portola NAA is required to have BACM in place by January 30, 2027 due to the reclassification as a Serious PM_{2.5} nonattainment area. The District is implementing BACM in the Portola NAA as summarized in Table 37.

Table 37. Portola NAA BACM Summary

SOURCE CATEGORY	BACM	Changes
RESIDENTIAL FUEL COMBUSTION	Yes	District rule update
MANAGED BURNING AND DISPOSAL	Yes	District rule update
COOKING	Yes	
MINERAL PROCESSES	Yes	
CONSTRUCTION AND DEMOLITION	Yes	
PAVED ROAD DUST	Yes	
UNPAVED ROAD DUST	Yes	
TRAINS	Yes	
OFF-ROAD - ALL OTHER	Yes	

With the upcoming District Rule addressing residential fuel combustion that will take place of the Portola City Ordinance and considering the lack of natural gas service in the area, this source is controlled at a BACM level for the conditions in the Portola NAA. The District has and continues to effectively reduce emissions from uncertified

wood stoves similar to other areas by requiring the change out of uncertified wood stoves during home sales, incentivizing the changeout of wood stoves in the Portola NAA, and curtailing the use of woodstoves during high PM_{2.5} levels for uncertified stoves. The District is requiring the use of seasoned wood and the State is promoting weatherization to ensure homes use less wood. This suite of measures is the best available control measure for the Portola NAA to control emissions from residential fuel combustion.

Based on the measures in other areas, the District and City of Portola are proposing updates to the open burning rules. During mandatory curtailment days open burning is prohibited in Zone 1. Burning will be prohibited in the City of Portola. With these updates, the District will be controlling open burning in the Portola NAA at a BACM level.

The Portola NAA is at an elevation of 4,890 feet. Further, the current unpaved emissions inventory estimates an average of 10 vehicle passes per day, well below 26 AADT threshold for the unpaved road control measures. The current District rules for unpaved and paved roads are at BACM level for the Portola NAA.

For the mineral processing category, the District permit for the single source is the best available control measure.

CARB has unique authority provided by the CAA that allows California to develop emissions standards for off-road equipment and vehicles. Looking at the emission standards, fuels and in-use requirements, locomotives and other off-road sources are controlled at a BACM level for the Portola NAA.

Appendix A

Positive Matrix Factorization Report

Technical Report

Source Apportionment of PM_{2.5} Measured at the Portola Monitoring Site

Positive matrix factorization (PMF) is a multivariate source apportionment method that deduces source profiles as well as contributions from PM_{2.5} speciation data. PMF is one of several EPA recommended receptor modeling methods (U.S. EPA, 2008). To identify major PM_{2.5} sources affecting Portola monitoring site, PMF2 (bilinear PMF) was used in this study.

1. Sample Collection and Data Screening

The analyzed PM_{2.5} speciation samples were collected by Spiral Aerosol Speciation Samplers (SASS; Met One Instruments, Grants Pass, OR) at Portola SLAMS (State and Local Air Monitoring Stations) network monitoring site located in the Plumas County.

Comparing PM_{2.5} data measured by the speciation sampler and the collocated Federal Reference Method (FRM) sampler in Figure 1 shows reasonable agreement using 205 data between 2011 and 2014 (*slope* = 1.10, *Intercept* = 0.45, *r*² = 0.98).

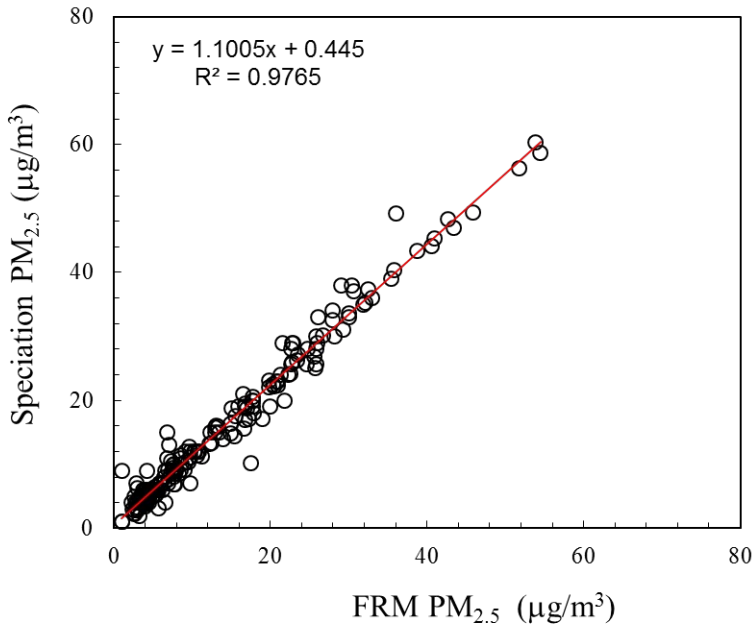


Figure 1. FRM PM_{2.5} versus Speciation PM_{2.5} between 2011 and 2014.

Since a carbon denuder that minimizes positive sampling artifact caused by adsorption of gaseous organic materials was not included upstream of quartz filter in the SASS samplers, a positive organic carbon (OC) artifact concentration was estimated utilizing the intercept of the regression of OC concentrations against PM_{2.5} concentrations (Tolocka et al. 2001, Kim et al. 2005). Samples for which PM_{2.5} or OC concentration had an error flag and samples for which

the PM_{2.5} or OC data were not available were excluded from the regression analysis between PM_{2.5} and OC concentration. Using 208 samples out of 289 samples between 2011 and 2014, the intercept -1.07 μg/m³ in PM_{2.5} regression against OC concentration indicates no positive OC artifact at the Portola site (Figure 2).

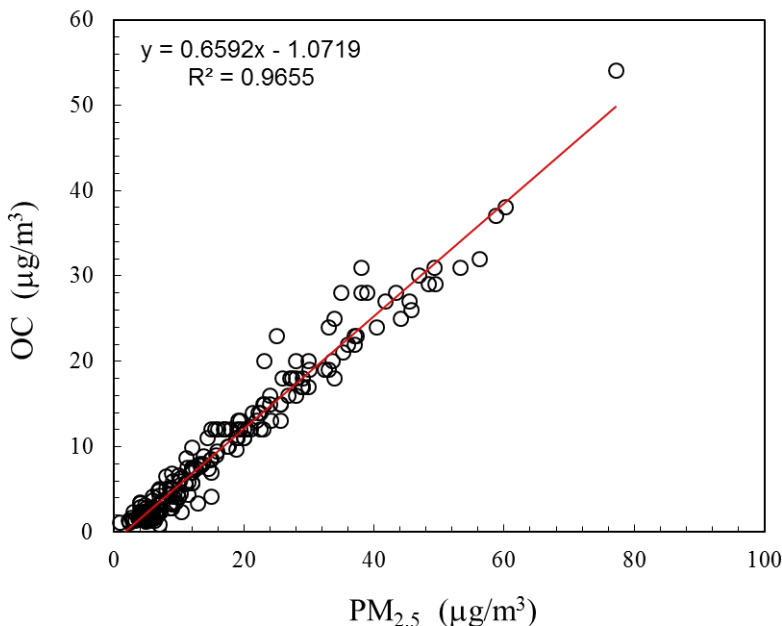


Figure 2. OC artifact estimation: PM_{2.5} concentrations versus OC concentrations.

For the source apportionment, 93 samples out of 289 samples were excluded from the data set for which the PM_{2.5}, OC, or EC data had an error flag, or for which PM_{2.5}, OC or EC data were not available. 14 samples for which sum of all measured species were larger than PM_{2.5} concentrations or sum of all measured species were less than 50% of PM_{2.5} concentrations were excluded. Overall, 37% of the data were excluded in this study.

For the chemical species screening, X-Ray Fluorescence (XRF) S was excluded from the analyses to prevent double counting of mass concentrations since XRF S and Ion Chromatography (IC) SO₄²⁻ were highly correlated (*slope* = 2.77, *r*² = 0.96). Due to the higher analytical precision compared to XRF K, IC K⁺ were included in the analyses. 17 chemical species below minimum detection level (MDL) values more than 90% were excluded. XRF Mn that has Signal-to-Noise (*S/N*) ratio below 0.2 was excluded (Paatero and Hopke, 2003). Thus, a total of 182 samples and 16 species including PM_{2.5} mass concentrations collected between 2011 and 2014 were analyzed. A summary of PM_{2.5} speciation data is provided in Tables 1.

Table 1. Summary of PM_{2.5} species mass concentrations at Portola.

Species	Arithmetic mean ($\mu\text{g}/\text{m}^3$)	Geometric mean ($\mu\text{g}/\text{m}^3$)	Minimum ($\mu\text{g}/\text{m}^3$)	Maximum ($\mu\text{g}/\text{m}^3$)	Number of below MDL ¹ values (%)	S/N ratio ²
PM _{2.5}	17.4154	12.5563	2.4000	77.2000	0	NA ³
OC	10.4044	6.5457	1.1000	54.0000	0	NA
EC	1.3912	0.8275	0.1000	6.2000	0	NA
SO ₄	0.4999	0.4157	0.0900	2.3000	5.5	49.6
NO ₃ ⁻	0.4410	0.3166	0.0570	4.4300	0	NA
NH ₄ ⁺	0.1585	0.1071	0.0250	1.2000	19.2	15.9
Al	0.0223	0.0145	0.0075	0.1800	62.1	1.7
Br	0.0014	0.0011	0.0010	0.0050	75.8	0.4
Ca	0.0318	0.0257	0.0035	0.2000	1.6	270.2
Cl	0.0252	0.0138	0.0035	0.1500	27.5	12.4
Cr	0.0021	0.0017	0.0015	0.0510	89.0	0.3
Fe	0.0453	0.0360	0.0060	0.2300	0	NA
K ⁺	0.0862	0.0770	0.0650	0.4230	84.1	0.3
Si	0.1245	0.0940	0.0110	0.6300	0	NA
Ti	0.0039	0.0029	0.0020	0.0220	55.5	1.2
Zn	0.0041	0.0030	0.0010	0.0180	25.3	7.6

¹ Minimum detection level

² Signal-to-noise ratio (Paatero and Hopke, 2003)

³ not available (infinite S/N ratio caused by no below average MDL value)

The application of PMF2 depends on the estimated uncertainties based on the analytical uncertainties for each of the measured data. Since the SLAMS data were not accompanied by analytical uncertainties, the fractional uncertainties suggested for PMF2 analysis by Kim et al (2005) were used (Table 2).

Table 2. Estimated fractional uncertainties¹ for SLAMS data at Portola.

Species	Fractional uncertainty	Species	Fractional uncertainty
---------	------------------------	---------	------------------------

OC	0.07	Cl	0.10
EC	0.07	Cr	0.05
SO ₄	0.07	Fe	0.05
NO ₃ ⁻	0.07	K ⁺	0.07
NH ₄ ⁺	0.07	Si	0.10
Al	0.10	Ti	0.05
Br	0.05	Zn	0.05
Ca	0.11		

¹ Kim et al. (2005)

To assign input data for PMF2, the procedure of Polissar et al. (1998) is used. The measurement values are used for the input concentration data, and the sum of the analytical uncertainty and one-third of the detection limit value is used as the input uncertainty data assigned to each measured value. Concentration values below the detection limit are replaced by half of the detection limit values, and their input uncertainties are set at five-sixth of the detection limit values. Missing values are replaced by the geometric mean of the measured values for each species, and to down-weight these replaced data and then to reduce their influence on the solution, their accompanying uncertainties are set at four times of this geometric mean value.

2. Results and Discussions

The final solutions were chosen based on the evaluation of the resulting source profiles as well as the quality of the chemical species fits by testing different numbers of sources, different species down-weighting, and different rotational parameter (FPEAK) values (Paatero et al., 2002). The global optimums of the solutions were tested by using twenty random starts in the iterative fitting process.

A six-source model without matrix rotation (rotational parameter FPEAK = 0) provided the most physically interpretable sources for the Portola site: Wood burning, mobile, secondary nitrate, secondary sulfate, airborne soil, and refuse burning. As recommended by Paatero and Hopke (2003), which is to down-weight the variable in the analysis so that the noise does not compromise the solution, the estimated uncertainties of Al, Br, Cr, K⁺, and Ti that have *S/N* (Signal-to-noise) ratios between 0.2 and 2 (weak variable) were increased by a factor of five. Mobile and refuse smoke were merged in a source in the five-source model. In the seven-source model, an uninterpretable source was separated from the refuse smoke.

Figure 3 and Table 3 present average source contributions, percentiles and mass concentrations, respectively. The pie chart showing increased wood burning contributions on high (> 35 µg/m³) PM_{2.5} days indicates that wood burning leads to high (> 35 µg/m³) PM_{2.5} days at Portola.

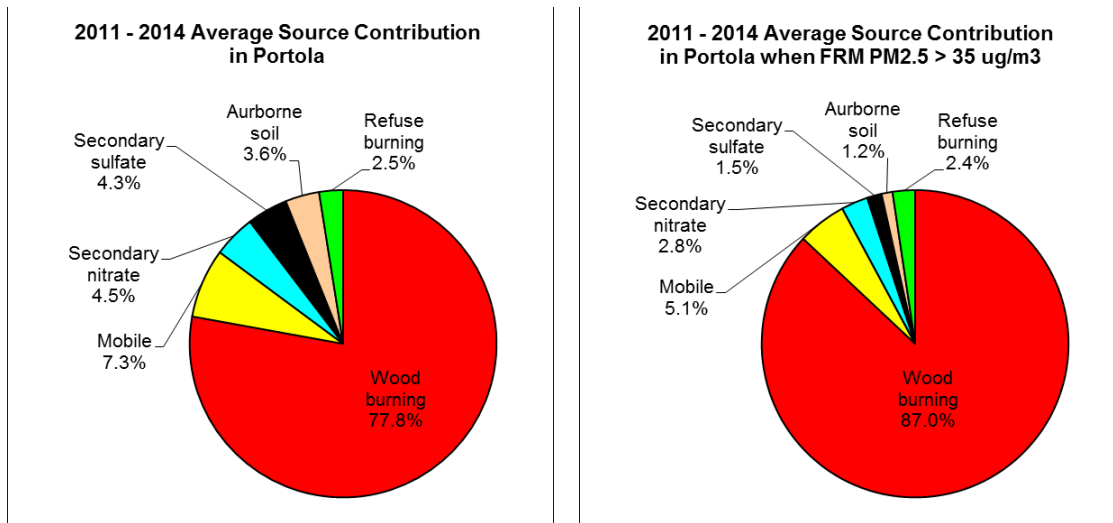


Figure 3. Average source contributions between 2011 and 2014.

Comparisons of the reconstructed PM_{2.5} mass contributions (sum of contributions from all sources) with measured PM_{2.5} mass concentrations in Figure 4 shows that the resolved sources effectively reproduce the measured values and account for most of the variation in the PM_{2.5} mass concentrations ($slope = 0.92$, $r^2 = 0.97$). The source profiles, corresponding source contributions, monthly variations of source contributions, and weekday/weekend variations are presented in Figures 6 through 9.

Table 3. Average source contributions ($\mu\text{g}/\text{m}^3$) to PM_{2.5} mass concentration.

Sources	Average source contribution (\pm 95 % distribution)
Wood burning	13.12 (1.80)
Mobile	1.23 (0.22)
Secondary nitrate	0.75 (0.17)
Secondary sulfate	0.72 (0.09)
Airborne soil	0.60 (0.08)
Refuse burning	0.42 (0.07)
Estimated PM _{2.5} ($\mu\text{g}/\text{m}^3$)	16.85 (1.92)
Measured PM _{2.5} ($\mu\text{g}/\text{m}^3$)	17.42 (2.06)

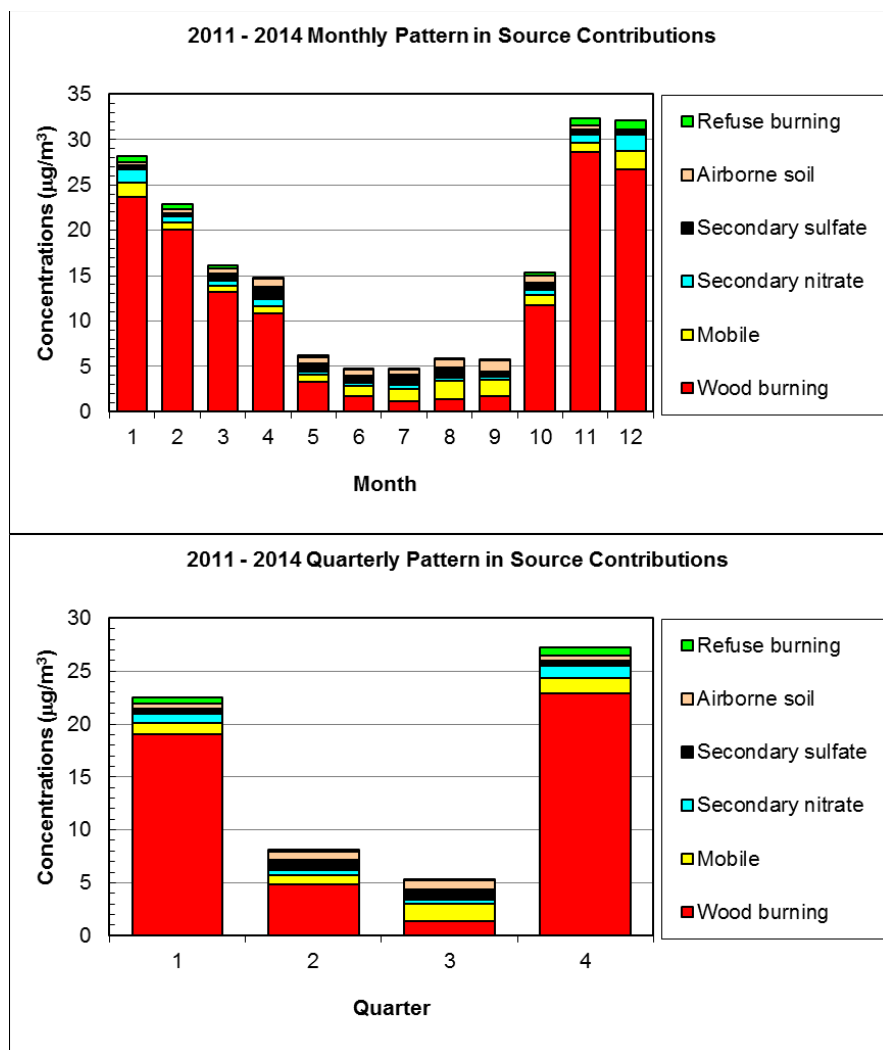


Figure 4. Monthly and quarterly average source contributions between 2011 and 2014.

Wood burning contributed the most accounting for 77.8% of the $PM_{2.5}$ concentration at Portola between 2011 and 2014. It was a predominant $PM_{2.5}$ source contributing 10 times more than the next major source (i.e., Mobile) at Portola. Wood burning was characterized by OC, EC, and K^+ (Watson et al., 2001). Wood burning category reflects contributions from residential wood burning and cooking. Wood burning shows a winter-high trend suggesting that it was mostly contributed by wood burning for residential heating. Wood burning at Portola shows weak weekend-high contribution trends.

Mobile source was identified by its high concentration of OC and EC, and minor species such as Fe (Watson et al., 1994). The average contributions from mobile source to $PM_{2.5}$ concentration was 7.3% at Portola. Mobile source shows summer (August) and winter (December-January)-high seasonal trends. It does not show weekday/weekend variation.

Secondary nitrate has high concentrations of NO_3^- and NH_4^+ . It consists of NH_4NO_3 and several minor species such as secondary OC and EC that transport together. It contributed 4.5% of the $PM_{2.5}$ concentrations. Secondary sulfate has high concentrations of SO_4^{2-} and NH_4^+ and accounts for 4.3% of the $PM_{2.5}$ concentration at Portola. Secondary nitrate has winter-high trend.

In contrast, secondary sulfate shows strong seasonal variation with higher concentrations in summer when the photochemical activity is highest. Both secondary particles do not show weekday/weekend variations.

Airborne soil has high concentrations of Si, Fe, Al and Ca. It contributed 3.6% of the PM_{2.5} concentration at Portola. The airborne soil category reflects wind-blown dust as well as re-suspended crustal materials by road traffic as indicated by the presence of EC and SO₄²⁻ in the source profile in Figure 6. Airborne soil contribution at Portola showed spring and fall high variation (Figure 8). The weekday high variation shown in Figure 9 indicates the airborne soil at Portola mostly came from anthropogenic activities.

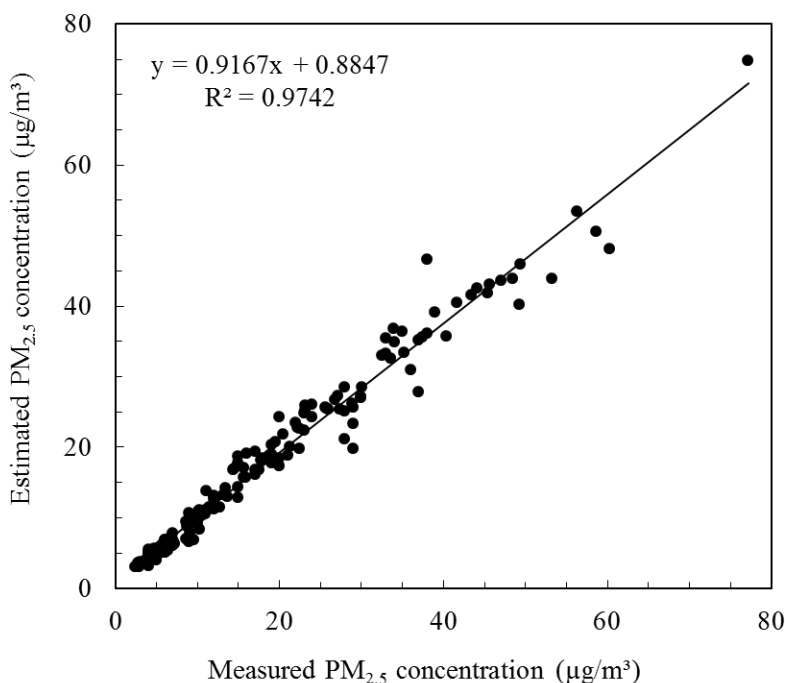


Figure 5. Measured versus PMF2 predicted PM_{2.5} mass concentrations.

Refuse burning is characterized by OC, Cl, and K⁺ (Christian et al., 2010; Hodzic et al., 2012; Li et al., 2012). Refuse burning category reflects contributions from burning of wood as well as garbage. The high Cl concentration in this source likely reflects burning of polyvinyl chloride in garbage. Higher contributions from refuse burning in winter shown in Figure 8 indicate that it mostly came from heating sources. It contributed 2.5% to the PM_{2.5} mass concentration at Portola and does not show weekday/weekend variations.

3. Conclusions

PM_{2.5} speciation data collected at the Portola monitoring site between 2011 and 2014 were analyzed. Using PMF2, the multivariate source apportionment tool, six major PM_{2.5} sources were identified: Wood burning, mobile, secondary nitrate, secondary sulfate, airborne soil, and refuse burning. This analysis showed that most of the PM_{2.5} at Portola was originated from wood burning.

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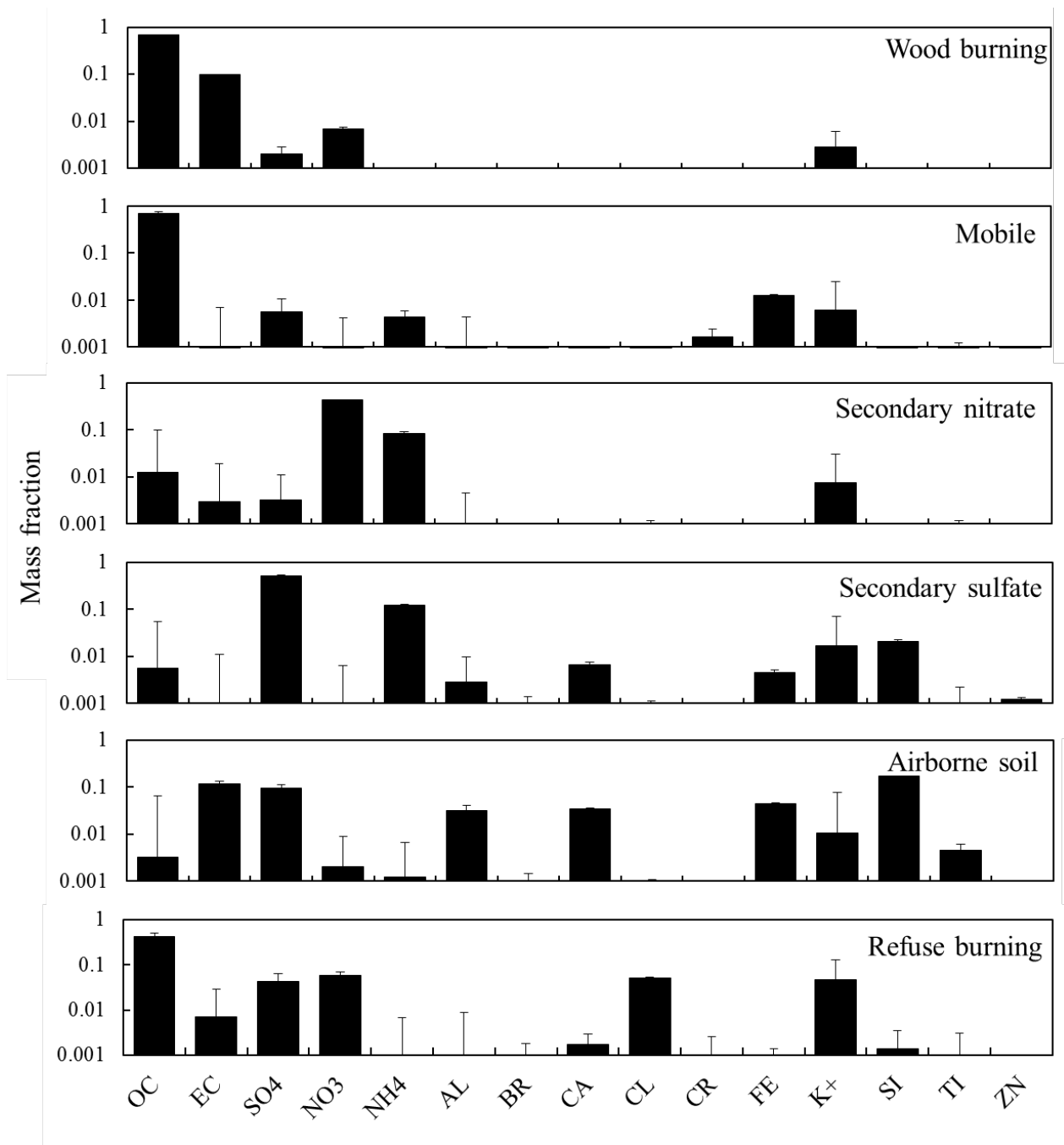


Figure 6. Source profiles deduced from PM_{2.5} samples measured at Portola (prediction ± standard deviation).

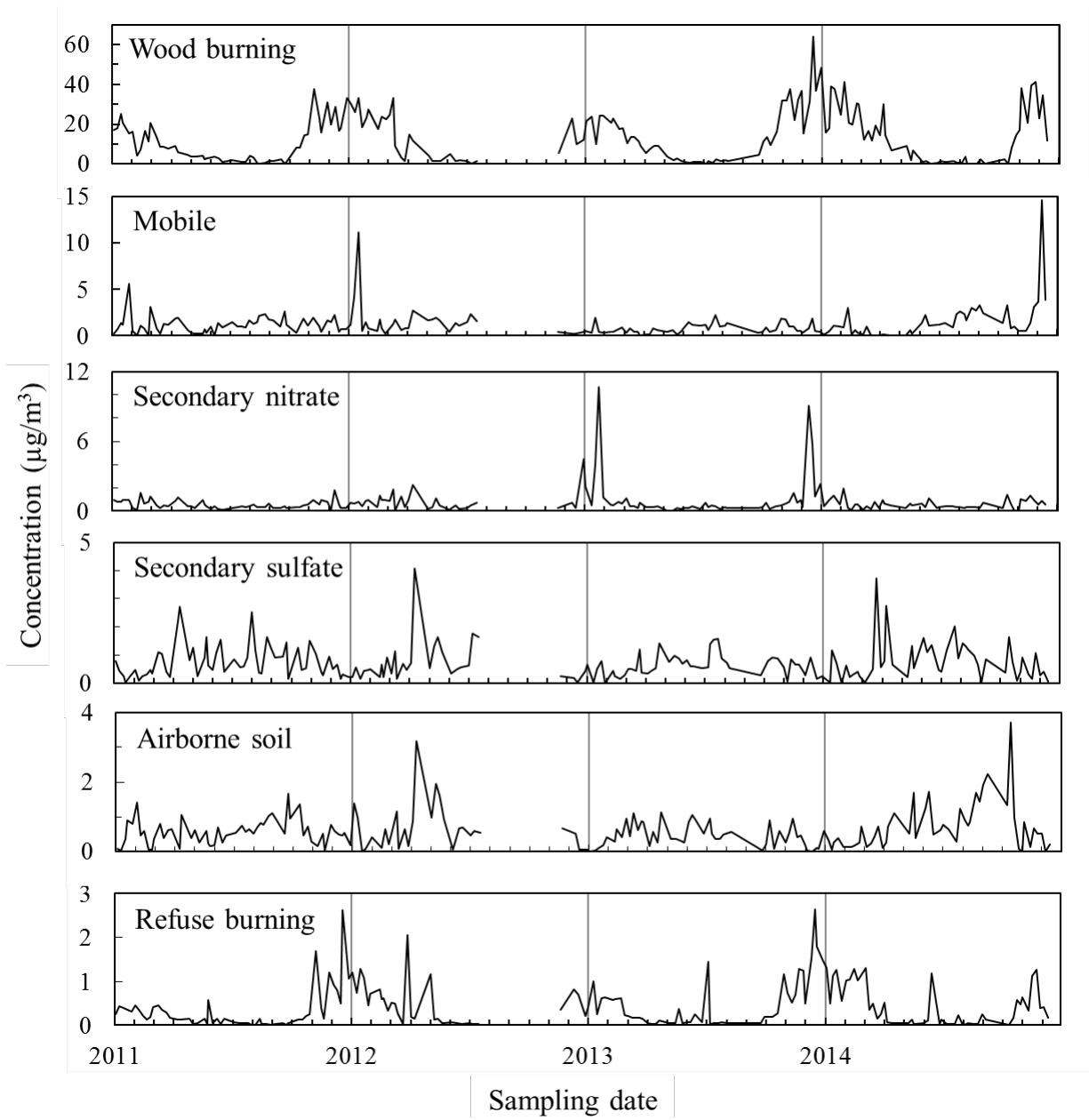


Figure 7. Source contributions deduced from PM_{2.5} samples measured at Portola.

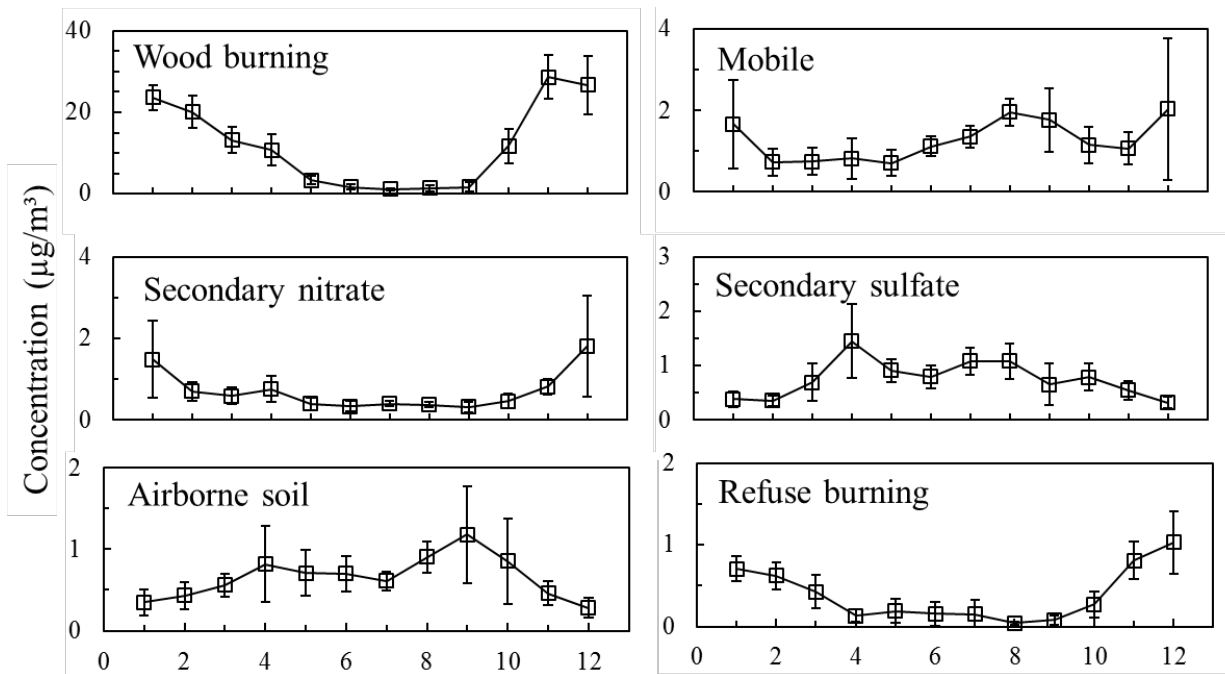


Figure 8. Monthly variations of source contributions to PM_{2.5} mass concentration at Portola (mean ± 95 % distribution).

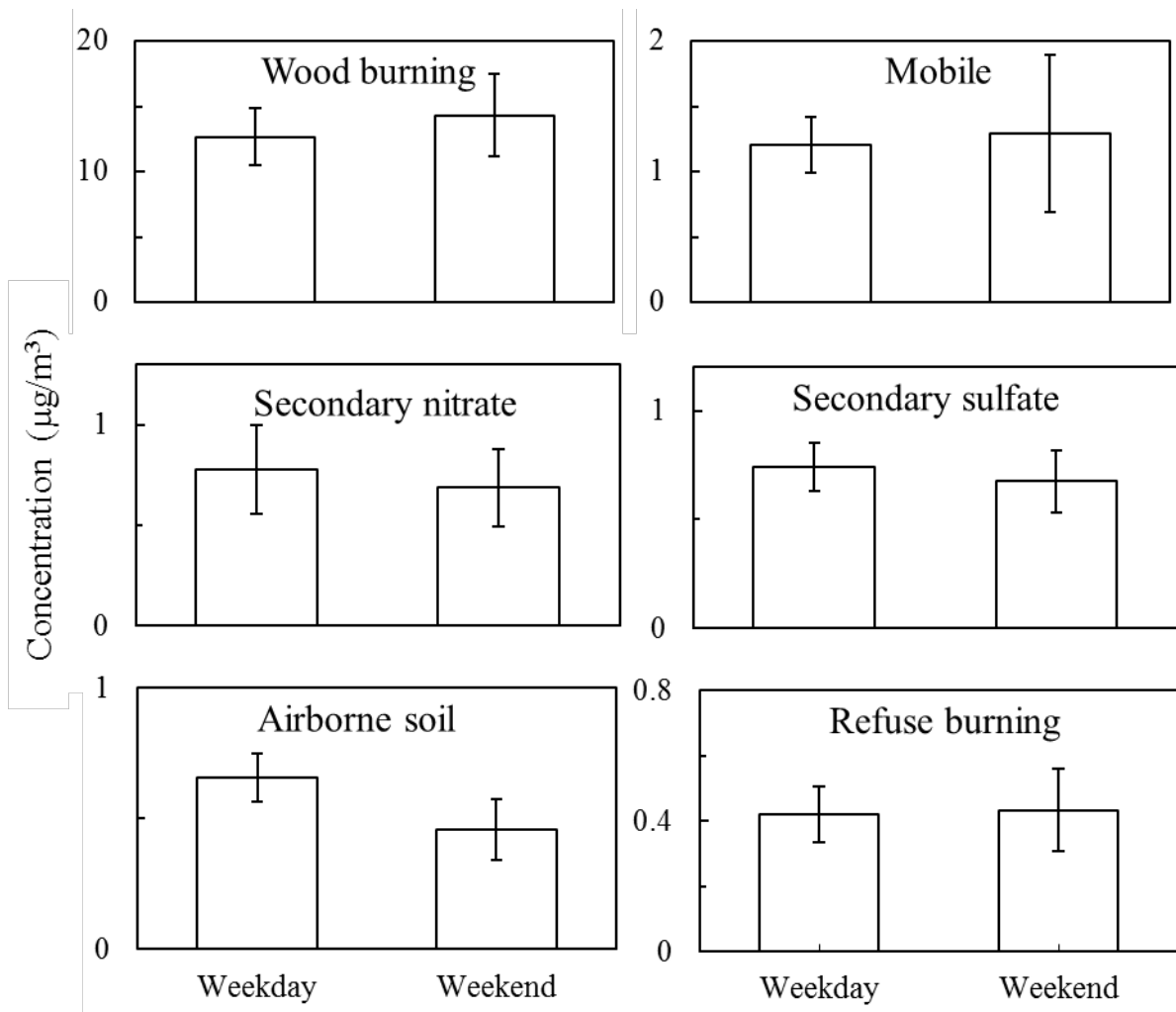


Figure 9. Weekday/weekend variations of source contributions to $\text{PM}_{2.5}$ mass concentration at Portola (mean \pm 95 % distribution).

Appendix B

Emissions Inventory Methodology

Plumas County (Portola) 12 µg/m³ Annual PM_{2.5} National Ambient Air Quality Standards (NAAQS) Emissions Inventory Write-Up

California Emissions Projection Analysis Model (CEPAM) 2022 PM_{2.5} Plans Emission Projections v1.00 (October 2023)

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Emissions Inventory Background

Emissions inventories are required by the Clean Air Act (Act) and the PM2.5 SIP Requirements Rule for the 2012 12 ug/m³ annual PM2.5 National Ambient Air Quality Standards (NAAQS) (PM2.5 Implementation Rule). Specifically, they are required for those areas that exceed the health-based NAAQS. These areas are designated as nonattainment based on monitored exceedances of these standards. These nonattainment areas must develop an emissions inventory as the basis of a State Implementation Plan (SIP, or Plan) that demonstrates how they will attain the standards by specified dates. This document describes the emissions inventory included in the Plumas County (Portola) 12 ug/m³ annual PM2.5 SIP (PM2.5 Portola SIP).

Emissions Inventory Overview

Emissions inventories are estimates of the amount and type of pollutants emitted into the atmosphere by facilities, mobile sources, and areawide sources. They are fundamental components of an air quality plan and serve critical functions such as:

1. the primary input to air quality modeling used in attainment demonstrations;
2. the emissions data used for developing control strategies; and
3. a means to track progress in meeting the emission reduction commitments.

The California Air Resources Board (CARB) and the Northern Sierra Air Quality Management District (District) have developed a comprehensive current emissions inventory consistent with the requirements set forth in Section 182(a)-(f) of the Act¹. CARB and District staff conducted a thorough review of the inventory to ensure that the emission estimates reflect accurate emissions reports for point sources and that estimates for mobile and areawide sources are based on the most recent approved models and methodologies.

CARB also reviewed the growth profiles for point and areawide source categories and updated them as necessary to ensure that the emission projections are based on data that reflect historical trends, current conditions, and recent economic and demographic forecasts.

The United States Environmental Protection Agency (U.S. EPA) regulations require that the emissions inventory for a PM2.5 SIP contains emissions data for directly emitted PM2.5 and its precursors; oxides of nitrogen (NO_x), oxides of sulfur (SO_x), volatile organic compounds (VOC)², and ammonia (NH₃). The inventory included in this plan substitutes VOC with

¹ Section 182(a)-(f) of the Act. <https://www.govinfo.gov/content/pkg/USCODE-2013-title42/html/USCODE-2013-title42-chap85-subchapl-partD-subpart2-sec7511a.htm>

² Section 182(a)(1) of the Act. <https://www.govinfo.gov/content/pkg/USCODE-2013-title42/html/USCODE-2013-title42-chap85-subchapl-partD-subpart2-sec7511a.htm>

reactive organic gases (ROG), which, in general, represent a slightly broader group of compounds than those in U.S. EPA's list of VOCs.

Inventory Base Year

40 CFR 51.1315(a) requires that the inventory year be selected consistent with the baseline year for the reasonable further progress (RFP) plan as required by 40 CFR 51.1310(b)³, which states that the base year emissions inventory shall be the emissions inventory for the most recent calendar year of which a complete triennial inventory is required to be submitted to U.S. EPA under the provisions of subpart A of 40 CFR part 51, Air Emissions Reporting Requirements, 40 CFR 51.1– 50. The 2020 inventory year was selected as the base year as this is the most recent submission to the U.S. EPA for the National Emissions Inventory (NEI). Additionally, the 2020 inventory year was used as the basis for a survey conducted related to residential wood combustion in Portola, which was used for emission estimates. Residential wood combustion is the major contributor to particle pollution in the region; therefore, using the 2020 inventory year allows for a more accurate emissions estimate.

Forecasted Inventories

In addition to base year emissions, emissions projections are needed for a variety of reasons, including redesignation maintenance plans, the attainment projected inventory for a nonattainment area (NAA), and air quality modeling for attainment plans⁴.

For stationary and area sources, forecasted inventories are a projection of the base year inventory that reflects expected growth trends for each source category and emissions reductions due to adopted control measures. CARB develops emission forecasts by applying growth and control profiles to the base year inventory. The stationary and area source emissions inventories for the PM_{2.5} Portola SIP are modeled by the California Emission Projection Analysis Model (CEPAM), 2022 PM_{2.5} Plans Emission Projections, Version 1.00.

Growth profiles for point and areawide sources are derived from surrogates, such as economic activity, fuel usage, population, and housing units, that best reflect the expected growth trends for each specific source category. Growth projections were obtained primarily from government entities with expertise in developing forecasts for specific sectors, or, in some cases, from econometric models. Control profiles, which account for

³ 40 CFR 51.1315(a). <https://www.govinfo.gov/content/pkg/CFR-2021-title40-vol2/pdf/CFR-2021-title40-vol2-sec51-1315.pdf>.

⁴ 40 CFR 51.114. <https://www.govinfo.gov/content/pkg/CFR-2000-title40-vol2/pdf/CFR-2000-title40-vol2-sec51-114.pdf>.

emission reductions resulting from adopted rules and regulations, are derived from data provided by the regulatory agencies responsible for the affected emission categories.

Projections for on-road mobile source emissions are generated by CARB's EMFAC2021 model, which predicts activity rates and vehicle fleet turnover by vehicle model year, along with activity inputs from the metropolitan planning organization (MPO). Off-road mobile sources are forecasted with category-specific models or, where not available, CARB's OFFROAD2007. CEPAM integrates the emission projections derived from these mobile source models to develop a comprehensive forecasted emission inventory. As with stationary sources, the mobile source models include control algorithms that account for adopted regulatory actions.

Temporal Resolution

Planning inventories typically include annual as well as seasonal (summer and winter) emission estimates. Annual emission inventories represent the total emissions over an entire year (tons per year), or the daily emissions produced on an average day (tons per day). Seasonal inventories account for temporal activity variations throughout the year, as determined by category-specific temporal profiles. Since PM_{2.5} concentrations tend to be highest during the winter months, the emission inventory used in the PM_{2.5} Portola SIP is based on the winter season (November through April).

Geographic Scope

The inventories presented in this Plan consist of emissions for the Plumas County PM_{2.5} Nonattainment Area, which represents the Portola portion of Plumas County. Typically, emission inventories are developed at a county-level geographical resolution. The county level emissions were allocated to the nonattainment area using the approach described below.

Stationary Point Sources:

Emissions from stationary point sources were designated as being inside or outside the nonattainment area based on the District's assessment of the geographical coordinates (latitude and longitude) to determine whether the facilities are located in the nonattainment area.

Areawide Sources:

District staff conducted a thorough review of the areawide categories to determine those that occur in the nonattainment area, and their emissions were allocated based on spatial surrogates (e.g., for residential wood combustion—ratio of emissions in Portola relative to Plumas County as a whole based on district survey, paved road miles, human population, etc.) that best reflect the expected distribution of these sources.

On-Road Mobile Sources:

2016 emissions from on-road mobile sources were gridded at the county level based on outputs from California’s on-road motor vehicle model, EMFAC2017. The allocation to the nonattainment area was accomplished by overlaying a GIS shape file defining the Portola nonattainment area boundary to develop emission fractions for Portola relative to Plumas County. These pollutant-specific fractions (for PM, PM10, PM2.5, NOx, ROG, SOx and NH3) were then applied to the EMFAC2021 modeled emission estimates for Plumas County to arrive at the estimated inventory for Portola.

Off-Road Mobile Sources:

As with areawide sources, District staff conducted a review of the off-road categories to determine those that do not occur in the nonattainment area and should be zeroed out. Of the remaining off-road categories, locomotive emissions were allocated based on rail miles, and the other sources were allocated based on human population.

Natural Sources: Biogenic ROG’s and Soil NOx:

2017 emissions were gridded at the county level based on outputs from the Model of Emissions of Gases and Aerosols from Nature MEGAN model. The allocation to the nonattainment area was accomplished by overlaying a GIS shape file defining the Portola nonattainment area boundary to develop emission fractions for Portola relative to Plumas County. These fractions were then applied to the emissions for Plumas County to arrive at the estimated inventory for the Portola nonattainment area.

The emission inventory allocation methods are summarized in Table 1 below.

Table 1 Methods for Spatial Allocation of Emissions to the Plumas County / Portola PM2.5 Nonattainment Area

Source Category	Summary Category Code	Allocation Method
Stationary Point Sources	NA	District LAT/LON Assessment of Facility Locations
Areawide Sources:		
<i>I.C. Reciprocating Engines</i>	099	Human Population
<i>Residential Wood Combustion</i>	610	District Survey

Source Category	Summary Category Code	Allocation Method
<i>Farming Operations: Livestock Husbandry</i>	620	Human Population
<i>Paved Road Dust</i>	640	Paved Road Miles
<i>Unpaved Road Dust</i>	645	Unpaved Road Miles
<i>Managed Burning:</i> - <i>Weed Abatement</i> - <i>Forest Management</i>	670	Human Population No prescribed burns occurred within the nonattainment area boundary in the 2020 analysis period
<i>Commercial Cooking</i>	690	Human Population
On-Road Mobile Sources	NA	GIS Shapefile Overlay defining the Portola boundary against the gridded 2016 emission outputs from the EMFAC2017 model for Plumas County
Off-Road Mobile Sources		
<i>Locomotives</i>	820	Rail Miles
Other Off-Road Sources	NA	Human Population
Other Areawide Sources	NA	Human Population
Natural Sources		
<i>Biogenic ROG's and Soil NOx</i>	910	GIS Shapefile Overlay defining the Portola nonattainment boundary against the gridded

Source Category	Summary Category Code	Allocation Method
		2017 emission outputs from the MEGAN model for Plumas County
<i>Wildfires</i>	930	No wildfires occurred within the nonattainment area boundary in the 2020 analysis period
Categories zeroed out due to no emission activity in the nonattainment area:		
<i>Cogeneration</i>	020	ZERO
<i>Agricultural IC Engines</i>	052	ZERO
<i>Perc Dry Cleaning</i>	210	ZERO
<i>Degreasing Operations</i>	220	ZERO
<i>Coating Operations</i>	230	ZERO
<i>Petroleum Marketing:</i> <i>- Natural Gas Transmission</i> <i>- Bulk Plants</i>	330	ZERO ZERO
<i>Chemical Manufacturing</i>	410	ZERO
<i>Asphaltic Concrete Production</i>	430	ZERO
<i>Wood And Paper Production</i>	450	ZERO
<i>Agricultural Pesticides</i>	530	ZERO
<i>Agricultural Tilling Dust</i>	620	ZERO

Source Category	Summary Category Code	Allocation Method
<i>Agricultural Harvest Dust</i>	620	ZERO
<i>Recreational Boats: Combustion</i>	840	ZERO
<i>Fork Lifts 50 HP</i>	860	ZERO
<i>Fork Lifts 120 HP</i>	860	ZERO
<i>Compressors 120 HP</i>	860	ZERO
<i>Nut Harvester 100 Hp</i>	870	ZERO
<i>Nut Harvester 175 Hp</i>	870	ZERO
<i>Cotton Pickers 600 Hp</i>	870	ZERO

Quality Assurance and Quality Control

CARB has established a quality assurance and quality control (QA/QC) process to ensure the integrity and accuracy of the emission inventories used in the development of air quality plans. QA/QC occurs at the various stages of SIP emission inventory development. Base year emissions are assembled and maintained in the California Emission Inventory Development and Reporting System (CEIDARS). CARB inventory staff works with air districts, which are responsible for developing and reporting point source emission estimates, to verify these data are accurate. The locations of point sources, including stacks, are checked to ensure they are valid. Area-wide source emissions estimates are developed by both CARB and district staff, and the methodologies are reviewed by both agencies before their inclusion in the emissions inventory. Mobile categories are verified with CARB mobile source staff for consistency with the on-road and off-road emission models. Additionally, CEIDARS is designed with automatic system checks to prevent errors, such as double counting of emission sources. At the final stage, CEPAM is thoroughly reviewed to validate the accuracy of growth and control application, and the output emissions are compared against prior approved versions of CEPAM to identify data anomalies.

Emission Inventory Components

A summary of the components that make up the PM2.5 Portola SIP emissions inventory is presented in the following sections. These include mobile (on- and off-road) sources, stationary point sources, areawide sources, and natural sources.

Mobile Source Emissions

CARB develops the emission inventory for the mobile sources using various modeling methods. These models account for the effects of various adopted regulations, technology types, fleet turnover, and seasonal conditions on emissions. Mobile sources in the emission inventory are composed of both on-road and off-road sources, described in the sections below.

On-Road Mobile Source Emissions

Emissions from on-road mobile sources, which include passenger vehicles, buses, and trucks, were estimated using outputs from CARB's EMFAC2021 v1.0.2 model. The on-road emissions were calculated by applying EMFAC2021 emission factors to the transportation activity data provided by the local MPO.

The EMFAC2021 model incorporates data on California's car and truck fleets, as well as travel activity. The light-duty motor vehicle fleet age, vehicle type, and vehicle population were updated based on 2019 California Department of Motor Vehicles (DMV) data. Moreover, the model also reflects the emissions benefits of CARB's recent rulemakings such as the Advanced Clean Trucks, Heavy-Duty Omnibus, as well as CARB's Truck and Bus Rule and previously adopted rules for other on-road diesel fleets.

EMFAC2021 utilizes a socio-econometric regression modeling approach to forecast new vehicle sales and to estimate future fleet mix. Light-duty passenger vehicle population includes 2019 DMV registration data along with updates to emission rates based on test data and the inclusion of plug-in hybrid electric vehicles. For heavy-duty vehicles, model year specific emission factors based on new test data were used, along with population estimates using DMV data for in-state trucks and International Registration Plan (IRP) data for out-of-state vehicles. Additional information and documentation on the EMFAC2021 model are available at:

<https://ww2.arb.ca.gov/our-work/programs/mobile-source-emissions-inventory/msei-road-documentation>

EMFAC2021 Heavy-Duty Inspection and Maintenance Off-Model Adjustment

On December 9, 2021, CARB adopted the Heavy-Duty Inspection and Maintenance (HD I/M) program, which controls emissions effectively from non-gasoline on-road heavy-duty vehicles with a gross vehicle weight rating (GVWR) greater than 14,000 pounds. Starting

from calendar year 2023, the program drastically reduces NOx and PM2.5 emissions by enforcing periodic testing and inspections for heavy-duty trucks operating in California.

The HD I/M regulation impacts some of the underlying assumptions in CARB's EMFAC2021 model, which was used to assess emissions from on-road mobile sources. Therefore, CARB developed off-model adjustment factors based on off-model analysis with EMFAC2021 to reflect the regulation. More information on this analysis is provided in Appendix D of the HD I/M staff report. Since this regulation was adopted after the release of EMFAC2021, these adjustment factors were calculated based on emission estimates under two scenarios: (1) EMFAC2021 default, plus HD I/M factors applied; and (2) EMFAC2021 default, which is the baseline before HD I/M. These adjustments, provided in the form of multipliers, were applied to emissions outputs from the EMFAC2021 model by the CEPAM external adjustment module to account for the impact of HD I/M. These off-model adjustment factors were applied to all heavy-duty diesel categories.

EMFAC2021 Advanced Clean Cars II

On November 30, 2022, CARB adopted Advanced Clean Cars II (ACC II), which requires all light-duty cars, trucks, and SUVs sold in California be zero emission vehicles by 2035. ACC II will be implemented in 2026 and is projected to substantially reduce NOx, PM2.5, and ROG emissions by decreasing the number of internal combustion engines in the light-duty fleet.

ACC II impacts some of the underlying assumptions in CARB's EMFAC2021 model, which was used to assess emissions from on-road mobile sources. Therefore, CARB developed off-model adjustment factors based on off-model analysis with EMFAC2021 to reflect the regulation. More information on this analysis is provided in Appendix D of the ACC II staff report. Since this regulation was adopted after the release of EMFAC2021, these adjustment factors were calculated based on emission estimates under two scenarios: (1) EMFAC2021 default, plus ACC II factors applied; and (2) EMFAC2021 default, which is the baseline before ACC II. These adjustments, provided in the form of multipliers, were applied to emissions outputs from the EMFAC2021 model by the CEPAM external adjustment module to account for the impact of ACC II. These off-model adjustment factors were applied to all light-duty categories.

Off-Road Mobile Source Emissions

Emissions from off-road sources are estimated using a suite of category-specific models or, where a new model was not available, the OFFROAD2007 model. Many of the newer models are developed to support recent regulations, including in-use off-road equipment, ocean-going vessels, and others. The sections below summarize the updates made by CARB to specific off-road categories that pertain to the Portola inventory.

Recreational Vehicles

Off-highway recreational vehicles include off-highway motorcycles (OHMC), all-terrain vehicles (ATV), off-road sport vehicles, off-road utility vehicles, sand cars, golf carts, and snowmobiles. A new model was developed in 2018 to update emissions from recreational vehicles. Input factors such as population, activity, and emission factors were re-assessed using new surveys, DMV registration information, and emissions testing. OHMC population growth is determined from two factors: incoming population as estimated by future annual sales and the scrapped vehicle population as estimated by the survival rate.

Additional information is available at:

<https://ww2.arb.ca.gov/our-work/programs/mobile-source-emissions-inventory/road-documentation/msei-documentation-offroad>

Fuel Storage and Handling

Emissions from portable fuel containers (gas cans) were estimated based on past surveys and CARB in-house testing. This inventory uses a composite growth rate that depends on occupied household (or business units), percent of households (or businesses) with gas cans, and average number of gas cans per household (or business) units.

Additional information is available at:

<https://ww2.arb.ca.gov/our-work/programs/mobile-source-emissions-inventory/road-documentation/msei-documentation-offroad>

Small Off-Road Engines (SORE)

SORE are spark-ignition engines rated at or below 19 kilowatts (i.e., 25 horsepower). Typical engines in this category are used in lawn and garden equipment as well as other outdoor power equipment and cover a broad range of equipment. The majority of this equipment belongs to the Lawn & Garden (e.g., lawnmower, leaf blower, trimmer) and Light Commercial (e.g., compressor, pressure washer, generator) categories of CARB's SORE emissions inventory model.

The newly developed, stand-alone SORE2020 Model reflects the recovering California economy from the 2008 economic recession and incorporates emission results from CARB's recent in-house testing as well as CARB's most recent Certification Database. CARB also has conducted an extensive survey of SORE operating within California through the Social Science Research Center (SSRC) at the California State University, Fullerton (CSUF). Data collected through this survey provides the most up-to-date information regarding the population and activity of SORE equipment in California. The final SORE emissions included the adopted SORE rule in December 2021 as well as the 15-day changes after the CARB hearing which allowed the pressure washers (greater than 5 hp) extra time for meeting the regulation. The SORE annual sales were forecasted using historic growth of the number of

California households (Department of Finance (DOF) household forecasts, 2000 – 2008 and 2009 - 2018).

Additional information on SORE baseline emissions (without the adopted rule and 15-day changes) is available at:

https://ww2.arb.ca.gov/sites/default/files/2020-09/SORE2020_Technical_Documentation_2020_09_09_Final_Cleaned_ADA.pdf

Locomotives

All locomotive inventories were updated in 2020 and include linehaul (large national companies), switchers (used in railyards), passenger, and Class 3 locomotives (smaller regional companies). Data for each sector was supplied by rail operations, including Union Pacific and Burlington Northern, and Santa Fe Railway (BNSF) for linehaul and switcher operations. Data for other categories was supplied by the locomotive owners. Emission factors for all categories were based on U.S. EPA emission factors for locomotives. The inventory reflects the 2005 memorandum of understanding (MOU) with Union Pacific and BNSF. Growth rates were primarily developed from the FAF.

Additional information is available at:

<https://ww2.arb.ca.gov/our-work/programs/mobile-source-emissions-inventory/road-documentation/msei-documentation-road>

Diesel Agricultural Equipment

The agricultural equipment inventory covers all off-road vehicles used on farms or first processing facilities (of all fuel types). It was updated in 2021 using a 2019 survey of California farmers and rental facilities, and the 2017 U.S. Department of Agriculture (USDA) agricultural census. Emission factors are based on the 2017 off-road diesel emission factor update. The inventory reflects incentive programs for agricultural equipment that were implemented earlier than August 2019. Agricultural growth rates were developed using historical data from the County Agricultural Commissioners' reports.

Additional information is available at:

https://ww2.arb.ca.gov/sites/default/files/2021-08/AG2021_Technical_Documentation_0.pdf

In-Use Off-Road Equipment

This category covers off-road diesel vehicles over 25 horsepower in construction, mining, industrial, and oiling drilling categories. The inventory was updated in 2022 based on the DOORS registration program. Activity was updated based on a 2021 survey of registered equipment owners, and emission factors were based on the 2017 off-road diesel emission

factor update. The inventory reflects the In-Use Off-Road Equipment Regulations, as amended in 2011.

Additional information is available at:

<https://ww2.arb.ca.gov/sites/default/files/2022-10/2022InUseDieselInventory.pdf>

Transportation Refrigeration Units

The Transportation Refrigeration Units (TRU) inventory was updated in 2020 based on the TRU reporting program at CARB. The activity was developed based on 2010 surveys of facilities served by TRUs and 2017 to 2019 telematics data purchased from TRU manufacturers. Emission factors were developed specifically for TRUs based on TRU engine certification data reported to U.S. EPA as of 2018. The inventory reflects the TRU Airborne Toxic Control Measure (ATCM) and 2021 amendments. Forecasting was based on IBISWorld reports forecast for related industries, and turnover forecasting was based on the past 20 years equipment population trends.

Additional information is available at:

<https://ww2.arb.ca.gov/sites/default/files/barcu/board/rulemaking/tru2021/apph.pdf>

Portable Equipment

Portable equipment inventory includes non-mobile diesel, such as generators, pumps, air compressors, chippers, and other miscellaneous equipment over 50 horsepower. This inventory was developed in 2017 based on CARB's registration program, 2017 survey of registered owners for activity and fuel, and the 2017 off-road diesel emission factor update. The inventory also reflects the Portable ATCM and 2017 amendments.

Because registration in Portable Equipment Registration Program (PERP) is voluntary, the PERP registration data was used as the basis for equipment population, with an adjustment factor used to represent the remaining portable equipment in the state. Estimates of future emissions beyond the base year were made by adjusting base year estimates for population growth, activity growth, and the purchases of new equipment (i.e., natural and accelerated turnover).

Additional information is available at:

<https://ww3.arb.ca.gov/msei/ordiesel/perp2017report.pdf>

Large Spark Ignition/Forklifts

The large spark ignition (LSI) inventory includes gasoline and propane forklifts, sweeper/scrubbers, and tow tractors. The inventory was updated in 2020 based on the LSI/forklift registration in the Diesel Off-Road Online Reporting System (DOORS) reporting system at CARB, and the sales data was provided by the Industrial Truck Association (ITA). Activity was based on a survey of equipment owners in the DOORS system, and emission

factors were based on U.S. EPA's latest guidance for gasoline and propane engines. The inventory reflects the LSI regulation requirements and 2016 amendments.

The updated methodology is currently in the process of being posted online. When it is completed, the methodology will be available at:

<https://ww2.arb.ca.gov/our-work/programs/mobile-source-emissions-inventory/road-documentation/msei-documentation-road>

Forestry Equipment

The new 2021 forestry diesel equipment emissions inventory was developed to replace the previous emissions inventory for diesel forestry equipment based on OFFROAD2007. This inventory includes equipment used in forestry and in milling. This includes foresting operations, such as feller/bunchers and dragline operations, equipment used to build roads to reach forested areas, and forklifts or loaders used in milling operations. The inventory was based on a 2019 survey of forestry operations and mills (for calendar year 2017), as well as the 2019 California Department of Tax and Fee Administration data on the annual timber harvest, with emission factors from the 2017 off-road diesel emission factor update. This sector does not include any emission reduction measures or strategies. The model projects forestry equipment population and emissions in future years by predicting the retirement and purchasing habits of forestry equipment. The model attempts to predict a business as usual (BAU) behavior based on the 2017 survey data.

Additional information is available at:

https://ww2.arb.ca.gov/sites/default/files/2021-10/2021_Forestry_Inventory_Technical_Document_FINAL_09302021.pdf

Stationary Point and Stationary Aggregated Sources

The stationary source inventory is composed of point sources and area-wide sources. The data elements in the inventory are consistent with the data elements required by the Air Emissions Reporting Requirements (AERR). The inventory reflects actual emissions from industrial point sources reported to the District by the facility operators through calendar year 2020.

Stationary point sources also include smaller point sources, such as gasoline dispensing facilities and laundering, that are not inventoried individually, but are estimated as a group and reported as a single source category, Stationary Aggregated. Emissions from these sources are estimated using various models and methodologies. Estimation methods include source testing, direct measurement by continuous emissions monitoring systems, or engineering calculations. Emissions for these categories are estimated by both CARB and the District.

Estimates for the categories below were developed by CARB and has been reviewed by CARB staff to reflect the most up-to-date information.

Oil and Gas Production

The oil and natural gas production inventory is estimated by a 2015 CARB methodology. This category is related to fugitive emissions from production-related fuel consumption, fugitive losses (sumps, pits, pumps, compressors, well heads, separators, valves, and fittings), vapor recovery and flares, tank and truck working and breathing losses, wastewater treatment, tertiary production, and wet and dry gas stripping. Emissions were calculated using U.S. EPA's Oil and Natural Gas Tool v1.4 with default emissions factors from ENVIRON Int'l Corp's 2012 report, "2011 Oil and Gas Emission Inventory Enhancement Project for CenSARA States," and activity data taken from California's Division of Oil, Gas, and Geothermal Resources (DOGGR) (which was renamed to Geologic Energy Management Division (CalGEM) in 2020). CARB also incorporated data from the 2007 Oil and Gas Industry Survey (e.g., typical component counts) and feedback from individual air districts (e.g., minimum controls required to operate in a certain district, with associated control factors) to improve these parameters and further adjust the tool's output. Emissions were grown to 2020 based on CalGEM historical statewide production. Growth in future years are assumed 2.9% annual decline, which reflects the statewide CalGEM trend from 2000 through 2016.

Additional information is available at:

<https://ww2.arb.ca.gov/resources/documents/oil-and-gas-industry-survey>

<https://ww3.arb.ca.gov/ei/areasrc/oilandgaseifinalreport.pdf>

Stationary Nonagricultural Diesel Engines

This category includes emissions from backup and prime generators and pumps, air compressors, and other miscellaneous stationary diesel engines that are widely used throughout the industrial, service, institutional, and commercial sectors. The emission estimates, including emission forecasts, are based on a 2003 CARB methodology derived from the OFFROAD2007 model. The 1996 Power Systems Research (PSR) database and districts' permit data was used as the source for engine activity data. Emission factors were obtained using the OFFROAD model which are based on the U.S. EPA's diesel standards and reflect California regulations.

Additional information is available at:

<https://ww3.arb.ca.gov/ei/areasrc/arbfuelcombothr.htm>

Laundering

This category includes emissions from petroleum-based solvents. The emission estimates are based on a 2002 CARB methodology that used nationwide consumption rates allocated

to the county level based on population. Emission factors are based on data in the Draft CAPCOA Air Toxic "Hot Spots" Program Perchloroethylene Dry Cleaners Industry-wide Risk Assessment Guidelines. Emissions were grown based on the DOF population forecasts, 2020.

Additional information is available at:

<https://ww3.arb.ca.gov/ei/areasrc/arbcleanlaund.htm>

Gasoline Dispensing Facilities

This category uses a 2015 CARB methodology to estimate emissions from fuel transfer and storage operations at gasoline dispensing facilities (GDFs). The methodology addresses emissions from underground storage tanks, vapor displacement during vehicle refueling, customer spillage, and hose permeation. The updated methodology uses emission factors developed by CARB staff that reflect more current in-use test data and also accounts for the emission reduction benefits of onboard refueling vapor recovery (ORVR) systems. The emission estimates are based on 2012 statewide gasoline sales data from the California Board of Equalization that were apportioned to the county level using fuel consumption estimates from EMFAC2014. Emissions were grown based on the EMFAC2017 version model.

Additional information is available at:

<https://ww2.arb.ca.gov/arb-petroleum-production-and-marketing-methodologies-petroleum-marketing>

Gasoline Cargo Tank

This category uses a 2002 CARB methodology to estimate emissions from gasoline cargo tanks. These emissions do not include the emissions from loading and unloading of gasoline cargo tank product; they are included in the gasoline terminal inventory and gasoline service station inventory. Pressure-related fugitive emissions are volatile organic vapors leaking from three points: fittings, valves, and other connecting points in the vapor collection system on a cargo tank. 1997 total gasoline sales were obtained from the California Department of Transportation. The emission factors are derived from the data in the report, "Emissions from Gasoline Cargo Tanks, First Edition," published by the Air and Waste Management Association in 2002.

The initial emission estimates for 1997 were grown to 2012 using a growth parameter developed by Pechan based on gasoline and oil expenditures data. Emissions were grown to 2020 and beyond according to fuel consumption from CARB's EMFAC 2017 mobile sources emission factors model.

Additional information is available at:

<https://ww2.arb.ca.gov/arb-petroleum-production-and-marketing-methodologies-petroleum-marketing>

Area-Wide Sources

Area-wide sources include categories where emissions take place over a wide geographic area, such as consumer products. Emissions from these sources are estimated using various models and methodologies. Estimation methods include surveys for determining emission activity, use of emission factors from data sources such as U.S. EPA's AP-42, and performing associated engineering calculations. Emissions for these categories are estimated by both CARB and the District.

Estimates for the categories below were developed by CARB and has been reviewed by CARB staff to reflect the most up-to-date information:

Consumer Products and Aerosol Coatings

The consumer product emission estimates utilized sales and formulation data from the CARB's mandatory survey of all consumer products sold in California for calendar years 2013 through 2015 (2015 Consumer Product Survey). The aerosol coatings estimates utilized sales and formulation data from a survey conducted by CARB in 2010. Based on the survey data, CARB staff determined the total product sales and total VOC emissions for the various product categories. Growth for personal care products are based on real disposable personal income projections per REMI version 2.4.5. No growth is assumed for aerosol coatings. Growth for all other consumer products are based on DOF population projections, 2020.

Additional information is available at:

<https://ww2.arb.ca.gov/our-work/programs/consumer-products-program/consumer-commercial-product-surveys>

Architectural Coatings

Architectural coatings are coatings applied to stationary structures and their accessories. They include house paints, stains, industrial maintenance coatings, traffic coatings, and many other products. Industrial maintenance coatings are high performance architectural coatings formulated for application to substrates, including floors, exposed to extreme environmental conditions (e.g., immersion in water, chronic exposure to corrosive agents, frequent exposure to temperatures above 121°C, repeated heavy abrasion). The architectural coatings category reflects emission estimates based on a 2014 comprehensive CARB survey for the 2013 calendar year. The emission estimates include benefits of the 2007 CARB Suggested Control Measures. These emissions are grown based on DOF households forecast, 2020.

Additional information is available at:

<https://ww2.arb.ca.gov/carb-solvent-evaporation-methodologies-architectural-coatings-and-cleaningthinning-solvents>

Structural Pesticides

The California Department of Pesticide Regulation (DPR) develops month-specific emission estimates for agricultural and structural pesticides. Each calendar year, DPR updates the inventory based on the Pesticides Use Report, which provides updated information from 1990 through the 2020 calendar year. Growth for structural pesticides is based on DOF households growth projections, 2020.

Additional information is available at:

<https://ww2.arb.ca.gov/carb-solvent-evaporation-methodologies-agricultural-and-non-agricultural-pesticides>

Residential Wood Combustion

Residential wood combustion emission estimates in 2020 for the Portola Nonattainment Area were based on estimates for wood-burning fireplaces (including inserts) and wood stoves (including conventional wood stoves, non-catalytic wood stoves, catalytic wood stoves, and pellet stoves). This updated methodology reflects the inclusion of data from the Greater Portola Wood Stove Change-Out Program, specific to Plumas County and the Portola NAA, in which the District offered incentives, up to the full cost of purchase and installation, to qualified residents of the Portola NAA to replace uncertified wood stoves or inserts used as a primary source of heat with cleaner burning and more energy efficient home heating devices.

Activity is based on the number and type of devices that are used per household and the wood consumption rates in the nonattainment area which are estimated from survey data. Emission factors are based on U.S. EPA's Wagon Wheel tool and survey data from the change-out program. No growth is assumed.

Additional information is available at:

https://ww2.arb.ca.gov/sites/default/files/2023-12/plumas_county_rwc_emission_update_2023_ada_final.pdf

Residential Distillate Oil and Liquefied Petroleum Gas

The residential distillate oil/liquefied petroleum gas (LPG) category includes emissions occurring in the residential sector. Distillate oil for heating is generally used in older homes and remote areas where natural gas lines are not available.

Activity is based on the number of housing units, population, and LPG and distillate oil capacities. The 1991 Fuels Report Working Paper published by the California Energy

Commission (CEC) was used to determine energy demand by fuel type in terms of the number of houses heated by a specific fuel in a particular area. Heating degree days (HDD) are used to estimate how many heating days are likely to occur in a particular area.

This category uses emission factors from U.S. EPA's AP-42. The emissions were initially calculated in 1993 then grown to 2012 using housing unit data from the DOF, 2013. Emissions were grown from 2012 to 2020 using a 'no growth' profile developed by Pechan (2012). Emissions post-2020 were grown based on Energy Information Administration (EIA) – State Energy Data Systems (SEDS), and no growth was assumed.

Additional information is available at:

<https://ww2.arb.ca.gov/carb-miscellaneous-process-methodologies-residential-fuel-combustion>

Farming Operations, Livestock

CARB staff updated the non-cattle Livestock Husbandry methodology to reflect livestock population data based on the USDA's 2017 Census of Agriculture. Cattle emissions are primarily based on the 2012 Census of Agriculture. TOG and ROG emission factors are based on a livestock speciation profile published by the U.S. EPA and PM10 emission factors are based on a study published by the University of California, Davis. A seasonal adjustment was added to account for the suppression of dust emissions in months in which rainfall occurs. Growth profiles are based on CARB's projections of Census of Agriculture's historical livestock population trends, 2012. No growth is assumed for dairy and feedlots.

Additional information is available at:

<https://ww2.arb.ca.gov/carb-miscellaneous-process-methodologies-farming-operations>

Construction and Demolition

Emission estimates for building construction and road construction operations are based on CARB methodologies. Emissions are estimated by applying emission factors developed by Midwest Research Institute (MRI) to the acreage disturbed by construction.

For building construction, the emission estimates in 2020 were grown from CARB estimates developed in 2002. The growth profile for building construction is based on construction jobs projections from the REMI county economic forecast model.

For road construction, the emission estimates in 2020 were grown from CARB estimates developed in 1997. The growth profile for road construction is based on construction jobs projections from the REMI county economic forecast model.

Additional information is available at:

<https://www.arb.ca.gov/ei/areasrc/arbmiscproconstdem.htm>

Paved Road Dust

Paved road dust emissions for 2017 were estimated in 2021 using a CARB methodology consistent with the current U.S. EPA method (AP-42). CARB developed the paved road dust planning emissions inventory using 2017 VMT data from CARB's EMFAC2017 model, and data from transportation planning agencies. VMT were distributed using 2017 travel fractions calculated using California Department of Transportation (Caltrans) Highway Performance Monitoring System (HPMS) data, by COADBIS, for each of five road types: freeway, major, collector, and local/local urban, and local rural. Emissions were grown using MPO VMT projections.

Additional information is available at:

<https://ww2.arb.ca.gov/carb-miscellaneous-process-methodologies-paved-road-dust>

Unpaved Road Dust – Farm Roads

Emissions for unpaved farm roads are based on CARB's methodology and 2012 harvested crop acreage from National Agricultural Survey Service (NASS). Emissions reflect crop specific VMT rates and an emission factor based on California test data conducted by the University of California, Davis (UC Davis) in 2001, and the Desert Research Institute (DRI) in 1996. Temporal profiles are based on crop specific activity profiles. Growth for this category is based on projected FMMP farmland acreage, 2016.

Additional information is available at:

<https://ww2.arb.ca.gov/carb-miscellaneous-process-methodologies-unpaved-road-and-traffic-area-dust>

Unpaved Nonfarm Road Dust

Emissions from unpaved nonfarm roads were estimated from 2008 unpaved road data collected from the California Statewide Local Streets and Roads Needs Assessment, Caltrans, and local agencies. Dust emissions were calculated using an emission factor derived from tests conducted by UC Davis and DRI. In addition, a rainfall adjustment factor was applied. CARB staff assumed no growth for this category based on the assumption that existing unpaved roads tend to get paved as vehicle traffic on them increases, which counteracts any additional emissions from new unpaved roads.

Additional information is available at:

https://ww3.arb.ca.gov/ei/areasrc/fullpdf/full7-10_2012.pdf

Windblown Dust from Unpaved Roads and Associated Areas

Emissions for this source category were estimated based on a 1997 CARB methodology reflecting acreage of erodible land. Unpaved road mileage in each county is calculated from

the Caltrans “Assembly of Statistical Report” documents. Emission factors quantify the quantity of eroded soil that is entrained to the air due to wind erosion and is based on an equation developed by the U.S. Department of Agriculture. The estimates assume no growth.

Additional information is available at:

<https://ww3.arb.ca.gov/ei/areasrc/onehtm/one7-13.htm>

Managed Burning & Disposal – Weed Abatement

The Agricultural Burning Managed Burning and Disposal category includes weed abatement (such as ditch and canal bank burning), and other materials. CARB updated the emissions inventory to reflect burn data reported by air district staff for 2017 which include data on amount of materials burned and the size of areas burned by crops. Emissions are calculated using specific emission factors and fuel loadings based on U.S. EPA’s AP-42, UC Davis studies, and CARB sponsored tests. Temporal profiles reflect monthly burn activity. No growth is assumed for burning associated with weed abatement.

Additional information is available at:

<https://ww2.arb.ca.gov/district-miscellaneous-process-methodologies-managed-burning-and-disposal>

Natural Sources

Biogenic Vegetation (ROG) and Soil (NO_x)

Biogenic emissions were generated using the Model of Emissions of Gases and Aerosols from Nature (MEGAN3.0) biogenic emissions model⁵. MEGAN3.0 incorporates a new pre-processor (MEGAN-EFP) for estimating biogenic emission factors based on available landcover and emissions data. The MEGAN3.0 default datasets for plant growth form, eco-type, and emissions were utilized. Leaf Area Index (LAI) for non-urban grid cells was based on the 8-day 500 m resolution Moderate Resolution Imaging Spectroradiometer (MODIS) Terra/Aqua combined product (MCD15A2H) for 2020⁶. The LAI data was converted to LAI_v, which represents the LAI for the vegetated fraction within each grid cell, by dividing the gridded MODIS LAI values by the Maximum Green Vegetation Fraction for each grid cell⁷. The MODIS LAI product does not provide information on LAI in urban regions, so urban LAI_v was estimated from the US Forest Service’s Forest Inventory and Analysis urban tree

⁵ <https://bai.ess.uci.edu/megan>

⁶ <https://earthdata.nasa.gov/>

⁷ https://archive.usgs.gov/archive/sites/landcover.usgs.gov/green_veg.html

plot data, processed through the i-Tree v6 software⁸. Hourly meteorology for MEGAN was provided by the 4 km WRF simulation described above, and all stress factor adjustments were turned off.

MEGAN implemented the parameterized scheme Yiener-Levy (YL95) to estimate soil NO_x⁹. Main features include separate exponential temperature dependence for wet soils and linear dependence for dry soils. An optimal temperature above which flux becomes temperature independent, scalar adjustments to account for both “pulsing” and canopy reduction, synoptic-scale temperature and precipitation forcing, an explicit linear dependence of emission on fertilizer rate. The estimate assumes no growth.

Point and Areawide Source Emissions Forecasting

Emission forecasts (2021 and subsequent years) are based on growth profiles that in many cases incorporate historical trends up to the base year or beyond. The growth surrogates used to forecast the emissions from these categories are presented below in Table 2. The emissions inventory also reflects emission reductions from point and areawide sources subject to District rules and CARB regulations. The rules and regulations reflected in the inventory are listed below in Table 3.

Table 2 Growth Surrogates for Point and Areawide Sources

Source Category	Subcategory	Growth Surrogate
Oil and Gas Production (Combustion)	Process Heaters	CalGEM statewide total oil production. Assumed 2.9% annual decline reflecting CalGEM historical trend, 2000 through 2016
	I.C. Reciprocating Engines	
Service and Commercial	Other Fuels	Energy Information Administration (EIA) Annual Energy Outlook, 2016
Other (Fuel Combustion)	I.C. Reciprocating Engines	Modeled estimate, 2003

⁸ <https://www.itreetools.org/tools/i-tree-eco>

⁹ Yienger, J. and Levy, H.: Empirical model of global soil-biogenic NO_x emissions, J. Geophys. Res.-Atmos., 100, 11447–11464, 1995.

Source Category	Subcategory	Growth Surrogate
Sewage Treatment	Sewage Treatment Plants	Department of Finance population forecast, 2020
Landfills	Municipal Solid Waste	Department of Finance population forecast, 2020
Incinerators	Other Waste	Department of Finance population forecast, 2020
Oil and Gas Production	Vapor Recovery/Flares	CalGEM statewide total oil production. Assumed 2.9% annual decline reflecting CalGEM historical trend, 2000 through 2016
	Other	
Laundering	Dry Cleaning	DOF population forecast, 2020
Petroleum Marketing	Gas Dispensing Facilities and Cargo Tanks	Fuel use from CARB EMFAC2017 model
Food and Agriculture	Bakeries	Regional Economic Models, Inc. (REMI) economic forecast, version 2.4.5
Mineral Processes	Sand and Gravel Excavation and Processing	REMI economic forecast, version 2.4.5
	Cement Concrete Manufacturing and Fabrication	
Consumer Products	Personal Care Products	Real Disposable Personal Income per REMI, version 2.4.5
	Other Consumer Products	DOF population forecast, 2020

Source Category	Subcategory	Growth Surrogate
	Aerosol Coatings	No growth
Architectural Coatings & Related Process Solvents	All	DOF households forecast, 2020
Residential Fuel Combustion	Wood Combustion	EIA – State Energy Data Systems (SEDS) – No growth
	Space Heating	
	Other Fuels	
Farming Operations	Livestock Husbandry	CARB projection of livestock population per Census of Agriculture, 2012
Pesticides & Fertilizers	Structural Pesticides	DOF households forecast, 2020
Asphalt Paving & Roofing	All	REMI economic forecast, version 2.4.5
Construction and Demolition	Building Construction	REMI economic forecast, version 2.4.5
	Road Construction	
Paved Road Dust	Major Streets	EMFAC2017 Vehicle Miles Travelled (VMT) data
	Collector Streets	
	Local Streets	

Source Category	Subcategory	Growth Surrogate
Unpaved Road Dust	City and County Roads	No Growth
	U.S. Forest and Park Roads	
	B.L.M. Roads	
	Farm Roads	Harvested Acreage
Fugitive Windblown Dust	Unpaved Roads and Associated Areas	No Growth
Managed Burning and Disposal	Weed Abatement	No Growth
	Non-Agricultural Open Burning	Department of Finance population forecast, 2020
	Other	
Cooking	Commercial	Department of Finance population forecast, 2020
	Other	

Table 3 CARB Control Rules and Regulations Included in the Inventory for Stationary Sources

Rule	Rule Title	Source Categories Impacted
ARB_R003 & ARB_R003_A	Consumer Product Regulations & Amendments	Consumer products
ARB_R007	Aerosol Coating Regulations	Aerosol coatings
GDF_HOSREG	Gasoline Dispensing Facility Hose Emission Regulation	Petroleum marketing - gasoline dispensing facility hoses
ORVR	Fueling emissions from ORVR vehicles	Petroleum marketing - fueling emissions from ORVR vehicles
NONAGICENG	Non-Ag IC Engine Emission Scalars	Non-agricultural IC Engines

External Adjustments

External adjustments were made in CEPAM to account for regulatory factors that were not accounted for in the baseline projections. The external adjustments reflected in the CEPAM 2022 PM2.5 Plans v1.00 Portola inventory are listed below in Table 4.

Table 4 External Adjustment IDs and Descriptions

Adjustment ID	Adjustment Description
HD_I/M	Heavy-Duty Inspection and Maintenance (HD I/M) Regulation adopted by CARB, Dec 2021
ACC_II	Advanced Clean Cars (ACC II) Regulation adopted by CARB, Nov 2022

Adjustment ID	Adjustment Description
NonAg_ICE	Non-ag internal combustion engines adjustment to reflect 2003 ATCM and 2010 rule amendment

Condensable Particulate Matter

Background

Condensable particulate matter (PM) is material that is vapor phase at stack conditions, but which condenses and/or reacts upon cooling and dilution in the ambient air to form solid or liquid PM immediately after discharge from the stack. Condensable PM is a component of primary PM, which is the sum of condensable and filterable PM. Filterable PM comprises particles that are directly emitted by a source as a solid or liquid [aerosol] at stack or release conditions. All condensable PM is assumed to be smaller than 2.5 microns (μm) in diameter.

The AERR requires states to report annual emissions of filterable and condensable components of PM_{2.5} and PM₁₀, “as applicable,” for large sources every inventory year and for all sources every third inventory year, beginning with 2011¹⁰. Subsequent emissions inventory guidance¹¹ from the U.S. EPA clarifies the meaning of the phrase “as applicable” by providing a list of source types for which condensable PM is expected by the AERR. These source types are stationary point and nonpoint combustion sources that are expected to generate condensable PM and include, for instance, commercial cooking, fuel combustion at electric generating utilities, industrial processes like cement or chemical manufacturing, and flares or incinerators associated with waste disposal. The condensable PM from stationary and areawide sources in this inventory is calculated using the methodology outlined below. Condensable PM is not required to be calculated for mobile sources.

Methodology

For the current inventory, the District has collected data on primary PM only, containing both filterable and condensable components without distinguishing between the two. Consequently, to be able to report emissions of the condensable component of PM_{2.5} separately as required by the AERR, primary PM_{2.5} is augmented to condensable PM using

¹⁰ 40 CFR §51.15(a)(1) and §51.30(b)(1)

¹¹ U.S. EPA. Emissions Inventory Guidance for Implementation of Ozone and Particulate Matter National Ambient Air Quality Standards (NAAQS) and Regional Haze Regulations. May 2017.
https://www.epa.gov/sites/production/files/2017-07/documents/ei_guidance_may_2017_final_rev.pdf

recommended fractions from U.S. EPA, which are published within their Emissions Inventory System (EIS) Gateway¹². Because these factors are assigned to Source Classification Codes (SCC), CARB Emission Inventory Codes (EICs) are crosswalked to SCC codes. These factors are then directly applied (multiplied) to primary PM_{2.5} to calculate condensable PM.

¹² EIS Gateway downloaded on 08/20.2022. <https://www.epa.gov/air-emissions-inventories/emissions-inventory-system-eis-gateway>

B-1, PM

CATEGORY/TYPE	SUBCATEGORY	2020	2021	2022	2023	2024	2025	2026	2027	2028
STATIONARY										
FUEL COMBUSTION	OIL AND GAS PRODUCTION (COMBUSTION)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FUEL COMBUSTION	SERVICE AND COMMERCIAL	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
WASTE DISPOSAL	INCINERATORS	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
INDUSTRIAL PROCESSES	MINERAL PROCESSES	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006
AREAWIDE										
MISCELLANEOUS PROCESSES	RESIDENTIAL FUEL COMBUSTION	0.486	0.486	0.486	0.486	0.486	0.486	0.486	0.486	0.486
MISCELLANEOUS PROCESSES	FARMING OPERATIONS	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
MISCELLANEOUS PROCESSES	CONSTRUCTION AND DEMOLITION	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.005
MISCELLANEOUS PROCESSES	PAVED ROAD DUST	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008
MISCELLANEOUS PROCESSES	UNPAVED ROAD DUST	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020
MISCELLANEOUS PROCESSES	FUGITIVE WINDBLOWN DUST	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
MISCELLANEOUS PROCESSES	MANAGED BURNING AND DISPOSAL	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006
MISCELLANEOUS PROCESSES	COOKING	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008
MOBILE										
ON-ROAD MOTOR VEHICLES	LIGHT DUTY PASSENGER (LDA)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ON-ROAD MOTOR VEHICLES	LIGHT DUTY TRUCKS - 1 (LDT1)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ON-ROAD MOTOR VEHICLES	LIGHT DUTY TRUCKS - 2 (LDT2)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ON-ROAD MOTOR VEHICLES	MEDIUM DUTY TRUCKS (MDV)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ON-ROAD MOTOR VEHICLES	LIGHT HEAVY DUTY TRUCKS - 1 (LHDT1)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ON-ROAD MOTOR VEHICLES	LIGHT HEAVY DUTY TRUCKS - 2 (LHDT2)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ON-ROAD MOTOR VEHICLES	MEDIUM HEAVY DUTY TRUCKS (MHDT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ON-ROAD MOTOR VEHICLES	HEAVY HEAVY DUTY TRUCKS (HHDT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ON-ROAD MOTOR VEHICLES	MOTORCYCLES (MCY)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ON-ROAD MOTOR VEHICLES	BUSES	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ON-ROAD MOTOR VEHICLES	MOTOR HOMES (MH)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
OTHER MOBILE SOURCES	TRAINS	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
OTHER MOBILE SOURCES	OFF-ROAD RECREATIONAL VEHICLES	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.002

OTHER MOBILE SOURCES	OFF-ROAD EQUIPMENT	0.008	0.007	0.007	0.006	0.006	0.006	0.005	0.005	0.005
OTHER MOBILE SOURCES	OFF-ROAD EQUIPMENT (PERP)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
OTHER MOBILE SOURCES	FARM EQUIPMENT	0.001	0.001	0.001	0.001	0.001	0.001	0.000	0.000	0.000
	TOTAL	0.553	0.553	0.553	0.553	0.552	0.552	0.551	0.551	0.550

Source: CARB California Emission Projection Analysis Model (CEPAM), 2022 PM2.5 Plans Emission Projections, Version 1.00; Winter, Grown & Controlled; tons per day

B-2, NH3

CATEGORY/TYPE	SUBCATEGORY	2020	2021	2022	2023	2024	2025	2026	2027	2028
STATIONARY										
WASTE DISPOSAL	SEWAGE TREATMENT	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
WASTE DISPOSAL	LANDFILLS	0.001	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
AREAWIDE										
MISCELLANEOUS PROCESSES	RESIDENTIAL FUEL COMBUSTION	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028
MISCELLANEOUS PROCESSES	FARMING OPERATIONS	0.095	0.094	0.094	0.094	0.094	0.094	0.094	0.094	0.094
MISCELLANEOUS PROCESSES	OTHER (MISCELLANEOUS PROCESSES)	0.009	0.010	0.010	0.010	0.010	0.009	0.009	0.009	0.009
MOBILE										
ON-ROAD MOTOR VEHICLES	LIGHT DUTY PASSENGER (LDA)	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
ON-ROAD MOTOR VEHICLES	LIGHT DUTY TRUCKS - 1 (LDT1)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ON-ROAD MOTOR VEHICLES	LIGHT DUTY TRUCKS - 2 (LDT2)	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
ON-ROAD MOTOR VEHICLES	MEDIUM DUTY TRUCKS (MDV)	0.000	0.000	0.001	0.001	0.001	0.001	0.001	0.001	0.001
ON-ROAD MOTOR VEHICLES	LIGHT HEAVY DUTY TRUCKS - 1 (LHDT1)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ON-ROAD MOTOR VEHICLES	LIGHT HEAVY DUTY TRUCKS - 2 (LHDT2)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ON-ROAD MOTOR VEHICLES	MEDIUM HEAVY DUTY TRUCKS (MHDT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ON-ROAD MOTOR VEHICLES	HEAVY HEAVY DUTY TRUCKS (HHDT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ON-ROAD MOTOR VEHICLES	MOTORCYCLES (MCY)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ON-ROAD MOTOR VEHICLES	BUSES	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ON-ROAD MOTOR VEHICLES	MOTOR HOMES (MH)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
OTHER MOBILE SOURCES	TRAINS	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
OTHER MOBILE SOURCES	OFF-ROAD RECREATIONAL VEHICLES	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
OTHER MOBILE SOURCES	OFF-ROAD EQUIPMENT	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
OTHER MOBILE SOURCES	OFF-ROAD EQUIPMENT (PERP)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
OTHER MOBILE SOURCES	FARM EQUIPMENT	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	TOTAL	0.137	0.137	0.137	0.137	0.137	0.137	0.137	0.136	0.136

Source: CARB California Emission Projection Analysis Model (CEPAM), 2022 PM2.5 Plans Emission Projections, Version 1.00; Winter, Grown & Controlled; tons per day

B-3, NOx

CATEGORY/TYPE	SUBCATEGORY	2020	2021	2022	2023	2024	2025	2026	2027	2028
STATIONARY										
FUEL COMBUSTION	OIL AND GAS PRODUCTION (COMBUSTION)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FUEL COMBUSTION	SERVICE AND COMMERCIAL	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FUEL COMBUSTION	OTHER (FUEL COMBUSTION)	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
PETROLEUM PRODUCTION AND MARKETING	OIL AND GAS PRODUCTION	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
AREAWIDE										
MISCELLANEOUS PROCESSES	RESIDENTIAL FUEL COMBUSTION	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074
MISCELLANEOUS PROCESSES	MANAGED BURNING AND DISPOSAL	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
MOBILE										
ON-ROAD MOTOR VEHICLES	LIGHT DUTY PASSENGER (LDA)	0.007	0.006	0.005	0.005	0.004	0.004	0.004	0.004	0.003
ON-ROAD MOTOR VEHICLES	LIGHT DUTY TRUCKS - 1 (LDT1)	0.005	0.004	0.004	0.003	0.003	0.003	0.002	0.002	0.002
ON-ROAD MOTOR VEHICLES	LIGHT DUTY TRUCKS - 2 (LDT2)	0.008	0.007	0.007	0.006	0.006	0.005	0.005	0.005	0.004
ON-ROAD MOTOR VEHICLES	MEDIUM DUTY TRUCKS (MDV)	0.010	0.009	0.008	0.007	0.006	0.006	0.005	0.005	0.004
ON-ROAD MOTOR VEHICLES	LIGHT HEAVY DUTY TRUCKS - 1 (LHDT1)	0.022	0.021	0.019	0.017	0.016	0.014	0.013	0.012	0.011
ON-ROAD MOTOR VEHICLES	LIGHT HEAVY DUTY TRUCKS - 2 (LHDT2)	0.003	0.003	0.003	0.003	0.003	0.002	0.002	0.002	0.002
ON-ROAD MOTOR VEHICLES	MEDIUM HEAVY DUTY TRUCKS (MHDT)	0.005	0.004	0.003	0.003	0.003	0.002	0.002	0.002	0.002
ON-ROAD MOTOR VEHICLES	HEAVY HEAVY DUTY TRUCKS (HHDT)	0.011	0.008	0.007	0.007	0.006	0.006	0.006	0.005	0.005
ON-ROAD MOTOR VEHICLES	MOTORCYCLES (MCY)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ON-ROAD MOTOR VEHICLES	BUSES	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000
ON-ROAD MOTOR VEHICLES	MOTOR HOMES (MH)	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
OTHER MOBILE SOURCES	TRAINS	0.084	0.085	0.086	0.088	0.089	0.089	0.090	0.092	0.093
OTHER MOBILE SOURCES	OFF-ROAD RECREATIONAL VEHICLES	0.004	0.005	0.005	0.005	0.005	0.006	0.006	0.006	0.006
OTHER MOBILE SOURCES	OFF-ROAD EQUIPMENT	0.126	0.119	0.112	0.105	0.097	0.089	0.082	0.076	0.071
OTHER MOBILE SOURCES	OFF-ROAD EQUIPMENT (PERP)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
OTHER MOBILE SOURCES	FARM EQUIPMENT	0.014	0.013	0.012	0.012	0.011	0.010	0.009	0.009	0.008
	TOTAL	0.379	0.363	0.351	0.339	0.326	0.315	0.304	0.297	0.290

Source: CARB California Emission Projection Analysis Model (CEPAM), 2022 PM2.5 Plans Emission Projections, Version 1.00; Winter, Grown & Controlled; tons per day

B-4, ROG

CATEGORY/TYPE	SUBCATEGORY	2020	2021	2022	2023	2024	2025	2026	2027	2028
STATIONARY										
FUEL COMBUSTION	OIL AND GAS PRODUCTION (COMBUSTION)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FUEL COMBUSTION	SERVICE AND COMMERCIAL	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FUEL COMBUSTION	OTHER (FUEL COMBUSTION)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
WASTE DISPOSAL	INCINERATORS	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
CLEANING AND SURFACE COATINGS	LAUNDERING	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
PETROLEUM PRODUCTION AND MARKETING	OIL AND GAS PRODUCTION	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
PETROLEUM PRODUCTION AND MARKETING	PETROLEUM MARKETING	0.010	0.010	0.009	0.009	0.009	0.008	0.008	0.008	0.007
INDUSTRIAL PROCESSES	FOOD AND AGRICULTURE	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
AREAWIDE										
SOLVENT EVAPORATION	CONSUMER PRODUCTS	0.034	0.034	0.034	0.034	0.034	0.035	0.035	0.035	0.035
SOLVENT EVAPORATION	ARCHITECTURAL COATINGS AND RELATED PROCESS SOLVENTS	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007
SOLVENT EVAPORATION	PESTICIDES/FERTILIZERS	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
SOLVENT EVAPORATION	ASPHALT PAVING / ROOFING	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
MISCELLANEOUS PROCESSES	RESIDENTIAL FUEL COMBUSTION	0.653	0.653	0.653	0.653	0.653	0.653	0.653	0.653	0.653
MISCELLANEOUS PROCESSES	FARMING OPERATIONS	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063
MISCELLANEOUS PROCESSES	MANAGED BURNING AND DISPOSAL	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004
MISCELLANEOUS PROCESSES	COOKING	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
MOBILE										
ON-ROAD MOTOR VEHICLES	LIGHT DUTY PASSENGER (LDA)	0.013	0.011	0.010	0.010	0.009	0.009	0.008	0.008	0.008
ON-ROAD MOTOR VEHICLES	LIGHT DUTY TRUCKS - 1 (LDT1)	0.009	0.008	0.007	0.006	0.005	0.005	0.004	0.004	0.004
ON-ROAD MOTOR VEHICLES	LIGHT DUTY TRUCKS - 2 (LDT2)	0.010	0.009	0.008	0.008	0.008	0.008	0.008	0.008	0.007
ON-ROAD MOTOR VEHICLES	MEDIUM DUTY TRUCKS (MDV)	0.014	0.012	0.010	0.010	0.009	0.008	0.008	0.008	0.008
ON-ROAD MOTOR VEHICLES	LIGHT HEAVY DUTY TRUCKS - 1 (LHDT1)	0.006	0.005	0.005	0.005	0.005	0.004	0.004	0.004	0.004
ON-ROAD MOTOR VEHICLES	LIGHT HEAVY DUTY TRUCKS - 2 (LHDT2)	0.001	0.001	0.001	0.001	0.001	0.000	0.000	0.000	0.000
ON-ROAD MOTOR VEHICLES	MEDIUM HEAVY DUTY TRUCKS (MHDT)	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

ON-ROAD MOTOR VEHICLES	HEAVY HEAVY DUTY TRUCKS (HHDT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ON-ROAD MOTOR VEHICLES	MOTORCYCLES (MCY)	0.005	0.005	0.005	0.004	0.004	0.004	0.004	0.004	0.004
ON-ROAD MOTOR VEHICLES	BUSES	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ON-ROAD MOTOR VEHICLES	MOTOR HOMES (MH)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
OTHER MOBILE SOURCES	TRAINS	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004
OTHER MOBILE SOURCES	RECREATIONAL BOATS	0.016	0.016	0.015	0.015	0.015	0.014	0.014	0.014	0.014
OTHER MOBILE SOURCES	OFF-ROAD RECREATIONAL VEHICLES	0.129	0.127	0.124	0.122	0.119	0.117	0.115	0.113	0.111
OTHER MOBILE SOURCES	OFF-ROAD EQUIPMENT	0.065	0.064	0.064	0.063	0.062	0.060	0.059	0.057	0.055
OTHER MOBILE SOURCES	OFF-ROAD EQUIPMENT (PERP)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
OTHER MOBILE SOURCES	FARM EQUIPMENT	0.003	0.003	0.003	0.003	0.002	0.002	0.002	0.002	0.002
OTHER MOBILE SOURCES	FUEL STORAGE AND HANDLING	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
NATURAL SOURCES										
	BIOGENIC SOURCES	0.180	0.180	0.180	0.180	0.180	0.180	0.180	0.180	0.180
	TOTAL	1.237	1.224	1.216	1.209	1.203	1.196	1.190	1.184	1.179

Source: CARB California Emission Projection Analysis Model (CEPAM), 2022 PM2.5 Plans Emission Projections, Version 1.00; Winter, Grown & Controlled; tons per day

B-5, SOx

CATEGORY/TYPE	SUBCATEGORY	2020	2021	2022	2023	2024	2025	2026	2027	2028
STATIONARY										
FUEL COMBUSTION	SERVICE AND COMMERCIAL	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
PETROLEUM PRODUCTION AND MARKETING	OIL AND GAS PRODUCTION	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
AREAWIDE										
MISCELLANEOUS PROCESSES	RESIDENTIAL FUEL COMBUSTION	0.021	0.021	0.021	0.021	0.021	0.021	0.021	0.021	0.021
MISCELLANEOUS PROCESSES	MANAGED BURNING AND DISPOSAL	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
MOBILE										
ON-ROAD MOTOR VEHICLES	LIGHT DUTY PASSENGER (LDA)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ON-ROAD MOTOR VEHICLES	LIGHT DUTY TRUCKS - 1 (LDT1)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ON-ROAD MOTOR VEHICLES	LIGHT DUTY TRUCKS - 2 (LDT2)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ON-ROAD MOTOR VEHICLES	MEDIUM DUTY TRUCKS (MDV)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ON-ROAD MOTOR VEHICLES	LIGHT HEAVY DUTY TRUCKS - 1 (LHDT1)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ON-ROAD MOTOR VEHICLES	LIGHT HEAVY DUTY TRUCKS - 2 (LHDT2)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ON-ROAD MOTOR VEHICLES	MEDIUM HEAVY DUTY TRUCKS (MHDT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ON-ROAD MOTOR VEHICLES	HEAVY HEAVY DUTY TRUCKS (HHDT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ON-ROAD MOTOR VEHICLES	MOTORCYCLES (MCY)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ON-ROAD MOTOR VEHICLES	BUSES	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ON-ROAD MOTOR VEHICLES	MOTOR HOMES (MH)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
OTHER MOBILE SOURCES	TRAINS	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
OTHER MOBILE SOURCES	OFF-ROAD RECREATIONAL VEHICLES	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
OTHER MOBILE SOURCES	OFF-ROAD EQUIPMENT	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
OTHER MOBILE SOURCES	OFF-ROAD EQUIPMENT (PERP)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
OTHER MOBILE SOURCES	FARM EQUIPMENT	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	TOTAL	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022

Source: CARB California Emission Projection Analysis Model (CEPAM), 2022 PM2.5 Plans Emission Projections, Version 1.00; Winter, Grown & Controlled; tons per day

Section 7.1

Residential Wood Combustion

Plumas County Update

Revised July 2023

Emission Inventory Source Category

Miscellaneous Processes/Residential Fuel Combustion

Emission Inventory Codes (CES Codes) and Description

610-600-0230-0000 (82115) Residential Wood Combustion – Wood Stoves

610-602-0230-0000 (82123) Residential Wood Combustion – Fireplaces

I. Overview

This methodology is used to estimate criteria pollutant emissions from various types of residential wood combustion devices in Plumas County for the year 2020. This document contains emissions estimates for wood-burning fireplaces and wood stoves (which includes fireplace inserts and pellet stoves). This update reflects data specific for Plumas County and the Portola Nonattainment Area (NAA) provided by the Northern Sierra Air Quality Management District (District).

II. Background

The types of devices that burn wood in a typical residence are fireplaces, wood-burning stoves, fireplace inserts, and pellet stoves. The most common wood-burning device in a home is the fireplace. A fireplace is generally a masonry or prefabricated (metal) enclosure with the side facing the interior of the house left open and a chimney to exhaust the flue gas. The combustion air can be supplied from the outside air or from the inside air.

Wood stoves are enclosed stand-alone devices that vent exhaust gas through an existing chimney or flue. Wood stoves radiate heat from their exterior surfaces, and they are commonly used in residences as space heaters. They are used both as the primary source of residential heat and to supplement conventional heating systems. Wood stoves control burning or burn time by restricting the amount of air that can be used for combustion (U.S. EPA, 1996a). This methodology estimates emissions for four different types of wood stoves: (1) the conventional wood stove; (2) the non-catalytic wood stove; (3) the catalytic wood stove; and (4) the pellet stove.

Conventional wood stoves do not have any emission reduction technology or design features and, in most cases, were manufactured before July 1, 1986 (U.S. EPA, 1996a). Non-catalytic wood stoves do not contain catalysts, but they do have emission reducing technology or features. Older, non-catalytic wood stoves reduce emissions by directing unburned hydrocarbons and carbon monoxide (CO) into a secondary chamber, where mixing with fresh, preheated makeup air enhances further combustion (U.S. EPA, 1996a). Newer non-catalytic wood stoves have three internal characteristics that create a good environment for complete combustion: firebox insulation; a large baffle to produce a longer, hotter gas flow path; and pre-heated combustion air introduced through small holes above the fuel in the firebox. The baffle and some other internal parts of a non-catalytic stove need replacement periodically as they deteriorate with the high heat of efficient combustion (WHO, 2013).

Catalytic wood stoves are equipped with a ceramic or metal honeycomb device, called a combustor or converter that is coated with a noble metal such as platinum or palladium. The catalyst material reduces the ignition temperature of the unburned hydrocarbons and CO in the exhaust gases, which allows these pollutants to be burned at normal stove operating temperatures. As these pollutants burn, the temperature inside the catalyst increases to a point where the ignition of the gases is essentially self-sustaining (U.S. EPA, 1996a). All catalytic stoves have a lever-operated catalyst bypass damper which is opened for starting and reloading. The catalytic honeycomb degrades over time and must be replaced, but its durability is largely in the hands of the stove user. The catalyst can last more than six seasons if the stove is used properly, but if the stove is over-fired, garbage is burned and regular cleaning and maintenance are not done, the catalyst may break down in as little as two years (WHO, 2013).

Residential wood stoves are classified as conventional (also referred to as uncertified or Pre-Phase I) and certified. As of writing this document, there were several rounds of New Source Performance Standard for certifying wood burning devices (1988, 1990, 2015, and 2020). Some Pre-Phase I stoves may use older catalytic technology; however, for the purposes of this methodology, we make the conservative assumption that all Pre-Phase I stoves are conventional devices.

Fireplace inserts can be described as wood stoves that fit into the firebox of a fireplace. These devices are used to heat a house, or a portion of the house. Inserts are generally more effective at providing heat than a fireplace. They radiate the heat to the interior house space, or with the aid of a fan, circulate air around the insert and vent the heated air into the house. Since fireplace inserts share operating and combustion characteristics with wood stoves, the same emission factors are used for both fireplace inserts and wood stoves (HPBA, 2009a; U.S. EPA, 1996a; WHO, 2013).

Pellet stoves are fueled with pellets of sawdust, wood products, and other biomass materials pressed into manageable shapes and sizes. These stoves have active air flow systems and unique grate designs to accommodate pelleted fuel. Some pellet stove models are subject

to the 1988 New Source Performance Standards (NSPS), while others are exempt due to a high air-to-fuel ratio (i.e., greater than 35-to-1) (U.S. EPA, 1996a).

III. Emissions Estimation Method

For this revision based on 2020 occupied housing in Plumas County, the methodology for estimating emissions remained the same as the [current statewide methodology](#), and the update reflects inclusion of data from the Greater Portola [Wood Stove Change-Out Program](#) (Program), specific to Plumas County and the Portola NAA. As part of the change-out program, the District offered incentives, up to the full cost of purchase and installation, to qualified residents of the Portola NAA using uncertified wood stoves or inserts as a primary source of heat. The Program collected data about the type and number of devices replaced in the NAA. These data are used to develop the residential wood burning emissions estimates for the Portola NAA. Emissions were estimated in three groups: a) Area outside the Portola NAA, b) emissions for devices updated in the Portola NAA, and c) the emissions of devices not updated within the Portola NAA.

A. Outside Portola Nonattainment Area

1. Wood-burning Fireplaces

a. Determine the number of wood-burning fireplaces that are actually used

Equation 1:
$$FP_{all} = [H_{total}] * [P_{fp}] * [M_{fp}]$$

Where

FP_{all} = Number of fireplaces that are actually in use

H_{total} = Number of occupied housing units in the county outside the NAA

P_{fp} = Percent of homes with a fireplace

M_{fp} = Average number of fireplaces per home

Table below shows the values for the variables used in Equation 1.

H_{total} = Number of occupied housing units in Plumas County, not including the Nonattainment Area, 2020	5567 ¹
P_{fp} = Percent of homes with a fireplace	64.2% ²
M_{fp} = Average number of fireplaces per home	1.1 ²

¹ [2020 Census Data](#)

² [CARB Statewide Residential Fuel Combustion Methodology, Appendix A](#)

b. Determine the amount of wood burned in fireplaces

For fireplaces, we assume that three types of fuel are burned: (1) cord wood; (2) bundle wood; and (3) wax/sawdust manufactured logs (e.g., Duraflame, Pine Mountain, Hearthlog). Provided below are methods for estimating the consumption rates for the different fireplace fuels.

b.1 Fireplaces – Cord Wood & Bundle Wood

A standard cord of wood is defined as a stack of wood with a volume of 128 cubic feet (4 feet x 4 feet x 8 feet).

Bundle wood is typically purchased from a retail store, either packaged in a box or wrapped in plastic. Fireplaces burn cord wood and bundle wood for aesthetic purposes and for heating purposes. This methodology assumes wood consumption rates that include both cord wood and bundle wood. In addition, it is assumed that fireplaces burn more wood when they are used for heating purposes, as compared to aesthetic purposes (Houck, 2001a).

Provided below is a method to determine the percentage of fireplaces used for aesthetic and heating purposes, and the associated wood consumption rate for each of these uses. For fireplaces, the total amount of wood consumed is based on the number of individual fireplace units, rather than the number of homes that have fireplaces. This is done to maintain consistency with the units for the estimated consumption rate.

Equation 2:
$$FP_{aes} = [FP_{all}] * [P_{fp,cord}] * [PF_{fp,aes}]$$

Equation 3:
$$F_{aes} = [FP_{aes}] * [N_{cord,aes}] * [W_{cord}]$$

Where

FP_{aes} = Number of fireplaces being used primarily for aesthetic purposes

FP_{all} = Number of fireplaces that are actually in use

$P_{fp,cord}$ = Percent of fireplaces that burn cord wood

$P_{fp,aes}$ = Percent of fireplace use that is described as aesthetic

F_{aes} = Amount of cord wood burned in fireplaces for aesthetic purposes, tons wood/year

$N_{cord,aes}$ = Number of cords burned in fireplaces – aesthetics

W_{cord} = Weight of an average cord of wood

Equation 4:
$$FP_{heat} = [FP_{all}] * [P_{fp,cord}] * [P_{fp,heat}]$$

Equation 5:
$$F_{heat} = [FP_{heat}] * [N_{cord,heat}] * [W_{cord}]$$

Where

FP_{heat} = Number of fireplaces being used primarily for heating purposes

FP_{all} = Number of fireplaces that are actually in use

$P_{fp,heat}$ = Percent of fireplace use that is for heating purposes (non-aesthetic)

F_{heat} = Amount of cord wood burned in fireplaces for heating purposes, tons wood/year

$N_{\text{cord,heat}}$ = Number of cords burned in fireplaces – heating
 W_{cord} = Weight of an average cord of wood

Table below shows values of variables for Equations 2-5.

$P_{\text{fp,cord}}$ = Percent of fireplaces that burn cord wood	88% ³
$P_{\text{fp,aes}}$ = Percent of fireplace use that is described as aesthetic	59% ³
$N_{\text{cord,aes}}$ = Number of cords burned in fireplaces – aesthetics	0.74 ⁴ cord/fireplace/year
W_{cord} = Weight of an average cord of wood	1.54 ⁴ tons/cord
$P_{\text{fp,heat}}$ = Percent of fireplace use that is for heating purposes (non-aesthetic)	41% ³
$N_{\text{cord,heat}}$ = Number of cords burned in fireplaces – heating	4.3 ⁴ cord/fireplace/year

b.2 Fireplaces - Manufactured Wax/Sawdust Logs

Manufactured Wax/Sawdust Logs (e.g., Duraflame, Pine Mountain, Hearthlog) are made from a mixture of sawdust, wax, and binders. Below is a method to determine the manufactured log consumption rate for fireplaces.

Equation 6:
$$H_{\text{fp,ml}} = [H_{\text{total}}] * [P_{\text{fp,u}}] * [P_{\text{fp,ml}}]$$

Equation 7:
$$F_{\text{ml}} = [H_{\text{fp,ml}}] / [H_{\text{fp,ml, statewide total}}] * [CA_{\text{mfrd log sales}}]$$

Where

$H_{\text{fp,ml}}$ = Number of homes with fireplaces that primarily burn manufactured logs

H_{total} = Number of occupied housing units in the county, not including the NAA

$P_{\text{fp,u}}$ = Percent of homes with a fireplace that was actually used during the burn season

$P_{\text{fp,ml}}$ = Percent of active fireplaces that primarily burn manufactured logs

F_{ml} = Amount of manufactured logs burned in fireplaces, tons/year

$H_{\text{fp,ml}}$ = Number of homes with fireplaces that primarily burn manufactured logs

$H_{\text{fp,ml, statewide total}}$ = Statewide total for all homes with fireplaces that primarily burn manufactured logs

$CA_{\text{mfrd log sales}}$ = Total sales of manufactured logs in California, tons/year

Table⁵ below contains the variables used in Equations 6-7.

³ CARB Statewide Residential Fuel Combustion Methodology, Appendix A

⁴ Wood Stove Change-Out Program Data collected for Portola NAA

⁵ CARB Statewide Residential Fuel Combustion Methodology, Appendix A

$H_{fp,ml}$ = Number of homes with fireplaces that primarily burn manufactured logs	12%
$H_{fp,ml, statewide\ total}$ = Statewide total for all homes with fireplaces that primarily burn manufactured logs	372,371
$CA_{mfrd\ log\ sales}$ = Total sales of manufactured logs in California, tons/year	60,825

2. Wood Stoves

a. Determine the number of homes with wood stoves that are actually used

Equation 8:
$$H_{w,u} = [H_{total}] * [P_{w,u}]$$

Where

$H_{w,u}$ = Number of homes with wood stoves that are actually in use

H_{total} = Number of occupied housing units in the county

$P_{w,u}$ = Percent of homes with a wood stove that was actually used during the burn season

Table⁵ below contains the values used in Equation 8.

H_{total} = Number of occupied housing units in Plumas County, not including the Nonattainment Area, 2020	5567
$P_{w,u}$ = Percent of homes with a wood stove that was actually used during the burn season	28%

b. Determine the amount of wood burned in wood stoves

For wood stoves, we assume that only cord wood is burned, because survey data indicate that wood stove owners do not purchase bundles of wood (OMNI, 2003). In addition, wax/sawdust manufactured logs are not recommended for use in wood stoves (HPBA, 2009b). There are three types of wood stoves that are addressed in this methodology:

- (1) Conventional Wood Stoves
- (2) Certified Catalytic Wood Stoves
- (3) Certified Non-Catalytic Wood Stoves

Provided below are methods for estimating the consumption rates for wood stoves.

b.1 Wood Stoves – Cord Wood

This methodology assumes that all wood stoves in use burn cord wood. In addition, it is assumed that wood stoves are used for heating purposes only. Provided below is a method to determine the cord wood consumption rate for wood stoves.

b.1.1 Total Cord Wood Consumption for All Wood Stoves

Equation 9:
$$F_w = [H_{w,u}] * [N_{cord}] * [W_{cord}]$$

Where

F_w = Total amount of cord wood burned in wood stoves, tons wood/year

$H_{w,u}$ = Number of homes with wood stoves that are actually in use

N_{cord} = Number of cords burned in wood stoves, cords/home/year

W_{cord} = Weight of an average cord of wood

b.1.2 Cord Wood Consumption for Conventional Non-Catalytic Wood Stoves

Equation 10:
$$F_{w,con} = [F_w] * [100\% - P_{ph}]$$

Where

$F_{w,con}$ = Amount of cord wood burned in conventional wood stoves, tons wood/year

F_w = Total amount of cord wood burned in wood stoves, tons wood/year

P_{ph} = Percent of wood stoves that are EPA certified

Note: It is assumed that all wood stoves purchased prior to 1 July 1990 are conventional non-catalytic units and all wood stoves purchased on or after 1 July 1990 are EPA-certified units (catalytic and non-catalytic). Therefore, the estimated percentage of conventional wood stoves is $[100\% - P_{ph}]$.

b.1.3 Cord Wood Consumption for Certified Catalytic Wood Stoves

Equation 11:
$$F_{w,cat} = [F_w] * [P_{ph}] * [P_c]$$

Where

$F_{w,cat}$ = Amount of cord wood burned in certified catalytic wood stoves, tons wood/year

F_w = Total amount of cord wood burned in wood stoves, tons wood/year

P_{ph} = Percent of wood stoves that are EPA certified

P_c = Percent of wood stoves that are catalytic

Note: It is assumed that all wood stoves purchased prior to 1 July 1990 were conventional non-catalytic units. Therefore, the percentage of catalytic wood stoves was only applied to certified wood stoves purchased on or after 1 July 1990.

b.1.4 Cord Wood Consumption for Certified Non-Catalytic Wood Stoves

Equation 12:
$$F_{w,ncat} = [F_w] * [P_{ph}] * [100\% - P_c]$$

Where

$F_{w,ncat}$ = Amount of cord wood burned in certified non-catalytic wood stoves, tons wood/year

F_w = Total amount of cord wood burned in wood stoves, tons wood/year

P_{ph} = Percent of wood stoves that are EPA certified

P_c = Percent of wood stoves that are catalytic

Table below contains the values for Equation 9-12.

Ncord = Number of cords burned in wood stoves, cords/home/year	4.3 ⁶ cords/home/year
P_{ph} = Percent of wood stoves that are EPA certified	46% ⁷
P_c = Percent of wood stoves that are catalytic	24% ⁷
W_{cord} = Weight of an average cord of wood	1.54 ⁶ tons/cord

3. Fireplace Inserts

a. Determine the number of homes with fireplace inserts that are actually used

Equation 13:
$$H_{fi,u} = [H_{total}] * [P_{fi,u}]$$

Where

$H_{fi,u}$ = Number of homes with fireplace inserts that are actually in use

H_{total} = Number of occupied housing units in the county, not including the NAA

$P_{fi,u}$ = Percent of homes with a fireplace insert that was actually used during the burn season

⁶ Wood Stove Change-Out Program Data collected for Portola NAA

⁷ CARB Statewide Residential Fuel Combustion Methodology, Appendix A

b. Determine the amount of wood burned in fireplace inserts.

For fireplace inserts, we assume that three types of fuel are primarily burned: (1) cord wood; (2) bundle wood; and (3) compressed sawdust logs which are 100% sawdust and wood shavings with no wax or binders (e.g., Pres-to Logs, Eco-Logs, etc.).

Similar to wood stoves, there are three types of fireplace inserts that are addressed in this methodology:

- (1) Conventional Fireplace Inserts
- (2) Certified Catalytic Fireplace Inserts
- (3) Certified Non-Catalytic Fireplace Inserts

Emissions for fireplace inserts are reported under EIC 610-600-0230-0000, the general wood stove category. Provided below are methods for estimating the consumption rates for fireplace inserts.

b.1 Fireplace Inserts - Cord Wood

This methodology assumes that fireplace inserts burn cord wood for heating purposes only. Provided below is a method to determine the cord wood consumption rate for fireplace inserts.

b.1.1 Total Cord Wood Consumption for All Fireplace Inserts

Equation 14:
$$F_{fi,cord} = [H_{fi,u}] * [N_{cord,i}] * [W_{cord}]$$

Where

- $F_{fi,cord}$ = Total amount of cord wood burned in fireplace inserts, tons wood/year
- $H_{fi,u}$ = Number of homes with fireplace inserts that are actually in use
- $N_{cord,i}$ = Number of cords burned in fireplace inserts, cords/home/year
- W_{cord} = Weight of an average cord of wood

b.1.2 Cord Wood Consumption for Conventional Non-Catalytic Fireplace Inserts

Equation 15:
$$F_{fi,con} = [F_{fi,cord}] * [100\% - P_{ph}]$$

Where

- $F_{fi,con}$ = Amount of cord wood burned in conventional fireplace inserts, tons wood/year
- $F_{fi,cord}$ = Total amount of cord wood burned in fireplace inserts, tons wood/year
- P_{ph} = Percent of fireplace inserts that are EPA certified

Note: It is assumed that all fireplace inserts purchased prior to 1 July 1990 are conventional non-catalytic units and all fireplace inserts purchased on or after 1 July

1990 are EPA-certified units (catalytic and non-catalytic). Therefore, the estimated percentage of conventional fireplace inserts is $[100\% - P_{ph}]$.

b.1.3 Cord Wood Consumption for Certified Catalytic Fireplace Inserts

Equation 16:
$$F_{fi,cat} = [F_{fi,cord}] * [P_{ph}] * [P_c]$$

Where

$F_{fi,cat}$ = Amount of cord wood burned in certified catalytic fireplace inserts, tons wood/year

$F_{fi,cord}$ = Total amount of cord wood burned in fireplace inserts, tons wood/year

P_{ph} = Percent of fireplace inserts that are EPA certified

P_c = Percent of fireplace inserts that are catalytic

Note: It is assumed that all fireplace inserts purchased prior to 1 July 1990 were conventional non-catalytic units. Therefore, the percentage of catalytic fireplace inserts was only applied to certified fireplace inserts purchased on or after 1 July 1990.

b.1.4 Cord Wood Consumption for Certified Non-Catalytic Fireplace Inserts

Equation 17:
$$F_{fi,ncat} = [F_{fi,cord}] * [P_{ph}] * [100\% - P_c]$$

Where

$F_{fi,ncat}$ = Amount of cord wood burned in certified non-catalytic fireplace inserts, tons wood/year

$F_{fi,cord}$ = Total amount of cord wood burned in fireplace inserts, tons wood/year

P_{ph} = Percent of fireplace inserts that are certified (i.e., purchased after 1 July 1990)

P_c = Percent of fireplace inserts that are catalytic

Table below contains the variables used in Equations 13-17.

$P_{fi,u}$ = Percent of homes with a fireplace insert that was actually used during the burn season	6.3% ⁸
N_{cord} = Number of cords burned in fireplace inserts, cords/home/year	4.3 ⁹

⁸ CARB Statewide Residential Fuel Combustion Methodology, Appendix A

⁹ Wood Stove Change-Out Program Data collected for Portola NAA

P_{ph} = Percent of fireplace inserts that are EPA certified	46% ⁸
P_c = Percent of fireplace inserts that are catalytic	31% ⁸
W_{cord} = Weight of an average cord of wood	1.54 ⁹ tons/cord

b.2 Fireplace Inserts - Bundle Wood

Bundle wood is typically purchased from a retail store, either packaged in a box or wrapped in plastic. Depending on the type of survey data available, bundle wood may be included with cord wood, or it may be broken out separately. This methodology assumes that 9.4% of fireplaces burn bundle wood in addition to cord wood, based on average survey results (OMNI, 2003). However, this percentage may change if more detailed usage data are available. Average survey results may also be used to estimate the average consumption rate for bundles of wood (OMNI, 2003). Provided below is a method to determine the bundle wood consumption rate for fireplace inserts.

b.2.1 Total Bundle Wood Consumption for All Fireplace Inserts

Equation 18:
$$F_{fi,bundle} = [H_{fi,u}] * [P_{fi,bundle}] * [N_{bundle}] * [W_{bundle}]$$

Where

$F_{fi,bundle}$ = Amount of bundle wood burned in fireplace inserts, tons wood/year

$H_{fi,u}$ = Number of homes with fireplace inserts that are actually in use

$P_{fi,bundle}$ = Percent of fireplace inserts that burn bundle wood

N_{bundle} = Number of bundles burned in fireplaces, bundles/home/year

W_{bundle} = Weight of an average bundle of wood

b.2.2 Bundle Wood Consumption for Conventional Non-Catalytic Fireplace Inserts

Equation 19:
$$F_{fi,con,b} = [F_{fi,bundle}] * [100\% - P_{ph}]$$

Where

$F_{fi,con,b}$ = Amount of bundle wood burned in conventional fireplace inserts, tons wood/year

$F_{fi,bundle}$ = Total amount of bundle wood burned in fireplace inserts, tons wood/year

P_{ph} = Percent of fireplace inserts that are EPA certified

Note: It is assumed that all fireplace inserts purchased prior to 1 July 1990 are conventional non-catalytic units and all fireplace inserts purchased on or after 1 July

1990 are EPA-certified units (catalytic and non-catalytic). Therefore, the estimated percentage of conventional fireplace inserts is $[100\% - P_{ph}]$.

b.2.3 Bundle Wood Consumption for certified Catalytic Fireplace Inserts

Equation 20:
$$F_{fi,cat,b} = [F_{fi,bundle}] * [P_{ph}] * [P_c]$$

Where

$F_{fi,cat,b}$ = Amount of bundle wood burned in EPA certified catalytic fireplace inserts, tons wood/year

$F_{fi,bundle}$ = Total amount of bundle wood burned in fireplace inserts, tons wood/year

P_{ph} = Percent of fireplace inserts that are EPA certified

P_c = Percent of fireplace inserts that are catalytic

Note: It is assumed that all fireplace inserts purchased prior to 1 July 1990 were conventional non-catalytic units. Therefore, the percentage of catalytic fireplace inserts was only applied to certified fireplace inserts purchased on or after 1 July 1990.

b.2.4 Bundle Wood Consumption for Certified Non-Catalytic Fireplace Inserts

Equation 21:
$$F_{fi,ncat,b} = [F_{fi,bundle}] * [P_{ph}] * [100\% - P_c]$$

Where

$F_{fi,ncat,b}$ = Amount of bundle wood burned in EPA certified non-catalytic fireplace inserts, tons wood/year

$F_{fi,bundle}$ = Total amount of bundle wood burned in fireplace inserts, tons wood/year

P_{ph} = Percent of fireplace inserts that are EPA certified

P_c = Percent of fireplace inserts that are catalytic

Table¹⁰ below contains values for the variables used in Equation 18-21.

$P_{fi,bundle}$ = Percent of fireplace inserts that burn bundle wood	9.4%
N_{bundle} = Number of bundles burned in fireplaces	2.2 bundles/home/year
W_{bundle} = Weight of an average bundle of wood	0.024 ton/bundle
P_{ph} = Percent of fireplace inserts that are EPA certified	46%
P_c = Percent of fireplace inserts that are catalytic	31%

¹⁰ CARB Statewide Residential Fuel Combustion Methodology, Appendix A

Emissions for each device type is calculated using the following equation:

Equation 22:
$$E_{device} = (EF_{device} \times F_{device})/2000$$

Where

- E_{device} = Emissions of device, tons/year
- EF_{device} = Emission Factor for device, lbs/tons of wood burned
- F_{device} = Amount of wood burned, tons of wood burned/year

The emission factors in lbs/tons of wood burned (NEI 2020, USEPA Wagon Wheel) for each pollutant, device, and, fuel type are shown in the table below.

Device Description	Fuel Type	CO	NO_x	PM_{2.5}	SO₂	ROG/VOC	NH₃
Fireplace	Cord Wood, Bundles	149	2.6	22.7	0.4	18.9	1.8
Fireplace	Manufactured Log	137	6.5	46.4	4.2	33.8	0.004
Woodstove - Conventional	Cord Wood	230.8	2.8	29.5	0.4	53	1.7
Woodstove – Certified Non-Catalytic	Cord Wood	140.8	2.28	14.1	0.4	12	0.9
Woodstove – Certified Catalytic	Cord Wood	104.4	2	19.6	0.4	15	0.9
Fireplace Inserts - Conventional	Cord Wood, Bundles	230.8	2.8	29.5	0.4	53	1.7
Fireplace Inserts - Certified Non-Catalytic	Cord Wood, Bundles	140.8	2.28	14.1	0.4	12	0.9
Fireplace Inserts - Certified Catalytic	Cord Wood, Bundles	104.4	2	19.6	0.4	15	0.9

Below is a description of the pollutants used in the table above and later in this report.

Pollutant	Description
CO	Carbon Monoxide
NO _x	Oxides of Nitrogen
PM _{2.5}	Particulate matter with an aerodynamic diameter less than or equal to a nominal 2.5 micrometers
PM ₁₀	Particulate matter with an aerodynamic diameter less than or equal to a nominal 10 micrometers
PM	Total Particulate Matter
SO _x	Oxides of Sulfur
SO ₂	Sulfur Dioxide
TOG	Total Organic Gases
ROG	Reactive Organic Gases
VOC	Volatile Organic Carbon
NH ₃	Ammonia

B. Portola Nonattainment Area

Emissions for the Portola NAA are calculated based on information specific to the area. Devices that burn wood in the Portola NAA consist of fireplaces, woodstoves, and pellet stoves. Estimates of the amount of wood burned for each device category is provided below. Emissions for the NAA are calculated in two steps: 1) emission calculations for devices that were upgraded during the change-out program and 2) emission calculations for those devices that were not replaced.

1. Emissions for Upgraded Devices in Portola NAA

The District worked on replacing uncertified wood stoves with cleaner burning and more efficient home heating devices in the Portola NAA. Table below provides a summary of the new upgraded and installed devices through 2019. These devices replaced 340 uncertified wood stoves and 24 fireplaces that makes the total installations as of 12/31/2019 to be 364.

Table below show the breakdown of the newly installed devices as part of the change-out program.

Device Type	Number of Devices
Non-Catalytic Stoves	229
Catalytic Stoves	68
Catalytic/Non-Catalytic Stoves (Hybrid)	6
Pellet Stoves	43
Propane/Kerosene Stoves	18

The following formula was used to estimate emissions for the new devices.

Equation 23:
$$E_d = (EF_{new} \times WU \times WD \times [EFC_{old}/EFC_{new}])/2000$$

Where

- E_d = Emission of new device
- EF_{new} = Emission factor for new device
- WU = Wood usage
- WD = Wood density
- EFC_{old} = Old uncertified stove efficiency
- EFC_{new} = New certified stove efficiency

Table¹¹ below contains the variables used in Equation 23.

WU = Wood usage	4.3 cords/household/year
WD = Wood Density	1.54 tons/cord
EFC_{old} = Old uncertified stove efficiency	54%
EFC_{new} = New certified stove efficiency	68%

Emissions factors in lbs/tons of wood burned (NEI 2020 USEPA Wagon Wheel and change-out Program data) for every pollutant and device type are shown in Table below. Please

¹¹ [Wood Stove Change-Out Program Data collected for Portola NAA](#)

note that the PM_{2.5} emission factors are based on change-out program data provided in Appendix A below.

Device Type	CO	NO _x	PM _{2.5}	SO _x	ROG/VOC	NH ₃
Catalytic Wood Stove	92.3	2	See Appendix A	0.4	15	0.67
Non-Catalytic Wood Stove	122.6	1.69	See Appendix A	0.4	12	0.67
Hybrid Wood Stove	122.6	1.69	See Appendix A	0.4	12	0.67
Pellet Stove	15.9	3.8	See Appendix A	0.32	0.04	0.3

2. Emissions for Devices Not Replaced in Portola

Emissions from this category includes those devices in the Portola NAA that were not upgraded through the change-out program. These devices include: (1) Wood Stoves, (2) Fireplaces, and (3) Pellet Stoves. Prior to the device change-out program the District gathered information about the types of devices used in the NAA. See below tables for the [change-out Program data](#) from the District.

Table below shows the household data from the change-out program.

Occupied homes in Portola NAA, 2020	2765
Percent of households using wood as heating fuel	57
Households using wood as heating fuel in Portola NAA	1576

Table¹² below shows the breakdown by device type before the change-out program.

¹² [Wood Stove Change-Out Program Data collected for Portola NAA](#)

Device Type	Percent	Number of Devices (Multiply by 1.1 to account for multiple devices in household)
Woodstoves/Fireplace Inserts	88%	1526
<i>Noncertified/Unknown</i>	53%	809
<i>EPA Certified</i>	47%	717
Fireplaces used for heating	9%	156
Pellet Stoves	3%	47

Since emissions for 2020 will include both new devices installed as well as the devices that were not upgraded, the 364 upgraded devices will be subtracted out from the information above leaving the new device count for 2020 as follows¹²:

Device Type	Devices Replaced during Program	Devices Not Replaced
Woodstoves/Fireplace Inserts		1186
<i>Noncertified/Unknown</i>	340	469
<i>EPA Certified</i>		717
Fireplaces used for heating	24	132
Pellet Stoves		47

Provided below are the methods used for estimating the wood consumption rates and emissions for each device type.

a. Woodstoves/Fireplace Inserts

Woodstoves and fireplace inserts are broken down into three categories (1) conventional/noncertified, (2) certified catalytic, and (3) certified non-catalytic. The method for determining wood usage for each category is shown below.

a.1 Conventional/Noncertified Woodstoves

Equation 24:
$$WU_{w,conv} = [N_{w,conv}] * [N_{cord}] * [W_{cord}]$$

Where

$WU_{w,conv}$ = Wood usage for conventional/noncertified woodstove, tons/year

$N_{w,conv}$ = Number of conventional/noncertified woodstoves

N_{cord} = Number of cords burned

W_{cord} = Weight of average cord

a.2 Certified Catalytic Woodstoves

Equation 25:
$$WU_{w,cat} = [N_{w,cat}] * [N_{cord}] * [W_{cord}] * [P_{w,cat}]$$

Where

$WU_{w,cat}$ = Wood usage for certified catalytic woodstove, tons/year

$N_{w,cat}$ = Number certified catalytic woodstoves

N_{cord} = Number of cords burned

W_{cord} = Weight of average cord

$P_{w,cat}$ = Percent of certified catalytic woodstoves for region

a.3 Certified Non-Catalytic Woodstoves

Equation 26:
$$WU_{w,nc} = [N_{w,nc}] * [N_{cord}] * [W_{cord}] * [P_{w,nc}]$$

Where

$WU_{w,nc}$ = Wood usage for certified non-catalytic woodstove, tons/year

$N_{w,nc}$ = Number certified non-catalytic woodstoves

N_{cord} = Number of cords burned

W_{cord} = Weight of average cord

$P_{w,nc}$ = Percent of certified non-catalytic woodstoves for region

b. Fireplaces

Equation 27:
$$WU_f = [N_f] * [N_{cord}] * [W_{cord}]$$

Where

WU_f = Wood usage for fireplaces, tons/year

N_f = Number of fireplaces

N_{cord} = Number of cords burned

W_{cord} = Weight of average cord

c. Pellet Stoves

Equation 28:
$$WU_{pellet} = [N_{pellet}] * [W_{pellets}]$$

Where

WU_{pellet} = Wood usage for pellet stoves, tons/year

N_{pellet} = Number of pellet stoves

$W_{pellets}$ = Amount of pellets burned per year per household

Table¹³ below contains the variables used in Equations 24-28.

N_{cord} = Number of cords burned	4.3 cords/home/year
W_{cord} = Weight of average cord	1.54 tons/cord
$P_{\text{w,nc}}$ = Percent of certified non-catalytic woodstoves for region	76%
$P_{\text{w,cat}}$ = Percent of certified catalytic woodstoves for region	24%
W_{pellets} = Amount of pellets burned per year per household	3 tons/home/yr

Emissions factors in lbs/tons of wood burned (NEI 2020 USEPA Wagon Wheel) for each pollutant and device type are shown in Table below.

Device type	CO	NO_x	PM_{2.5}	SO_x	ROG/VOC	NH₃
Conventional/Uncertified Woodstoves	230.80	2.80	29.50	0.40	53.00	1.70
Certified Catalytic Wood Stove	92.30	2.00	19.60	0.40	15.00	0.67
Certified Non-Catalytic Wood Stove	122.60	1.69	14.10	0.40	12.00	0.67
Fireplaces	149.00	2.6	22.7	0.40	18.9	1.8
Pellet Stove	15.90	3.8	2.9	0.32	0.04	0.30

¹³ *Wood Stove Change-Out Program Data collected for Portola NAA*

IV. Emissions Estimates

Below is a summary of the emissions estimates following the methods outlined in the previous.

A. Emissions estimates for Outside Portola NAA

2020 Emissions estimates for outside the Portola Nonattainment Area in tons per year.

Device Description	Fuel Type	Fuel Burned, tons/year	CO	NO_x	PM_{2.5}	SO₂	ROG/VOC	NH₃
Fireplace	Cord Wood, Bundles	11719	873	15	133	2	111	11
Fireplace	Manufactured Log	70.1	5	0	2	0	1	0
Woodstove, Conventional	Cord Wood	5574	643	8	82	1	148	5
Woodstove, Certified Non-Catalytic	Cord Wood	3609	254	4	25	1	22	2
Woodstove, Certified Catalytic	Cord Wood	1140	59	1	11	0	9	1
Fireplace Inserts, Conventional	Cord Wood, Bundles	1255	145	2	19	0	33	1
Fireplace Inserts, Certified Non-Catalytic	Cord Wood, Bundles	738	52	1	5	0	4	0
Fireplace Inserts, Certified Catalytic	Cord Wood, Bundles	331	17	0	3	0	2	0

B. Emissions estimates for Portola NAA

2020 Emissions estimates for new installed devices in Portola NAA in tons per year.

Device Description	Fuel Type	Fuel Burned, tons/year	CO	NO _x	PM _{2.5}	SO ₂	ROG/VOC	NH ₃
Woodstove, Certified Catalytic	Cord Wood	450	16.50	0.36	0.56	0.07	2.68	0.12
Woodstove, Certified Non-Catalytic	Cord Wood	1516	73.82	1.02	4.01	0.24	7.23	0.40
Woodstove, Certified Hybrid	Cord Wood	40	1.93	0.03	0.02	0.006	0.19	0.01
Pellet Stove	Pellets	129	0.81	0.19	0.20	0.02	0.002	0.02

2020 Emissions estimates for devices that weren't replaced in the Portola NAA in tons per year.

Device Description	Fuel Type	Fuel Burned, tons/year	CO	NO _x	PM _{2.5}	SO ₂	ROG/VOC	NH ₃
Fireplace	Cord Wood, Bundles	874.3	65	1	10	0	8	1
Woodstove - Conventional	Cord Wood	3103	358	4	46	1	82	3
Woodstove - Certified Non-Catalytic	Cord Wood	3609	221	3	25	1	22	1
Woodstove - Certified Catalytic	Cord Wood	1140	53	1	11	0	9	0
Pellet Stove	Pellets	142	1	0	0	0	0	0

C. Emissions estimates by EIC for Plumas County

2020 Emissions summary by EIC for Plumas County in tons per year.

Source	EIC	CO	NO _x	PM _{2.5}	SO ₂	ROG/VOC	NH ₃
Woodstoves	610-600-0230-0000	1897	26	233	4	341	13
Fireplaces	610-602-0230-0000	943	17	145	3	120	11

Emissions for PM, PM₁₀, and TOG are speciated from PM_{2.5} and ROG/VOC according to [CARB's Speciation Profile 424](#).

V. Acronyms and Glossary

CO	Carbon Monoxide
EF	Emission Factor
EIC	Emission Inventory Code. A 14-digit code that CARB uses to define emission categories in all sectors (stationary, area-wide, mobile, and, natural sources)
NH ₃	Ammonia
NO _x	Oxides of Nitrogen
NSPS	New Source Performance Standard
PM _{2.5}	Particulate matter with an aerodynamic diameter less than or equal to a nominal 2.5 micrometers.
PM ₁₀	Particulate matter with an aerodynamic diameter less than or equal to a nominal 10 micrometers.
ROG	Reactive Organic Gases
SO _x	Oxides of Sulfur
SO ₂	Sulfur Dioxide
TOG	Total Organic Gases
Ton	2000 pounds (lb)
VOC	Volatile Organic Compounds

VI. References

1. Houck, 2001a. Houck, James E. (OMNI Consulting Services), Joseph Mangino (U.S. EPA), Garry Brooks (Eastern Research Group), and Roy H. Huntley (U.S. EPA); "Recommended Procedure for Compiling Emission Inventory National, Regional and County Level Activity Data for the Residential Wood Combustion Source Category"; In proceedings from U.S. Environmental Protection Agency Emission Inventory Conference, Denver, CO; 2001; <http://www.omni-test.com/publications/CompilingEmission.pdf>
2. HPBA, 2009a. Hearth, Patio, & Barbecue Association; "Fireplace Inserts Fact Sheet"; http://www.hpba.org/fileadmin/factsheets/product/FS_FireplaceInsert.pdf
3. OMNI, 2003. Broderick, David R. and James E. Houck (OMNI Consulting Services, Inc.); "Results of Wood Burning Survey - Sacramento, San Joaquin, and San Francisco Areas, University of California Berkeley/California Air Resources Board - GIS Study"; Jan. 15, 2003; <http://www.omni-test.com/publications/final.pdf>
4. OMNI, 2006. Houck, James E. and Brian N. Eagle (OMNI Environmental Services Inc.); "Residential Wood Combustion Emission Inventory, South Coast Air Basin and Coachella Portion of Salton Sea Air Basin, 2002 Base Year"; October 24 2006; <http://www.omni-test.com/publications/SCAQMD-RWC4.pdf>
5. U.S. EPA, 1996a. United States Environmental Protection Agency; AP-42, Compilation of Air Pollutant Emission Factors, Fifth Edition, Volume I: Stationary Point and Area Sources, Section 1.0, 1.10 Residential Wood Stoves; October 1996; <http://www.epa.gov/ttn/chief/ap42/ch01/final/c01s10.pdf>
6. WHO, 2013. Wood Heat Organization; "Wood Heating Systems"; <http://www.woodheat.org/wood-appliances.html> (as of January 2013)

VII. Appendix A

Information regarding the new wood burning devices installed in the Portola NAA and their respective *PM2.5 emission factors*. The emission factors were calculated as follows:

1. The certification test emission rate was scaled upward by 50 percent to reflect the real-world in-home performance¹⁴;
2. The scaled emission rate was divided by the average burn rate of 1.5 kilograms per hour (kg/hr) to calculate grams of PM2.5 emissions per kilogram of wood (g/kg)¹⁵; and
3. The result was multiplied by 2 to convert g/kg to lb/ton.

Program Tracking # (YYYY-XXX)	New Fuel	Install Date	Replacement Device Type	Emission Factor, lb PM _{2.5} /ton wood
2016-001	wood	5/23/2016	NC	5.8
2016-003	wood	8/9/2016	NC	3.8
2016-006	wood	5/11/2016	NC	7
2016-007	wood	8/5/2016	NC	6.6
2016-008	wood	6/24/2016	NC	1.16
2016-009	wood	5/10/2016	NC	6.4
2016-011	wood	5/27/2016	NC	7.6
2016-012	wood	5/19/2016	NC	6.18
2016-015	wood	5/11/2016	NC	6.4
2016-016	wood	8/4/2016	NC	6
2016-017	wood	7/14/2016	NC	7
2016-019	wood	6/13/2016	NC	4.6
2016-020	wood	6/23/2016	NC	8.8
2016-021	wood	5/25/2016	NC	7.6
2016-022	wood	8/18/2016	NC	7.2
2016-023	wood	6/28/2016	NC	5.54
2016-024	wood	5/19/2016	NC	4.8
2016-025	wood	7/14/2016	NC	7
2016-026	wood	9/1/2016	NC	0.16
2016-028	wood	5/16/2016	NC	7
2016-029	wood	6/21/2016	NC	8.8
2016-030	wood	10/19/2016	NC	7.8

¹⁴ <https://www3.epa.gov/ttnchie1/conference/ei17/session4/houck.pdf>

¹⁵ Based on information received from Gary Blais of U.S. EPA Burnwise Program on August 2, 2016, titled "Conversion Factor TB." The spreadsheet was prepared by Tom Butcher, Research Engineer, Brookhaven National Laboratory.

Program Tracking # (YYYY-XXX)	New Fuel	Install Date	Replacement Device Type	Emission Factor, lb PM_{2.5}/ton wood
2016-032	wood	7/25/2016	NC	8.8
2016-033	wood	8/2/2016	NC	6.4
2016-035	wood	7/8/2016	NC	5.8
2016-036	wood	6/22/2016	NC	7.6
2016-037	wood	10/11/2016	NC	8.4
2016-038	wood	6/23/2016	NC	6.4
2016-039	wood	7/26/2016	NC	7
2016-040	wood	7/19/2016	NC	7.2
2016-041	wood	7/8/2016	NC	8.2
2016-042	wood	6/14/2016	NC	5.4
2016-044	wood	7/14/2016	NC	7.6
2016-045	wood	7/12/2016	NC	8.8
2016-046	wood	7/28/2016	NC	4.2
2016-047	wood	7/22/2016	NC	6.4
2016-048	wood	12/5/2016	NC	7.2
2016-049	wood	8/3/2016	NC	7
2016-050	wood	7/11/2017	NC	4.2
2016-051	wood	7/26/2016	NC	6.4
2016-054	wood	8/17/2016	NC	4.6
2016-055	wood	9/14/2016	NC	7.2
2016-056	wood	8/26/2016	NC	6.2
2016-057	wood	12/16/2016	NC	7
2016-058	wood	7/29/2016	NC	6
2016-059	wood	8/19/2016	NC	4.6
2016-061	wood	8/12/2016	NC	7.8
2016-062	wood	8/9/2016	NC	7.6
2016-064	wood	8/2/2016	NC	6
2016-065	wood	8/17/2016	NC	7.2
2016-066	wood	12/20/2016	NC	7.8
2016-068	wood	9/15/2016	NC	4.6
2016-069	wood	9/14/2016	NC	7.4
2016-070	wood	11/18/2016	NC	6.4
2016-072	wood	9/9/2016	NC	7.8
2016-073	wood	4/19/2018	NC	6.58
2016-074	wood	8/9/2016	NC	4.2
2016-075	wood	11/3/2016	NC	8.94
2016-076	wood	9/7/2016	NC	7.6

Program Tracking # (YYYY-XXX)	New Fuel	Install Date	Replacement Device Type	Emission Factor, lb PM_{2.5}/ton wood
2016-078	wood	10/13/2016	NC	7
2016-079	wood	8/18/2016	NC	7.6
2016-080	wood	6/27/2017	NC	3.8
2016-082	wood	9/9/2016	NC	7
2016-083	wood	10/11/2016	NC	7
2016-084	wood	9/13/2016	NC	7.4
2016-085	wood	10/19/2016	NC	7
2016-089	wood	9/8/2016	NC	6
2016-091	wood	10/6/2016	NC	6
2016-093	wood	12/1/2016	NC	7
2016-096	wood	10/18/2016	NC	8.8
2016-098	wood	11/18/2016	NC	6.4
2016-099	wood	5/17/2017	NC	8.4
2016-101	wood	10/10/2016	NC	8.8
2016-103	wood	10/12/2016	NC	8.8
2016-104	wood	11/22/2016	NC	6.4
2016-106	wood	10/21/2016	NC	7
2016-107	wood	2/24/2017	NC	3.8
2016-108	wood	8/18/2017	NC	7
2016-109	wood	12/7/2016	NC	6.2
2016-111	wood	11/3/2016	NC	8.4
2016-112	wood	11/21/2016	NC	7.8
2016-113	wood	11/17/2016	NC	6
2016-115	wood	10/17/2016	NC	8.8
2016-118	wood	10/31/2016	NC	7.78
2016-120	wood	12/20/2016	NC	8.8
2016-121	wood	11/8/2016	NC	8.8
2016-122	wood	11/16/2016	NC	8.8
2016-123	wood	12/16/2016	NC	7
2016-126	wood	1/27/2017	NC	7
2016-127	wood	9/6/2018	NC	6.6
2016-128	wood	12/19/2016	NC	8.94
2016-129	wood	6/14/2017	NC	7.6
2016-131	wood	11/7/2017	NC	7
2016-132	wood	12/12/2016	NC	8.8
2016-133	wood	12/7/2016	NC	7
2016-134	wood	12/7/2016	NC	8

Program Tracking # (YYYY-XXX)	New Fuel	Install Date	Replacement Device Type	Emission Factor, lb PM_{2.5}/ton wood
2016-135	wood	7/14/2017	NC	7.6
2016-136	wood	12/15/2016	NC	6.4
2016-137	wood	12/20/2016	NC	4.6
2016-138	wood	1/27/2017	NC	7.2
2016-139	wood	1/24/2017	NC	6.4
2016-140	wood	12/16/2019	NC	7.8
2016-145	wood	3/16/2017	NC	7
2016-146	wood	6/20/2017	NC	7
2016-147	wood	3/30/2017	NC	7
2016-148	wood	12/28/2016	NC	5.6
2016-149	wood	1/31/2017	NC	7
2016-150	wood	8/3/2017	NC	7
2016-151	wood	7/6/2017	NC	7.18
2017-001	wood	5/21/2017	NC	6.4
2017-002	wood	8/9/2018	NC	6.8
2017-003	wood	3/9/2017	NC	7.8
2017-155	wood	5/26/2017	NC	8.8
2017-156	wood	5/10/2017	NC	6.4
2017-157	wood	3/27/2017	NC	6.4
2017-159	wood	3/31/2017	NC	6.4
2017-161	wood	4/12/2017	NC	3.8
2017-163	wood	9/5/2017	NC	8.4
2017-164	wood	5/25/2017	NC	6
2017-165	wood	5/20/2017	NC	6.4
2017-166	wood	6/30/2017	NC	1.6
2017-168	wood	5/19/2017	NC	4.6
2017-169	wood	6/28/2017	NC	6.18
2017-170	wood	9/12/2018	NC	6.58
2017-171	wood	6/7/2017	NC	7.6
2017-172	wood	6/13/2017	NC	7.6
2017-173	wood	7/14/2017	NC	7.18
2017-174	wood	8/22/2017	NC	6
2017-177	wood	7/17/2017	NC	6.8
2017-179	wood	9/4/2018	NC	7.6
2017-182	wood	8/7/2017	NC	5.8
2017-183	wood	8/24/2017	NC	8.58
2017-184	wood	10/12/2017	NC	8.8

Program Tracking # (YYYY-XXX)	New Fuel	Install Date	Replacement Device Type	Emission Factor, lb PM_{2.5}/ton wood
2017-187	wood	7/25/2017	NC	7.78
2017-188	wood	8/23/2017	NC	3.8
2017-190	wood	9/6/2017	NC	7.78
2017-191	wood	8/17/2017	NC	6.2
2017-192	wood	8/16/2017	NC	7.98
2017-193	wood	11/30/2017	NC	7.78
2017-194	wood	7/27/2017	NC	8.8
2017-195	wood	11/30/2017	NC	7
2017-197	wood	12/5/2017	NC	7.78
2017-198	wood	1/24/2019	NC	8.8
2017-199	wood	12/5/2017	NC	7.18
2017-200	wood	11/20/2017	NC	7.72
2017-203	wood	11/15/2017	NC	4.2
2017-205	wood	9/7/2017	NC	5
2017-207	wood	8/30/2017	NC	7
2017-208	wood	12/21/2017	NC	6.78
2017-210	wood	2/7/2018	NC	8.8
2017-211	wood	11/21/2017	NC	7.78
2017-212	wood	11/20/2017	NC	7.78
2017-213	wood	12/1/2017	NC	7.6
2017-216	wood	12/26/2017	NC	8.4
2017-217	wood	12/6/2017	NC	6.58
2017-221	wood	11/9/2017	NC	8.8
2017-223	wood	1/26/2018	NC	7
2017-225	wood	8/2/2018	NC	8.4
2017-228	wood	2/6/2018	NC	6.6
2017-229	wood	1/31/2018	NC	6.78
2017-231	wood	2/21/2018	NC	7.38
2017-232	wood	1/10/2018	NC	3.8
2017-234	wood	12/8/2017	NC	8.8
2017-236	wood	3/6/2018	NC	3.8
2018-239	wood	9/21/2018	NC	3.08
2018-241	wood	4/26/2018	NC	7.78
2018-242	wood	10/4/2018	NC	3.8
2018-244	wood	2/6/2018	NC	7.78
2018-245	wood	2/7/2018	NC	7.78
2018-246	wood	9/20/2018	NC	3.08

Program Tracking # (YYYY-XXX)	New Fuel	Install Date	Replacement Device Type	Emission Factor, lb PM_{2.5}/ton wood
2018-250	wood	5/13/2018	NC	7
2018-251	wood	6/6/2018	NC	7
2018-254	wood	4/4/2018	NC	8.58
2018-256	wood	4/30/2018	NC	7.8
2018-260	wood	5/9/2018	NC	6.58
2018-261	wood	6/26/2018	NC	6.58
2018-263	wood	5/24/2018	NC	8.4
2018-265	wood	3/28/2018	NC	1.16
2018-266	wood	3/14/2018	NC	5.68
2018-267	wood	5/1/2018	NC	7.8
2018-270	wood	3/19/2018	NC	7.8
2018-271	wood	6/4/2018	NC	7.78
2018-272	wood	8/31/2018	NC	7
2018-273	wood	5/18/2018	NC	6.58
2018-276	wood	9/12/2018	NC	2.2
2018-278	wood	5/8/2018	NC	8.58
2018-280	wood	10/10/2018	NC	7
2018-282	wood	8/3/2018	NC	5.38
2018-287	wood	3/29/2019	NC	6.4
2018-289	wood	9/5/2018	NC	7.18
2018-290	wood	9/21/2018	NC	6.58
2018-292	wood	10/25/2018	NC	3.8
2018-293	wood	12/7/2018	NC	6.58
2018-297	wood	10/3/2018	NC	3.8
2018-298	wood	11/1/2018	NC	7
2018-299	wood	11/1/2018	NC	6.4
2018-301	wood	10/2/2018	NC	7.8
2018-310	wood	11/13/2019	NC	6.4
2018-312	wood	3/21/2019	NC	7.18
2018-314	wood	10/12/2018	NC	4.6
2018-315	wood	11/26/2018	NC	3.8
2018-320	wood	12/6/2018	NC	3.08
2018-323	wood	12/5/2019	NC	6
2018-324	wood	1/8/2019	NC	3.8
2018-327	wood	3/13/2019	NC	7
2018-328	wood	3/5/2019	NC	3.98
2019-331	wood	5/7/2019	NC	8.58

Program Tracking # (YYYY-XXX)	New Fuel	Install Date	Replacement Device Type	Emission Factor, lb PM_{2.5}/ton wood
2019-332	wood	10/3/2019	NC	8.58
2019-333	wood	9/10/2019	NC	6.58
2019-335	wood	4/11/2019	NC	7.8
2019-340	wood	6/6/2019	NC	8.58
2019-342	wood	6/20/2019	NC	6.6
2019-345	wood	5/30/2019	NC	3.8
2019-348	wood	10/14/2019	NC	3.8
2019-349	wood	7/26/2019	NC	8.58
2019-359	wood	10/30/2019	NC	2.98
2019-360	wood	5/13/2019	NC	7.4
2019-361	wood	6/4/2019	NC	6
2019-362	wood	11/20/2019	NC	6.58
2019-366	wood	10/2/2019	NC	8.58
2019-367	wood	7/11/2019	NC	8.58
2019-369	wood	8/29/2019	NC	6.78
2019-371	wood	5/22/2019	NC	7.4
2019-375	wood	6/13/2019	NC	5.2
2019-376	wood	10/9/2019	NC	1.6
2019-378	wood	6/18/2019	NC	8.4
2019-385	wood	8/13/2019	NC	8.58
2019-386	wood	10/1/2019	NC	6.6
2019-397	wood	8/9/2019	NC	7.18
2016-010	wood	11/1/2017	CAT	3.52
2016-018	wood	7/21/2016	CAT	3.6
2016-043	wood	8/16/2016	CAT	2.96
2016-067	wood	8/18/2016	CAT	0.9
2016-071	wood	8/17/2016	CAT	0.9
2016-087	wood	10/5/2016	CAT	4.84
2016-090	wood	10/19/2016	CAT	4.84
2016-095	wood	9/22/2016	CAT	3.52
2016-102	wood	9/21/2016	CAT	2.96
2016-105	wood	11/16/2016	CAT	2.6
2016-130	wood	1/17/2017	CAT	3.52
2017-176	wood	6/21/2017	CAT	4.8
2017-178	wood	9/20/2017	CAT	1.94
2017-201	wood	8/17/2017	CAT	7.6
2017-209	wood	10/4/2017	CAT	4.84

Program Tracking # (YYYY-XXX)	New Fuel	Install Date	Replacement Device Type	Emission Factor, lb PM_{2.5}/ton wood
2017-214	wood	11/14/2017	CAT	0.09
2017-215	wood	10/6/2017	CAT	1.58
2017-220	wood	10/31/2017	CAT	0.7
2017-230	wood	3/13/2018	CAT	4.84
2018-243	wood	7/19/2018	CAT	15
2018-255	wood	4/23/2018	CAT	0.18
2018-258	wood	4/25/2018	CAT	4.84
2018-262	wood	9/25/2018	CAT	4
2018-264	wood	3/29/2018	CAT	4.84
2018-268	wood	8/16/2018	CAT	3.52
2018-274	wood	8/8/2018	CAT	2.6
2018-277	wood	9/19/2018	CAT	2.6
2018-279	wood	6/18/2018	CAT	2.6
2018-284	wood	7/24/2018	CAT	2.6
2018-294	wood	7/16/2018	CAT	2.6
2018-300	wood	10/11/2018	CAT	4.8
2018-302	wood	9/18/2018	CAT	4.4
2018-304	wood	10/15/2018	CAT	4.8
2018-305	wood	10/22/2018	CAT	4.84
2018-308	wood	11/30/2018	CAT	1.8
2018-309	wood	11/5/2018	CAT	4.8
2018-313	wood	12/4/2018	CAT	4.84
2018-316	wood	12/4/2018	CAT	2.6
2018-318	wood	11/14/2018	CAT	2.6
2018-325	wood	2/19/2019	CAT	1.6
2018-326	wood	1/25/2019	CAT	3.58
2019-329	wood	2/12/2019	CAT	5.18
2019-338	wood	10/14/2019	CAT	1.8
2019-339	wood	8/7/2019	CAT	2.6
2019-344	wood	5/14/2019	CAT	3.52
2019-346	wood	7/9/2019	CAT	1.4
2019-350	wood	5/29/2019	CAT	4.84
2019-351	wood	6/11/2019	CAT	2.74
2019-352	wood	5/30/2019	CAT	3.52
2019-353	wood	5/21/2019	CAT	3.52
2019-358	wood	6/3/2019	CAT	3.52
2019-364	wood	5/29/2019	CAT	3.52

Program Tracking # (YYYY-XXX)	New Fuel	Install Date	Replacement Device Type	Emission Factor, lb PM_{2.5}/ton wood
2019-368	wood	5/30/2019	CAT	1.46
2019-372	wood	10/10/2019	CAT	0.88
2019-373	wood	5/31/2019	CAT	1.46
2019-377	wood	11/21/2019	CAT	1.44
2019-382	wood	6/5/2019	CAT	3.52
2019-389	wood	7/21/2019	CAT	3.52
2019-390	wood	7/21/2019	CAT	3.52
2019-392	wood	8/2/2019	CAT	0.88
2019-395	wood	8/22/2019	CAT	2.6
2019-398	wood	10/3/2019	CAT	2.52
2019-402	wood	9/30/2019	CAT	2.52
2019-408	wood	12/18/2019	CAT	1.44
2019-410	wood	12/3/2019	CAT	1.44
2019-413	wood	12/19/2019	CAT	0.88
2019-416	wood	12/6/2019	CAT	1.46
2019-424	wood	12/30/2019	CAT	1.6
2016-002	wood	5/18/2016	Hybrid	1.6
2016-004	wood	5/19/2016	Hybrid	1.6
2016-005	wood	5/17/2016	Hybrid	0.9
2016-014	wood	5/25/2016	Hybrid	0.9
2019-330	wood	2/21/2019	Hybrid	1.6
2019-357	wood	5/28/2019	Hybrid	1.18
2016-013	pellet	5/25/2016	pellet	3.06
2016-031	pellet	8/2/2016	pellet	3.06
2016-052	pellet	5/17/2017	pellet	3.06
2016-063	pellet	8/1/2017	pellet	3.06
2016-088	pellet	11/15/2016	pellet	3.06
2016-094	pellet	11/4/2016	pellet	3.06
2016-100	pellet	11/1/2016	pellet	3.06
2016-117	pellet	11/17/2016	pellet	3.06
2016-124	pellet	12/13/2016	pellet	3.06
2016-141	pellet	3/14/2017	pellet	3.06
2016-144	pellet	3/10/2017	pellet	3.06
2017-160	pellet	4/13/2017	pellet	3.06
2017-162	pellet	10/10/2017	pellet	3.06
2017-167	pellet	5/12/2017	pellet	3.06
2017-175	pellet	8/8/2017	pellet	3.06

Program Tracking # (YYYY-XXX)	New Fuel	Install Date	Replacement Device Type	Emission Factor, lb PM_{2.5}/ton wood
2017-196	pellet	9/8/2017	pellet	3.06
2017-204	pellet	10/13/2017	pellet	3.06
2017-218	pellet	1/31/2018	pellet	3.06
2017-222	pellet	12/5/2017	pellet	3.06
2017-233	pellet	12/11/2017	pellet	3.06
2017-235	pellet	1/9/2018	pellet	3.06
2017-237	pellet	2/27/2018	pellet	3.06
2018-238	pellet	4/19/2018	pellet	3.06
2018-275	pellet	8/14/2018	pellet	3.06
2018-281	pellet	5/30/2018	pellet	3.06
2018-285	pellet	9/27/2018	pellet	3.06
2018-286	pellet	7/17/2018	pellet	3.06
2018-291	pellet	8/31/2018	pellet	3.06
2018-296	pellet	10/24/2018	pellet	3.06
2018-303	pellet	11/21/2018	pellet	3.06
2018-317	pellet	5/10/2019	pellet	3.06
2019-336	pellet	12/3/2019	pellet	3.06
2019-337	pellet	5/30/2019	pellet	3.06
2019-365	pellet	9/12/2019	pellet	3.06
2019-370	pellet	8/12/2019	pellet	3.06
2019-379	pellet	8/20/2019	pellet	3.06
2019-381	pellet	8/22/2019	pellet	3.06
2019-383	pellet	7/10/2019	pellet	3.06
2019-388	pellet	9/17/2019	pellet	3.06
2019-391	pellet	9/18/2019	pellet	3.06
2019-393	pellet	9/25/2019	pellet	3.06
2019-399	pellet	10/8/2019	pellet	3.06
2019-407	pellet	10/11/2019	pellet	3.06
2016-053	propane	9/1/2016	propane	0
2016-092	propane	10/13/2016	propane	0
2017-185	propane	8/8/2017	propane	0
2017-186	propane	10/4/2017	propane	0
2017-202	propane	10/19/2017	propane	0
2017-224	propane	2/23/2018	propane	0
2018-248	propane	5/30/2018	propane	0
2018-253	propane	7/13/2018	propane	0
2018-269	propane	11/7/2018	propane	0

Program Tracking # (YYYY-XXX)	New Fuel	Install Date	Replacement Device Type	Emission Factor, lb PM_{2.5}/ton wood
2018-295	propane	9/24/2019	propane	0
2018-311	propane	1/17/2019	propane	0
2019-341	propane	10/8/2019	propane	0
2019-394	propane	10/17/2019	propane	0
2019-401	propane	8/27/2019	propane	0
2016-125	kerosene	1/6/2017	kerosene	0
2018-259	kerosene	3/27/2018	kerosene	0
2019-403	kerosene	10/9/2019	kerosene	0
2019-414	kerosene	12/10/2019	kerosene	0

Appendix C

Incentive Measure and Enforceable Commitment

RESIDENTIAL WOOD STOVE CHANGE-OUT INCENTIVE MEASURE

OVERVIEW

The Northern Sierra Air Quality Management District (District) began implementation of the Greater Portola Wood Stove Change-out Program (Program) in 2016. The Program serves the Plumas County PM_{2.5} Nonattainment Area and was initially funded with EPA 2015 Targeted Airshed Grant (TAG). Since that first grant, the Program received additional TAG funding in fiscal years 2018 and 2020. Table 1 lists funding dedicated to implementing this Program. The objective of the Program is to reduce PM_{2.5} emissions from residential wood heating to attain the 2012 annual PM_{2.5} National Ambient Air Quality Standard (NAAQS) of 12 µg/m³. Replacing 416¹ old wood burning devices with less-polluting and more efficient alternative between 2015 and 2020 led to a 15 percent decrease in an annual average PM_{2.5} design value between 2015 and 2021. However, the decrease in concentrations was not sufficient to attain the 12 µg/m³ annual PM_{2.5} standard by the moderate attainment date of December 31, 2021². Additional emissions reductions will be necessary to attain the standard by the serious attainment date of December 31, 2025. As outlined in the Attainment Demonstration Section of this SIP, replacing 100 uncertified wood burning stoves with less-polluting and more energy efficient home heating alternatives between January 1, 2021, and December 31, 2024, is estimated to reduce PM_{2.5} emissions by 0.025 tons per day (tpd) resulting in estimated 2025 design value of 11.8 µg/m³.

Table 1. Funding for Wood Stove Change-out Program

Agency	2015 TAG	2018 TAG	2020 TAG	Combined
TAG Grand Total	\$2,483,607.00	\$3,172,238.00	\$2,842,468.00	\$8,498,313.00
TAG District	\$2,308,607.00	\$2,970,612.00	\$2,655,967.00	\$7,935,186.00
TAG CARB	\$175,000.00	\$201,626.00	\$186,501.00	\$563,127.00
District Match	\$40,000.00	\$40,000.00	\$40,000.00	\$120,000.00
Total Project Cost	\$2,523,607.00	\$3,212,238.00	\$2,882,468.00	\$8,618,313.00

The District has about \$5 million remaining³ in the 2018 and 2020 TAG Funding to implement a multi-faceted program focused on reducing emissions from wood burning home heating devices by providing incentives for replacing older wood heating devices, installing wood sheds, offering vouchers for chimney sweeps, and educating the public about device operation and the benefits of using properly seasoned wood. To qualify, the uncertified wood stove must be operable and currently in use in the residence. For eight years, 2016 through 2023, the District offered incentives ranging from \$1,500 to \$13,500 utilizing 2015, 2018, and 2020 TAG funding. Over the next three years, 2024 through 2026, the District will continue to offer incentives ranging from \$3,500 through \$13,500 utilizing the remaining 2018 and 2020 TAG funding. Table 2 summarizes the incentive measure and the estimated reductions in emissions. While the District will continue to incentivize changes outs after December 31, 2024, the District is not making an enforceable commitment for these reductions and will not account for them in the 2028 milestone.

¹ Based on change-outs completed through 12/31/2020

² <https://www.federalregister.gov/documents/2022/12/29/2022-28269/finding-of-failure-to-attain-and-reclassification-as-serious-nonattainment-for-the-2012-annual-fine>

³ As of May, 2024.

Table 2. Incentive Measure Summary

Source Category:	Residential Fuel Combustion - Wood Stoves	
Implementing Agency:	Northern Sierra Air Quality Management District and CARB	
Type of Action:	Northern Sierra Air Quality Management District Incentive Program	
Portola Nonattainment Area Estimated Emission Reductions (tons per day)		
Pollutant	2025 Attainment Year	2028 Post Attainment Milestone
PM _{2.5}	0.025	0.025

DEMONSTRATION THAT WOOD STOVE PROGRAM MEETS EPA REQUIREMENTS

According to EPA guidelines, emission reductions achieved from incentive programs may be credited towards demonstrating attainment in the SIP if they are enforceable, quantifiable, surplus, permanent, and adequately supported⁴.

The District has developed a series of documents to provide guidance to all parties, to verify each step in the process and to collect information to calculate emission reductions achieved by implementing the Program. Together the documents are considered to be the District’s program guidelines. This section includes the integrity demonstration for the Program projects using the Guidance Document for the Greater Portola Wood Stove Change-out Program (Guidance Document) dated 9/19/2024 as the incentive-based emission reduction measure. The Guidance Document is included in Appendix F and contains the following documents:

- Cover Sheet
- Wood Stove Change-Out Flow Chart
- List of Approved Retailers
- Program Application for Zone 1
- Heat Pump Program Application for Zone 1-A
- Program Application for Zone 2
- Owner/Tenant Agreement
- Program Tracking Form
- Acknowledgement of Training Form
- Verification of Destruction Form
- Work plans for 2018, and 2020 TAGs
 - FY18 TAG CARB Portola Workplan Final Revised 12_7_23
 - FY2020 TAG Workplan Revised 061721 FINAL
 - Retailer/Contractor Contract Agreement
 - Revised Workplans
 - Addendum to the 2015, 2018, and 2020 TAGs

In addition, the following documents will also be referenced:

⁴ See “Guidance on Incorporating Voluntary Mobile Source Emission Reduction Programs in State Implementation Plans (SIPs),” October 24, 1997, at page 6-7; “Improving Air Quality with Economic Incentive Programs,” January 2001 at Section 4.1; “Incorporating Emerging and Voluntary Measures in a State Implementation Plan (SIP),” September 2004 at pages 3-4’ and “Diesel Retrofits: Quantifying and Using Their Emission Benefits in SIPs and Conformity,” February 2014 at pages 27-29.

- Northern Sierra Air Quality Management District: Request for Qualification for List of Qualified Retailers/Contractors for Greater Portola Wood Stove Change-out Program (RFQ)
- Northern Sierra Air Quality Management District: Request for Qualification for List of Qualified Retailers/Contractors for Greater Portola Wood Stove Change-out Program (RFQ)
 - Retailer/Contractor Contract Agreement (dated 3/1/16)
 - Revised Workplans
 - Addendum to the 2015, 2018, and 2020 TAGs

All wood stove change-out projects will satisfy the EPA integrity element demonstration, therefore emission reductions achieved through these projects are SIP creditable. The District and CARB fully implemented the 2015 TAG funding and closed the grant. The narrative describing the 2015 TAG outcomes is included in the 2015 Close Out Report in Appendix K. This accomplishment further demonstrates District and CARB commitment and skills in implementing the Program and achieving emission reductions.

Enforceable

Emission reductions and/or required actions are enforceable if they are independently verifiable and practically enforceable consistent with EPA guidance; program violations are defined; those liable can be fined; the state or EPA may apply penalties and secure corrective action where applicable; citizens have access to all emissions-related information obtained from participating sources. The following procedures will be followed to document all steps and ensure the old stoves are replaced with less-polluting and more energy efficient home heating alternatives, homeowners are trained on proper usage of the new device, the old device was destroyed or rendered permanently inoperable, and the project was completed.

To be considered for funding, a complete application, including certification by the applicant that all statements are correct, must be submitted to the District. The requirements and certification for the applicants are in listed in the following Program Applications:

- Program Application for Zone 1, page 1 and 2, Sections 1-14,
- Program Applications for Zone 2, page 1 and 2, Sections 1-15
- Program Application for Zone 1-A, page 1 and 2, Sections 1-15
- Program Application for Zone 1, page 3, "Applicant Certification," Section a -m,
- Program Application for Zone 2, page 3, "Applicant Certification," Section a - m

To be eligible for the Program, an Applicant must use a Program-eligible wood heating devices as a primary source of heat. The device must be currently installed and operational. Applicants who remove the device prior to an in-home estimate will be disqualified.

The following devices are eligible for incentives toward a replacement with less polluting and more energy efficient heating devices:

- Uncertified wood stove
- EPA certified wood stove manufactured 15+ years ago with the emission control technology in disrepair⁵
- EPA certified wood stove manufactured 10+ years ago, in any condition, to be replaced with a pellet, electric heat pump, propane, or kerosene heating device

⁵ An EPA certified wood stove that is 15+ years old may be repaired when the emission control technology is not functioning properly. If not repairable at a reasonable rate, it will be replaced with a new EPA certified device.

- Uncertified pellet stove (15+ years old) to be replaced with EPA certified pellet stove, electric heat pump or propane or kerosene heating device (not an EPA certified wood stove), or.
- Fireplace used as a primary heating device

An uncertified wood stove or insert is one that has not been certified by the EPA to comply with the performance and emission standards as defined in Title 40 Code of Federal Regulations, Part 60, Subpart AAA, February 28, 1988, or any subsequent revisions. To determine if the existing stove is uncertified, Applicant may do the following:

- Determine when the wood stove was installed. Wood stoves installed before July 1, 1988 do not comply with the particulate emission standards and are considered uncertified;
- Check the stove model against the EPA current and historical list of certified⁶ wood heaters. If the stove's manufacturer and model is not on the current and historical lists, the stove is considered uncertified; or
- Check the back of the wood stove for a certification label. Wood stoves which do not have any label describing particulate matter emission standards are considered uncertified

Applicants will determine the eligibility of their current wood stove. Applications will be reviewed by the District to determine if preliminary qualification requirements have been met. The wood stove's eligibility will be verified by the District or a Retailer Installer during an in-home estimate. An Applicant using a fireplace as a primary source of heat could also qualify for this Program. Burning wood in a fireplace is very inefficient for home heating purposes; fireplaces are therefore not typically used as a primary source of heat. In situations when an Applicant uses a fireplace as a primary source of heat, the Applicant may qualify for the Program. If the existing fireplace is structurally sound, the Program may offer an incentive to be used towards purchase and installation of an eligible fireplace insert. However, if the fireplace lacks structural integrity, the incentive could be used towards the purchase of an eligible free-standing home heating device or a heat pump. In this case, the fireplace and chimney must be rendered permanently inoperable to prevent use of the fireplace. Verification of inoperability would be the responsibility of the District. Due to ongoing concerns about PM_{2.5} emissions from woodburning devices, combined with Portola households' reluctance to remove woodburning devices upon installation of a heat pump due to concerns about power outages and heat pump performance in extreme cold, removal of a certified wood burning device will not be required to qualify for a zero-emission electric heat pump installation. This provision will apply only to City of Portola households because they are subject to the City of Portola mandatory woodburning curtailment and they reside in the most densely populated area with the highest woodsmoke emissions. The emission reductions from these types of change-outs, also referred to as combos, where the heat pump is added to an existing certified wood stove, are not credited towards the enforceable commitment. Instead, the enforceable commitment was calculated exclusively based on replacements. Alternative calculations factoring the emission reductions from combos may be considered in the final estimate in consultation with EPA.

Before and after photos will provide evidence of installation. Finally, all installations must be completed by a District-approved Retailer and self-installation of the new device is not eligible. Page 3 of the Program Application, the Applicant Certification Form, sections "a" through "m", must be completed by the applicant to self-certify the eligibility criteria. Zone 1-A applicants are allowed to retain the wood burning devices when applying for an electric heat pump.

Applicant must agree to allow District staff to enter the premises to inspect the installed device and to verify household follows the best wood burning practices and device maintenance in accordance with the installer-provided training.

The applicant can be a homeowner or tenant, but tenants or owners who have tenants who wish to be applicants

⁶ U.S. EPA Certified Wood Stove Database: <https://www.epa.gov/compliance/epa-certified-wood-heater-database>

must fill out the Owner/Tenant Agreement in addition to the Program Application for Zone 1, 1-A, and 2. The Agreement requires the homeowner and tenant to “allow the District and District-approved Retailers into the property noted above for inspection, estimate, installation and permitting. This includes allowing photos to be taken of the old, uncertified certified device before removal and photos of the new EPA certified device (Device) after installation.” Owner and tenant must also agree to review and agree to the applicant and Application Certification as noted above. Finally, tenants agree not to remove the Device and as it must stay with the property.

Once the District has selected an applicant for funding through the Program, the applicant must contact a District-approved Retailer. As part of the enforceable commitment for the Moderate SIP, the District released a request for qualifications (RFQ) for retailers and contractors. Based on the requirements, the District selected qualified retailer/contractor with agreements creating the District-approved retailer/contractor list. The agreement between the District and the retailer/contractor and the requirements are in the RFQ.

Per these provisions, only qualified retailers/contractors as identified on the District’s Program and with signed District agreements will be eligible to participate in the Program. To participate in the Program, the retailer/contractor/installer must agree to the following:

1. Maintain the Chimney Safety Institute of America (CSIA) and/or National Fireplace Institute (NFI) certification for the duration of the Program.⁷
2. Possess an active C61/D34 contractor license issued by the California Contractors State License Board throughout the life of the Program.⁸
3. Agree to promote switching to non-wood appliances by highlighting their benefits to project participants.⁹
4. Agree to train and educate the new owner on the proper operation of the new wood stove and acceptable fuels to maximize emission reductions. Verification of training will be required before payment will be issued to the retailer/contractor.¹⁰
5. Must be an authorized dealer of EPA certified devices and must be able to provide a list of all the EPA certified device brands for which each respondent is representing.¹¹
6. Must have all EPA certified devices sold to be under warranty, and retailer/contractor must have agreement with all manufacturers to honor the warranties.¹²
7. Agree to follow best practices on the new device installation procedures.¹³
8. Follow the District established process for removal and proper disposal of the older stove or, if applicable, render the device permanently inoperable.¹⁴

These requirements ensure that projects are carried out as anticipated, provide the District, CARB, and the public with data needed to verify the project emission reductions and help ensure that violations can be identified. Inspection requirements including verification of usage and requirements for photographic confirmation of the device ensure information provided by the applicant is consistent with actual operating device and the existing device is in working condition. Record keeping and tracking will be retained by the District/CARB, held for 5 years past the attainment date, and each replacement project must include all parameters necessary for quantifying the reductions.

⁷ Pg. 3, Retailer/Contractor Agreement

⁸ Pg. 3, Retailer/Contractor Agreement

⁹ Pg. 5, RFQ

¹⁰ Pg. 2, Retailer/Contractor Agreement

¹¹ Pg. 3, Retailer/Contractor Agreement

¹² Pg. 3, Retailer/Contractor Agreement

¹³ Pg. 7, Retailer/Contractor Agreement

¹⁴ Pg. 7, Retailer/Contractor Agreement

The 'Enforceable Commitment' Section also outlines steps that the District will take if the achieved emission reductions are short of projected milestone.

Quantifiable

To show that emission reductions from these incentive programs are quantifiable, the emission reductions must be measured in a reliable manner that can be replicated. In general, emission reductions are calculated by taking the difference between the emissions of a baseline technology and a reduced technology. The baseline technology is an uncertified wood stove, or a fireplace used as a primary source of heat. The reduced technologies are EPA-certified wood stove, pellet stove, propane stove, kerosene stove, and a heat pump.

Listed below are the step-by-step instructions and formulas for calculating emission reductions achieved by replacing uncertified wood stoves with cleaner-burning and more energy efficient alternatives. The first step in calculating emission reductions required converting certification test emission rates in grams per hour (g/hr) to emission factors in pounds per ton (lb/ton), as described below:

1. The certification test emission rate of the replacement device was scaled upward by 50 percent to reflect the variations in in-home performance;
2. The scaled emission rate was divided by an average burn rate of 1.5 kilograms per hour (kg/hr) to calculate grams of PM_{2.5} emissions per kilogram of wood (g/kg); and
3. The result was multiplied by 2 to convert g/kg to lb/ton.

In the next step, the following equation was used to calculate emission factor in pounds per ton:

$$\text{Equation 1: } EF = (ER \times 1.5) / BR \times 2$$

Where:

- | | |
|-----------|---|
| <i>EF</i> | Emission factor in pounds per ton |
| <i>ER</i> | Emission rate in grams per hour |
| <i>BR</i> | Average burn rate in kilograms per hour of operation |
| 1.5 | Factor used to scale certification test emission rate to reflect potential increase in emissions during in-home operation |
| 2 | Factor used to convert grams per kilogram to pounds per ton |

In the final three steps, the formulas shown in Equations 2 through 4, were used to calculate PM_{2.5} emissions of the old device, the new device, and the difference between them.

$$\text{Equation 2: } E_{old} = (EF_{old} \times WU \times WD) / 2000$$

$$\text{Equation 3: } E_{new} = (EF_{new} \times WU \times WD \times (EFC_{old} / EFC_{new})) / 2000$$

$$\text{Equation 3b: } E_{pellet} = (EF_{pellet} \times PU) / 2000$$

$$\text{Equation 4: } E_{benefit} = E_{old} - E_{new}$$

Where:

Symbol	Definition
E_{old}	Emissions of old device (ton/year)
E_{new}	Emissions of new device (ton/year)
E_{pellet}	Emissions of pellet stove (ton/year)
EF_{old}	Emission factor for the old device (lb/ton)
EF_{new}	Emission factor for the replacement device (lb/ton)
EF_{pellet}	Emission factor for the pellet stove (lb/ton)
WU	Wood usage (cords/year)
WD	Wood density (ton/cord)
PU	Pellet usage (ton/year)
EFC_{old}	Device efficiency for the old device (%)
EFC_{new}	Device efficiency for the new device (%)
$E_{benefit}$	Emission reductions from change-out (ton/year)

Since emission factors for pellet stoves are more representative of actual in-home usage, a default PM10 emission factor of 3.06 lb/ton, consistent with NSPS Review, was used for all pellet stoves. Portola households that use a pellet stove as the main source of heat are estimated to use two to three tons of pellet fuel per year. To ensure a conservative approach, three tons were assumed in estimating emission reductions. Consistent with California's Short Lived Climate Pollutant Reduction Strategy, propane and kerosene fueled heating devices were assumed to have negligible PM_{2.5} emissions. Table 8 lists constants and conversion factors used in calculating emission reductions and Table 9 lists estimated emission reductions achieved from each type of change-out as well as total emission reductions.

Table 3. Constants and Conversion Factors for Calculating Emission Reductions from Change-out Program.

Constants & Conversions	Value	Unit	Source
Woodstove Uncertified PM ₁₀ Emission Factor	30.60	lb/ton	AP-42, Table 1.10.-1
Woodstove Uncertified PM _{2.5} Emission Factor	29.47	lb/ton	CARB Methodology for Residential Wood Combustion
Woodstove 2020 NSPS Certified PM10 Emission Rate	2.00	g/hr	2020 NSPS
Woodstove 2020 NSPS Certified PM _{2.5} Emission Rate	1.93	g/hr	CARB Methodology for Residential Wood Combustion
Woodstove Average PM _{2.5} Emission Rate for Change-out Program	2.38	g/hr	Based on 413 devices installed through 2022
Emission Rate Scaling Factor	1.50		Assuming in use emissions are 50% higher
Woodstove 2020 NSPS Certified PM _{2.5} Emission Factor	3.85	lb/ton	PM _{2.5} Emission Rate*Scaling Factor /Burn Rate* Conversion from g/kg to lb/ton
Woodstove Average PM _{2.5} Emission Factor for Change-out Program	4.75	lb/ton	PM _{2.5} Emission Rate*Scaling Factor /Burn Rate* Conversion from g/kg to lb/ton
Pellet Stove PM10 Emission Factor	3.06	lb/ton	2020 NEI Nonpoint Wagon Wheel
Pellet Stove PM _{2.5} Emission Factor	2.95	lb/ton	CARB Methodology for Residential Wood Combustion
PM _{2.5} Emission Fraction of PM10	96.30	%	CARB Methodology for Residential Wood Combustion
Old Device Efficiency	54	%	AP-42, Table 1.10-5
New Device Efficiency	68	%	AP-42, Table 1.10-5
Wood Use in Uncertified Wood Stove	4.3	cords/year	District Survey
Pellet Use	3	tons/year	Quincy Hot Spots Personal Communication
Wood Density	1.54	ton/cord	CARB Emission Methodology
Average Burn Rate	1.5	kg/hour	Gary Blais Personal Communications
Conversion from lb to ton	2000		
Conversion from g/kg to lb/ton	2		

Table 4. Estimated Emission Reductions.

Change-out Type	Estimated Number	Emissions Before (tpy)	Emissions After (tpy)	Emissions Saved (tpy)	Emissions Saved (tpd)
Wood Stove Uncertified	20	1.951	0	1.951	0.005

to Heat Pump					
Wood Stove Uncertified to Certified Stove	50	4.878	0.506	4.372	0.012
Wood Stove Uncertified to Pellet Stove	30	2.927	0.133	2.794	0.008
Totals	100	9.757	0.639	9.118	0.025

Recordkeeping and tracking will be retained by the District/CARB, held for five years past the attainment date, and each replacement project must include:

1. Program tracking number for each change-out project that refers to the voucher number and funding source to serve as SIP identifier;
2. Specific guideline year as represented by the date on each District form;
3. Location of applicant (county or city or zip);
4. Model of old heating device (if available);
5. Old heating device serial number (if available);
6. Old heating fuel source/type (default wood);
7. Certification that old heating device is currently installed and in-use;
8. Model of new heating device;
9. New heating device serial number;
10. New heating device fuel source/type;
11. Date new heating device installed (available for use);
12. Homeowner/renter signed commitment to use new heating device as a primary source of heat;
13. Homeowner/renter signed commitment to rely on heat pump as a primary source of heat if installed as a heat pump and wood stove combo;
14. Affirmation by retailer/contractor that homeowner/renter was properly trained in use and fuel source;
15. Date of City verified destruction;
16. City certification that old heating device was destroyed with photo;
17. Date of payment/reimbursement to retainer/contractor;
18. Emissions rate of old wood stove;
19. Emissions rate of new device;
20. Useful life of new device; and
21. Emission reductions (emission benefit from replacing old heating device with new).

This data will be acquired during the applicant and retailer/contractor submittal, agreement, and installation process documentation listed earlier in this section. The data will be stored in a database where the District and CARB can input the listed information above, calculate the emission reductions, District performed inspections, and will be made available to the public in annual report described below or upon request.

These requirements ensure that projects are carried out as anticipated, provide the District, CARB, and the public with data needed to verify the project emission reductions and measured in a reliable manner that can be replicated.

Surplus

Emission reductions are surplus when they are not otherwise required by other regulations or legal mandates, any other state/local air quality program, a consent decree, or a federal rule designed to reduce criteria pollutant or precursor emissions. Also, emission reductions are considered surplus only for the project life of the device being replaced.

There are currently no other State or federal requirements to replace old wood stoves in the Portola NAA. The

current baseline SIP emission inventory for residential wood combustion was developed using 2020 occupied housing in Plumas County, the current statewide methodology for estimating residential wood combustion emissions with the inclusion of data from the Wood Stove Program through December 31, 2019.

Recordkeeping and reporting requirements described above in the “Enforceable” and “Quantifiable” sections ensure that current and future emission estimates correctly represent emissions occurring in the Portola NAA. Inspection requirements described in the “Enforceable” section ensure that the unit being replaced is still in-use and usable form and thus would not have been replaced by normal turnover. These requirements ensure that emission reductions from normal fleet turnover are not treated as surplus.

These requirements ensure that projects are carried out as anticipated, provide the District, CARB, and the public with data needed to verify the project emission reductions meet the surplus integrity element.

Permanent

Emission reductions from incentive programs are permanent if the State and EPA can ensure that emission reductions occur for as long as they are relied upon in the SIP, and no longer than the remaining project life of the wood stove being replaced. The Program requires that the old wood stove be rendered inoperable and recycled and that the destruction is verified to ensure old wood stoves are not reused and that the emission reductions are permanent. See “Verification of Destruction Form.”

- Program Application for Zone 1, page 3, “Applicant Certification,”
- Program Application for Zone 2, page 3, “Applicant Certification,”
- Program Application for Zone 1-A, page 3, “Applicant Certification,”
- Owner/Tenant Agreement
- Acknowledgement of Training Form

The first two sections above specify that the agreements must include language stating that the applicant is required to agree to participate in follow-up training and a survey ensuring that the emission reductions quantified are occurring and permanent. The third section certifies that the new stove will not be replaced, modified, or removed unless it is replaced by a cleaner burning appliance. These provisions enable EPA and the public to evaluate the validity for which CARB and the District attributes emission reductions to a particular project and to determine whether the emission reductions are occurring over time.

These requirements ensure that projects are carried out as anticipated, provide the District, CARB, and the public with data needed to verify the project emission reductions meet the permanent integrity element.

Adequately Supported

Demonstrations of adequate support include discussion of available funding, demonstrating legal authority, and highlighting the experience of District and CARB in implementing incentive programs.

Funding

The District received about \$8.5 million in TAG funding in fiscal years 2015, 2018, and 2020. Additionally, the District committed \$120,000 in match funding. Table 1 summarizes available funding. The 2015 funding has been fully implemented but the District has about \$5 million remaining¹⁵ in the 2018 and 2020 TAG Funding to continue implementing a multi-faceted program focused on reducing emissions from wood burning home

¹⁵ As of May, 2024.

heating devices by providing incentives for replacing older wood heating devices, installing wood sheds, offering vouchers for chimney sweeps, and educating the public about device operation and the benefits of using properly seasoned wood.

Legal Authority

The District was formed in 1986 by the merging of the Air Pollution Control Districts of Nevada, Plumas, and Sierra Counties. The District has the primary responsibility for control of air pollution from all sources other than vehicular sources. The control of vehicular sources is the responsibility of CARB. The District is composed of District staff, a Governing Board of Directors, and a Hearing Board. Currently, District staff is limited to four full-time employees in the main office in Grass Valley and three full-time employees and one part time employee located in the District's only field office in the City of Portola. There is one full-time staff member, and one part-time staff member dedicated to administering the EPA TAG Funds.

One of the continuous goals of the District is to conduct outreach and administer programs that will help bring the Portola NAA into attainment of the PM_{2.5} air quality standard. The District is working closely with Portola city officials, Plumas County agencies, local community organizations, and State and federal government organizations to outline a plan to attain 2012 annual PM_{2.5} NAAQS by December 31, 2025.

Experience in Implementing Incentive Programs

The District and CARB fully implemented the 2015 TAG funding and closed the grant. The main achievement of the 2015 TAG was replacing 540 old heating devices with less polluting and more energy efficient alternatives with an estimated reduction in PM_{2.5} emissions of 53 tons per year which equates to 0.1453 tpd. The narrative describing the 2015 TAG outcomes is included in Appendix K. This accomplishment demonstrates District and CARB commitment and skills in implementing the Program and achieving emission reductions.

The District has been implementing the California Climate Investment Woodsmoke Reduction Program in their jurisdiction since 2018. Between 2018 and 2024, the program provided over \$719,000 in incentives to replace the old wood stoves and fireplaces with cleaner-burning and more energy efficient home heating alternatives. By June 2024, 185 households benefited from this Program with 95 percent of funding benefiting priority populations. The District has demonstrated the technical ability to successfully implement a wood stove changeout program by establishing a plan, tracking progress, and adjusting accordingly to maximize short- and long-term program goals. In addition, the District has successfully administered over \$3 million from the Carl Moyer program and \$1,610,000 in FARMER grant awards. The success of these programs substantiates the District's experience in public outreach, marketing, administrative coordination, and fund management.

The District has hired one full time and one part time bilingual staff member to focus solely on administering the EPA TAG programs. The full-time staff member was hired in June of 2022. The part time staff member has worked on the wood stove change out program since 2017.

The CARB, under the California Health and Safety Code Section 39500, has the responsibility for coordinating, encouraging, and reviewing the efforts of all levels of government as they affect the air quality. Furthermore, under section 39602, the CARB is designated as the State agency responsible for the preparation of the state implementation plan required by the CAA and, to this end, shall coordinate the activities of all districts necessary to comply with that act. CARB staff will assist with annual verification of progress including estimating reductions in emissions and PM_{2.5} concentrations.

With respect to grant management, CARB has accepted several EPA grants in the past three years, including: Section 105 Air Pollution Control Financial Assistance Grant (Grant Number A-00901315), PM_{2.5} Monitoring Network Grant (Grant Number PM-98960901), and the State Clean Diesel Grant (Grant Number DS-00T87901).

Each of these recent grants represents a continuation of a multi-year, multi-million-dollar grant from EPA. For each grant, CARB has completed all grant agreement terms and completed (or expects to complete) the approved work plans to expeditiously apply funds to shared EPA and CARB air quality goals. CARB has documented progress on these grants through submittal of required reports and inputting collected data into state and national databases, as appropriate per the grant terms.

As part of the California Climate Investment Woodsmoke Reduction Program, CARB staff manages \$18 million in incentives for the replacement of uncertified residential wood burning stoves, inserts, and fireplaces used for primary space heating with cleaner, more efficient home heating devices. Additionally, CARB has extensive experience implementing other multi-million-dollar incentives programs, such as the Lower-Emission School Bus Program, the Carl Moyer Memorial Air Quality Standards Attainment (Moyer) Program, Goods Movement Emission Reduction (Goods Movement) Program, the Air Quality Improvement Program (AQIP), and the Providing Loan Assistance for California Equipment (PLACE) Program. CARB's experience in these programs has established solid working relationships with air districts as well as engine/equipment and retrofit manufacturers and vendors necessary for successfully implementing the proposed project.

Conclusion

Relevant portions of the documentation listed above relating to the Program establish clear criteria that enable the District to (1) verify compliance with the applicant and retailer/contractor certification statements to ensure that contracted emission reductions are enforced; (2) quantify the emission reductions attributed to specified projects with a reasonable level of accuracy; (3) verify that those emission reductions are "surplus" to federal/State requirements and other legal mandates; (4) follow-up on applicant and retailer/contractor certifications providing continued implementation of the program to ensure that emission reductions are "permanent" throughout the life of each project; (5) have sufficient funding, authority, and experience to adequately support implementation of the Program.

ENFORCEABLE COMMITMENT

The Northern Sierra Air Quality Management District (District) Governing Board hereby commits to:

- A. Implement at least 100 residential wood stove replacement projects for the purpose of attaining the 2012 annual PM_{2.5} National Ambient Air Quality Standard (NAAQS) of 12 µg/m³ by December 31, 2024, in accordance with the incentive program guidelines (Appendix F).
- B. By December 31, 2024, achieve 0.025 tons per day (tpd) of reductions in PM_{2.5} emissions from the baseline inventory in the Portola Serious SIP through implementation of these projects or substitute measures in accordance with Section E;
- C. In a report submitted to EPA by March 31, 2025:
 - i. Identify each project implemented between January 1, 2021 and December 31, 2024 by **program tracking number**, description of both baseline and new equipment, **and quantified emission reductions**;
 - ii. Provide formulas used to calculate emission reductions;
 - iii. Describe the actions taken and documentation collected by the District and CARB to confirm each project's compliance with program requirements;
 - iv. Determine whether the identified projects are projected to achieve the full amount of PM_{2.5} emission reductions identified in paragraph B; and
 - v. Describe any changes to relevant forms and related impacts on program integrity.
- D. Beginning upon adoption and through 2030, provide any requestor consistent with the California Public Records Act, all documents relied upon in the preparation of the annual demonstration report described in paragraph C and available in the relevant project file, including: project applications, grant contracts, inspection-related documents, destruction-related documentation, proof of installation by a certified installer, and any available inspection or audit-related documentation.
- E. If EPA determines by July 1, 2025 that information submitted by the District is insufficient to demonstrate that emission reductions required under paragraph B will occur on schedule, adopt and submit to EPA, no later than September 1, 2025, substitute rules and/or measures that will achieve emission reductions addressing the shortfall as expeditiously as practicable and no later than December 31, 2025.

TECHNICAL ANALYSES/SUPPORT

The District will rely on projections of SIP-creditable emission reductions under the Wood Stove Program Incentive Measure to satisfy PM_{2.5} SIP requirements including attainment demonstration, reasonable further progress, contingency measures, and quantitative milestones. The Portola SIP relies on directly emitted PM_{2.5} from the wood stove change-out program to provide 100 percent of reductions needed to demonstrate attainment. The plan does not take any credit for the ongoing reductions in NOx emissions or directly emitted PM_{2.5} from mobile sources.

The attainment demonstration relies on the rollback model demonstrating attainment of the standard by December 31, 2025. The rollback relies on emission reductions in directly emitted PM_{2.5} from the wood stove change-out estimated using calculations outlined in Quantifiable Section. Replacing 100 old wood burning devices with less polluting and more energy efficient home heating devices will reduce emissions of directly emitted PM_{2.5} by 0.025 tpd. This reduction in emissions from burning wood for heat will reduce annual PM_{2.5} design value from 12.6 µg/m³ in 2021 to 11.8 µg/m³ in 2025. Listed below are SIP elements that rely on emission reductions from the wood stove change-out:

- Attainment demonstration;
- Reasonable Further Progress - The area is expected to make linear progress between the baseline year, 2021, and the attainment year, 2025;
- Quantitative milestones - The area is expected to reduce emissions of directly emitted PM_{2.5} by 0.025 tpd by 2025 milestone year and maintain these reductions through 2028 post-milestone year; and
- Contingency measure - The attainment year emission, which factor in emission reductions from the Wood Stove Program are used in estimating contingency measure emission reduction target.

Because the plan relies on a voluntary measure to provide emission reductions necessary to attain the standard, the District and CARB took extra precautions to ensure that the program is successful and delivers the projected reductions needed to meet the milestones and attain the standard. The District took a number of steps to ensure sufficient participation in the program in order to meet the projected number of change-outs. One of the most important steps is offering significant financial incentives, up to full cost of purchase and installation of a cleaner burning device. Additionally, the District developed a simple and streamlined application process for those applying to participate in the program. PM_{2.5} pollution from certified wood stoves, even under optimal operating conditions, is still much higher than pollution from other heat sources. Therefore, the District is working to maximize the number of non-wood replacements. The reductions achieved by replacing a wood burning device with a non-wood burning device are more certain as emissions are less influenced by fuel quality, operator error, and lack of regular maintenance. In addition to offering higher incentives for switching to non-wood home heating, starting in March of 2022, removal of a wood-burning device will not be required for a household to qualify for a heat pump installation. This should significantly increase the number of households interested in switching their primary source of heat to a heat pump because it will alleviate concerns about the ability to heat their homes during a power outage. This new provision will apply only to households residing in the City of Portola where the population is denser than the surrounding areas and the residents are subject to the City's mandatory woodburning curtailment program. To provide a personal service the District maintains a satellite office at Portola with a full time and part time staff and offers assistance in filling applications in both, English and Spanish. These efforts are accompanied by a heavy advertising campaign which began a year before the program started and included city hall meetings complete with demonstration of cleaner burning appliances, website and newspaper advertising and posting fliers in frequently attended and visible locations. The District committed to holding an annual kick-off meeting to promote participation in the program. To date, the District has hosted eight wood stove workshops/events. Two of the eight events took place in the same year, April and November of 2019. Due to the COVID-19 pandemic there was no event in 2020 or 2021, however public education events were held in the spring of 2022, 2023, and 2024.

The District partnered with four retailers to implement this program. The retailers are tasked with offering the cleanest burning appliance that will meet the resident's need. The District offers an additional \$1,500 (up to full cost of purchase and installation) to residents willing to switch to alternative fuel. Since most of the change-outs will be completed during the summer months when homeowners are not heating their homes, concentrations during the second half of the year should be lower due to change-outs accomplished during summer. However, to ensure a conservative estimate of expected reductions, only the change-outs accomplished during the prior calendar year were factored into the projected emission reductions and the corresponding air quality benefits.

Finally, the District is implementing a suite of other measures as part of a long-term wood smoke reduction strategy. The District partnered with the City of Portola and other local organizations to educate the public on the importance of clean burning and proper device maintenance. These vital outreach and education efforts should bring significant emission reductions, for which the plan does not take any credit. Another potential source of reductions not factored into the plan is a mandatory wood burning program which has been in effect November through February since 2021 with a daily threshold limit of 30 ug₃. In April 2023, in response to triggering contingency measure, the residential wood-burning curtailment levels were lowered from 30 to 20 µg/m and the wood-burning season was extended to be in effect from September through April.

The Office of Inspector General internal investigation of the wood stove certification program, Report No. 23-E-0012¹⁶, revealed significant problems with the EPA wood stove certification program. As a result of flexibility in testing combined with limited oversight, many wood stoves certified by EPA as meeting the current New Source Performance Standard (NSPS) may have higher emissions than old uncertified stoves they are replacing. These findings introduce uncertainty into our estimates and may result in lower than estimated emission reductions and slower progress towards attainment.

PROCEDURES FOR PUBLIC DISCLOSURE OF INFORMATION

Provisions to ensure that EPA and the public have access to emission data in accordance with the requirements of CAA section 114 and EPA's implementing regulations in 40 CFR 2.301.

There are three methods the public can access information relating to the Northern Sierra Air Quality Management District Wood Stove Incentive Measure Program:

1. All documents created and/or used in implementing the requirements of the Wood Stove Program shall be kept and maintained by the District for a period of 5 years past the attainment date. Consistent with the California Public Records Act and other related requirements, such records shall be made available for public review upon request to the District. Information regarding the process for the public review of such records shall be included on the Wood Stove Incentive Measure Program website at <http://myairdistrict.com/index.php/grants-incentives/portola-woodstove-change-out-program/>;
2. In addition, a database developed and housed by the District shall be utilized to store all essential information in implementing and accounting emission reductions from the Program. Excluding applicant personal information, the public may request information from the database by contacting CARB or District; and
3. Derived from the database and per the enforceable commitment, a report produced by CARB and the District shall be submitted no later than March 31, 2025 and show the quantity of emission reductions achieved through the SIP-creditable incentive program, Program between January 1, 2021 and December 31, 2024. Previously submitted annual demonstration reports are available on CARB's website

¹⁶ <https://www.oversight.gov/sites/default/files/oig-reports/EPA/epaig20230228-23-E-00122.pdf>

(<https://ww2.arb.ca.gov/resources/documents/wood-stove-change-out-program-greater-portola-nonattainment-area-and-progress>) and the District's website (<https://www.myairdistrict.com/greater-portola-area-hub>).

¹⁶ <https://www.oversight.gov/sites/default/files/oig-reports/EPA/epaig20230228-23-E-00122.pdf>

Appendix D

Report on Opportunities for Reducing Wood Smoke in Portola, California Area

OPPORTUNITIES FOR REDUCING WOOD SMOKE IN THE PORTOLA, CALIFORNIA AREA

April 30, 2015

Prepared by Jennifer Weiss

Prepared under fixed price purchase orders for EC/R Incorporated (prime contractor)
EPA Contract EP---D---10---096, Work Assignment 5---04

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INTRODUCTION

Household wood combustion is a major contributor to ambient fine particle levels in the United States. Roughly one-half to two-thirds of the residential wood combustion in the United States occurs in wood stoves.¹ Particulate matter (PM) is formed during combustion reactions in wood stoves, with PM measuring a diameter of 2.5 micrometers (μm) or less ($\text{PM}_{2.5}$) being the primary form of particulate emissions from residential wood stoves. $\text{PM}_{2.5}$ is associated with increased incidence of asthma attacks² and other upper respiratory problems³ as well as increased acute and chronic mortality rates⁴ due to long-term exposure. Many rural mountain valley communities experience elevated levels of $\text{PM}_{2.5}$ in the winter because of smoke from wood-burning appliances and the sustained temperature inversions that occur during the cold season.

The United States Environmental Protection Agency (EPA) works with state, tribal, and local air quality agencies to monitor air quality in the U.S. and issues National Ambient Air Quality Standards (NAAQS or “standards”) for air quality that must be maintained by states in order to provide public health protection. The EPA has established annual and 24-hour $\text{PM}_{2.5}$ standards of 12 and 35 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$), respectively. In January 2015, the EPA designated and initially classified 14 areas across the country, including the City of Portola and surrounding parts of Plumas County, California (referred to as Greater Portola) as a “[nonattainment area](#)” for the annual $\text{PM}_{2.5}$ standard due to unhealthy levels of fine particulate emissions during the three-year period from 2011–2013. This nonattainment designation triggers requirements for the community to begin taking action as quickly as possible to reduce pollution levels so that the Portola area can attain the $\text{PM}_{2.5}$ standard by the end of 2021. Portola’s nonattainment status will remain in effect until the three-year average levels of $\text{PM}_{2.5}$ can be shown to meet the air quality standards and certain demonstrations and requirements are met. The area is also currently not meeting the 24-hour $\text{PM}_{2.5}$ standard.

This evaluation is an analysis of program alternatives that the Northern Sierra Air Quality Management District (NSAQMD) can use to reduce $\text{PM}_{2.5}$ in the Greater Portola nonattainment area without increasing the cost burden on low-income and low-wage earning households. NSAQMD is a regional air quality agency with a mission to preserve air quality and protect public health and welfare in Nevada, Plumas and Sierra counties. NSAQMD is responsible for conducting outreach and administering programs that will help bring the area back into attainment, and it is working closely with Portola city officials, local community organizations, and state and federal government organizations to outline a plan to reach attainment by 2021.

¹ P. M. Fine, G.R. Cass, and B.R.T. Simoneit “Chemical Characterization of Fine Particle Emissions from the Wood Stove Combustion of Prevalent United States Tree Species” *Environmental Engineering Science* (2004) 24 (6), pp 705 – 721

² J.C. Slaughter, T. Lumley, L. Sheppard, J.Q. Koenig, G.G. Shapiro “Effects of ambient air pollution on symptom severity and medication use in children with asthma” *Annals of Allergy, Asthma, & Immunology*, 91 (4) (2003), pp. 346–353.

³ D.H. Jaffe, M.E. Singer, A.A. Rimm “Air pollution and emergency department visits for asthma among Ohio Medicaid recipients, 1991–1996” *Environmental Research*, 91 (1) (2003), pp. 21–28.

⁴ F. Laden, J. Schwartz, F.E. Speizer, D.W. Dockery “Reduction in fine particulate air pollution and mortality: extended follow-up of the Harvard Six Cities Study” *American Journal of Respiratory and Critical Care Medicine*, 173 (6) (2006), pp. 667–672.

To help residents reduce smoke and unhealthy particulate emissions, the EPA provides wood-burning tips on its [Burn Wise](#) website, which offers efficient wood burning techniques and recommends that households upgrade older wood stoves to cleaner-burning [EPA-certified wood stoves](#), gas, propane, or electric appliances. However, this advice creates a new challenge for a small community like Portola. Given that a wood stove or heating appliance can cost between \$3,000 and \$5,000, the Portola community faces a financial challenge in its effort to clean up the air. How do you incentivize a household – especially a low-income household – to change out a working wood stove with a more efficient alternative? It can only happen through a coordination of existing resources and the development of a tiered strategic plan to address not only the financial barriers to wood stove changeouts, but also to foster a spirit of civic responsibility to address these air quality challenges.

RESEARCH OBJECTIVES AND METHODS

The objectives of this evaluation are first to identify potential wood stove replacement assistance program options and second to evaluate the financial viability of each alternative. To accomplish these objectives, a number of research methods were utilized. First, the research team compiled lists of key individuals and organizations to interview in Portola and the Plumas County region regarding existing air quality, weatherization and utility programs and potential funding sources for wood stove replacement assistance programs. The team then conducted phone and in person interviews with roughly 10 of these individuals over a six-week time frame (See Appendix A for a complete list of interviewees and key stakeholders). The team developed a set of questions to compile information from these individual's perspectives on program aims, costs, key challenges, and other relevant information. Next, these preliminary findings were discussed with EPA and NSAQMD staff to get feedback and provide strategic direction for analysis of program alternatives.

In early March, the Environmental Finance Center at The University of North Carolina (EFC), the EPA and NSAQMD convened a residential wood smoke roundtable with key leaders from community, environmental, health, financial, utility and local, state, and federal governmental organizations in the Portola and Plumas County area to review what the group already knew about wood stoves and demographics in the area. In addition, the group discussed outreach and financial assistance strategies for encouraging wood stove changeouts that could ultimately reduce wood smoke in the area and help move the area towards attainment. In the final phase of this evaluation, the research team evaluated three program alternatives and developed financial models to analyze each alternative's financial feasibility and associated number of potential wood stove changeouts. This report provides an evaluation of the program alternatives and recommends the education and outreach steps necessary to move forward with program development.

BACKGROUND

Based on the California Air Resource Board (CARB)'s most recent air quality data for the 2012---2014 period, the Greater Portola area is exceeding both the annual and 24---hr PM_{2.5} standards by 18 percent and 29 percent respectively. Analysis provided by CARB indicates that the Greater Portola area's high PM_{2.5} levels are mostly due to the impacts of residential wood smoke occurring primarily during the fall and winter months. The highest pollution levels occur during the evening and at night (i.e., 5:00 pm to 12:00 am) and in the morning (i.e., 5:00 am to 8:00 am) when more people are home and using their wood stoves and fireplaces. The Greater Portola nonattainment area lies approximately 50 miles northwest of Reno, Nevada. It covers the City of Portola and parts of surrounding Plumas County. A map of the nonattainment area can be found in Appendix B.

According to census data, there are approximately 2,723 housing units in the Greater Portola nonattainment area, and NSAQMD estimates that 1,239 (46 percent) use an uncertified wood burning appliance as their primary or secondary source of heat. The actual number of wood stoves in use in the nonattainment area is likely much higher, with some homes using multiple wood stoves. Although many of these houses might also have alternative heating source appliances (electric or propane) in the home, wood is abundant in Portola and many residents enjoy the ambiance, ease, and self---sufficiency of burning this renewable resource, especially because of its relative low cost and ready availability.

REGULATING WOOD SMOKE IN THE GREATER PORTOLA AREA

The Greater Portola nonattainment area does not currently have any regulations or ordinances in place to regulate the burning of wood in residential homes. During the times that the air does not meet federal health standards, CARB does issue a burn ban for open burning of green waste. A burn ban is a mandatory, yet temporary, order that prohibits the outdoor burning of green waste. In the last three years, the number of forecasted burn ban days in the Plumas County community were approximately 181 days annually, or 50 percent of total days each year.

In addition to the burn bans for open burning, in 2002 the Portola City Council approved a Woodstove and Fireplace Ordinance designed to restrict the types of new wood stoves that can be installed in homes and requires the inspection of wood stoves upon sale of a home to certify compliance with the EPA's wood heater emission standards. If an existing wood stove or fireplace does not comply, the appliance must be removed from the home and replaced with a certified appliance. The complete ordinance can be found in Appendix C.

PRIOR WOOD STOVE REPLACEMENT PROGRAMS

The NSAQMD has a long history of supporting wood stove replacement programs within their three county district. Most of these programs have utilized a \$1,000 rebate incentive to encourage residents to update an older, inefficient wood stove.

- 1999 Nevada, Sierra and Plumas County Woodstove Changeout Program --- \$15,000.
- 2002---2003 Lake Almanor Basin Woodstove Changeout Program --- \$50,000.
- 2003---2004 Plumas and Sierra County Woodstove Changeout Program --- \$40,000.
- 2004---2005 Greater Portola Area Woodstove Changeout Program --- \$25,000.
- 2004---2005 Plumas and Sierra County Woodstove Changeout Program --- \$30,000.

A total of 140 stoves in all three counties were changed out using the funds that were allocated for woodstove changeout programs. With the exception of the 2004---2005 Greater Portola program, all allocated money was spent. Although \$25,000 was allocated in 2004 for a woodstove changeout program specifically for the Greater Portola area, only \$10,000 was utilized (changing out 10 woodstoves). Of the \$15,000 of unspent funds, \$10,000 has been allocated to the Greater Portola nonattainment area and \$5,000 of the unspent funds has been allocated to the City of Portola's woodstove changeout program.

MARCH 2, 2015 ROUNDTABLE DISCUSSION

In March 2015, the EFC, EPA and NSAQMD convened a residential wood smoke roundtable with key leaders from community, environmental, health, financial, utility and local, state, and federal governmental organizations in the Portola and Plumas County area. Representatives from the EPA, CARB, USDA Rural Development, U.S. Forest Services, Liberty Utilities, Plumas---Sierra Rural Electric Cooperative, Plumas Crisis Intervention and Resource Center, Portola Family Resource Center, Plumas County Public Health Agency and Plumas Bank joined NSAQMD and the City of Portola to brainstorm solutions and form a collaborative plan.

The objective for the day was to review what the group already knew about wood stoves and demographics in the area and discuss outreach and financial assistance strategies for encouraging wood stove changeouts that could ultimately reduce wood smoke in the area and help move the community toward attainment of the air quality standard. Through the discussions, it became clear that the financial "how you pay for it" question was only one piece of the puzzle. A proactive, collaborative strategy for improving air quality must also include educational outreach, economic incentives and community support in order to successfully change habits and reduce wood smoke in the area.

MARCH 19, 2015 WOOD STOVE WORKSHOP

To help educate residents on proper wood burning techniques and demonstrate new EPA---certified wood stoves, the NSAQMD hosted a wood stove workshop for Portola residents on March 19, 2015. About 50 local residents attended the workshop and were entered into a drawing for two \$1,000 gift certificates to the two wood stove retailers who were on hand to conduct wood stove demonstrations at the event. One of the winners noted that his home was built in 1927 and he does not have an EPA certified stove. In addition to a presentation on proper wood---burning techniques from a representative from the Hearth, Patio and Barbecue Association and wood stove demonstrations from local retailers, representatives were available from local fire agencies to discuss wood stove safety and from the Plumas County Public Health Agency to share information about the health impacts of particulate matter. All speakers stressed the importance of the community working together to improve air quality and thereby improving health and quality of life.



Photos courtesy of Julie Ruiz, Northern Sierra Air Quality Management District and Katie Stewart, EPA

PORTOLA AREA RESIDENTIAL HEATING SURVEY

In March and April 2015, the NSAQMD administered a survey to assess the demographics of the community's residents, particularly as they relate to heating sources and wood stoves. Eighty---nine surveys were received, 39 of which were collected at the March 19 wood stove workshop, 30 from drop boxes located around the city, 11 picked up from homebound residents and the remaining nine collected online and via fax. The complete survey can be found in Appendix D.

Preliminary results from the survey reveal demographic characteristics of the Portola residents that will be useful as the community moves forward with a wood stove replacement program:

- **Home Ownership:** 71 percent of survey respondents own their home.
- **Wood Burning Devices:** 62 respondents (70 percent) have a wood-burning device in the home and 55 (82 percent) of these devices are wood stoves.
- **Sources of Heat:** 58 percent of the respondents use wood as the primary source of heat, followed by propane (21 percent) and kerosene (10 percent). Although electricity as a primary source of heat was found in only 7 percent of respondents' homes, 25 percent of the homes used electricity as a secondary heating source.
- **Health and Age Demographics:** 29 percent of respondents have someone in the home diagnosed with asthma or another respiratory/breathing disorder. 25 percent of respondents had K-12 children in the home and 65 percent had at least one senior over 55 years old living in the home.

FIGURE 1: QUESTION 1, PORTOLA AREA RESIDENTIAL HEATING SURVEY, APRIL 2015 (N=89)

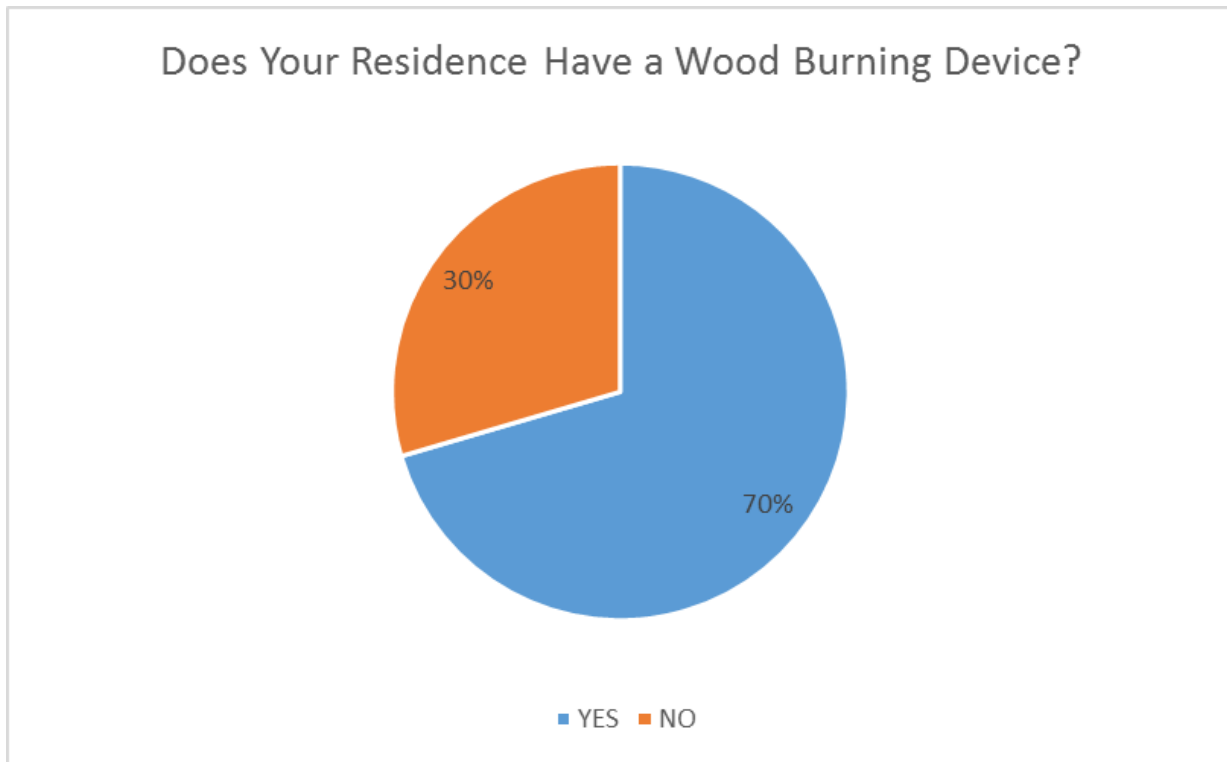
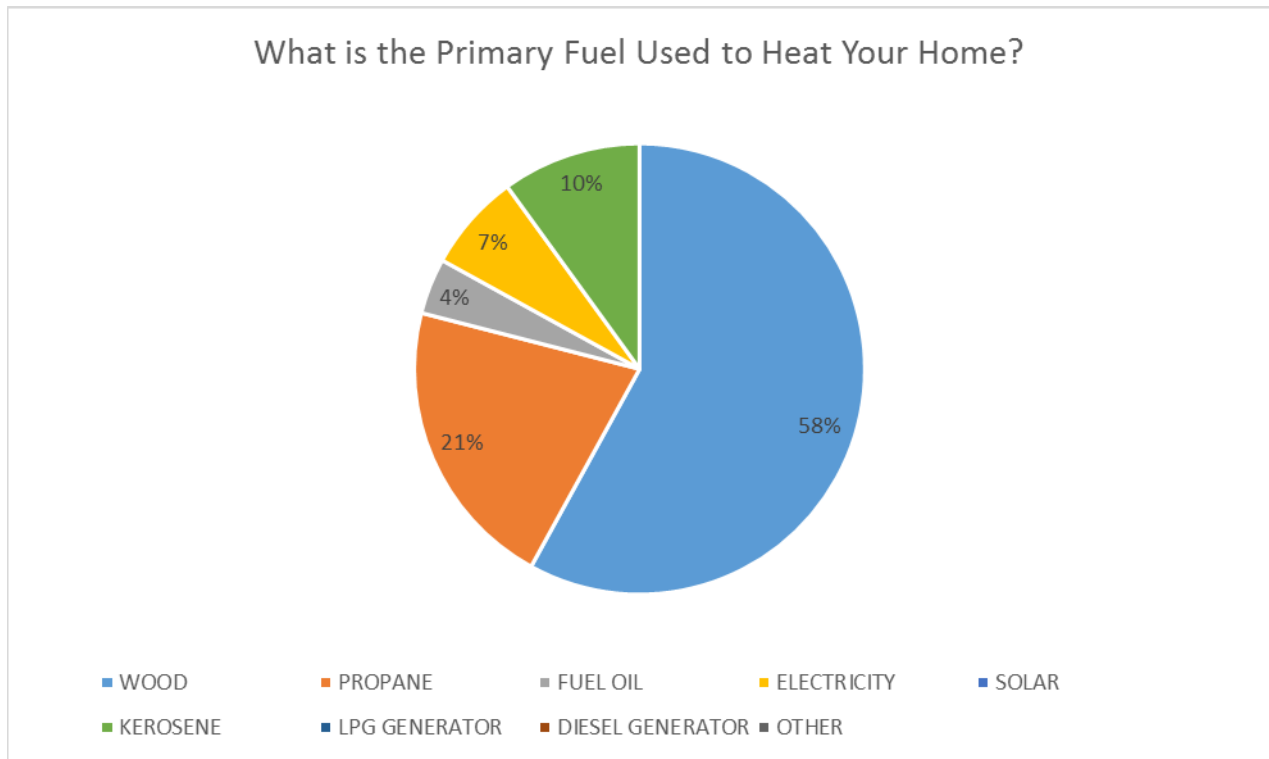


FIGURE 2: QUESTION 10, PORTOLA AREA RESIDENTIAL HEATING SURVEY, APRIL 2015 (N=89)



PORTOLA WOOD STOVE REPLACEMENT GOAL

The California Air Resources Board provided a preliminary estimate of how many wood stoves operating in the Portola PM_{2.5} nonattainment area would have to be replaced with EPA---certified stoves to improve air quality and help move the area towards attainment. The CARB preliminary analysis estimates that the minimum number of stoves to target for replacement in the nonattainment area is 600 stoves, or 50 percent of the estimated number of uncertified wood stoves in the nonattainment area. With an estimated replacement cost of \$3,500 per stove, it is estimated that a woodstove replacement program designed to significantly move the area towards attainment would cost, at a minimum, \$2,100,000, not including program implementation, outreach, and education costs.

ASSISTANCE PROGRAMS AVAILABLE

There are a number of programs established to help address the weatherization and energy assistance needs of Portola and Plumas County residents, particularly for households qualifying as low-income (defined in Table 2 below) and seniors (over 62 years of age). These programs include home repair programs, weatherization programs and energy assistance programs.

HOME REPAIR AND WEATHERIZATION PROGRAMS

State, federal and utility programs are currently available to assist low-income residents of Portola and Plumas County with weatherization of homes to improve a home's efficiency and/or repair a safety or health hazard in the home. While not all of the programs allow for a wood stove changeout as a qualified use of funds, all will provide energy efficiency improvements that will reduce the resident's heating requirements, lowering the cost of heating the home by an alternative source (electricity/gas/propane). In addition to weatherization improvements, some programs will also allow for the changeout of a wood stove as summarized in Table 1 below. All programs have income qualifying limits as outlined in Table 2.

TABLE 1: SUMMARY OF HOME REPAIR/WEATHERIZATION PROGRAMS AVAILABLE FOR PLUMAS CO.*

Program	Funds Available (Plumas County)	Target Audience	Weatherization (Y/N)	Wood--Stove (Y/N)
USDA Rural Repair and Rehabilitation Grants	\$1.23 million**	Very Low Income Over 62 years	Y	Y
USDA Rural Repair and Rehabilitation Loans	\$1.28 million**	Very Low Income	Y	Y
LIHEAP Weatherization	\$130,000	Low Income	Y	N
LIHEAP Energy Crisis Intervention	\$27,000	Low Income	Y	Y
U.S. DOE Weatherization	\$16,800	Low Income	Y	Y
Plumas County Housing Rehabilitation	\$140,000	Low Income	Y	N
Liberty Utilities Energy Savings Assistance	N/A	Low Income	Y	N

* Program data as of March 2, 2015.

** Fund availability for the USDA Rural Repair and Rehabilitation programs are for the State of California.

USDA 504 RURAL REPAIR AND REHABILITATION GRANTS AND LOANS

The USDA Rural Development Office Rural Repair and Rehabilitation program provides loans and grants to very low-income homeowners located in a rural area to repair, improve, or modernize their dwellings or to remove health and safety hazards. This includes weatherization of a home in addition to the repair or replacement of a heating appliance (including wood) to improve health and safety. This program does not include rentals. There are two components to the program:

- Up to **\$7,500 in grant funds** are available to qualifying homeowners in rural areas. Grant funds may be used only to pay for repairs and improvements resulting in the removal of health and safety hazards. Qualifying homeowners must be over 62 years of age, meet the income limits outlined below and be unable to obtain affordable credit elsewhere.
- **Loans of up to \$20,000** are available to income-qualifying homeowners (no age restrictions). Loans are for up to 20 years at 1 percent interest. A real estate mortgage and full title service are required for loans of \$7,500 or more.

Both programs are administered through the USDA Rural Development office in Redding, CA. Program funds are currently offered on a first-come, first-served basis to all qualifying California residents with approximately \$1.234 million available in California for grants and \$1.28 million available for loans.

TABLE 2: INCOME LIMITS FOR INCOME-QUALIFYING PROGRAMS*

Number in Household	Portola / Plumas County Income Limits				
	USDA Rural Repair	LIHEAP ⁵	Plumas Co. Housing Rehabilitation	Liberty Utilities Programs	Plumas-Sierra Rural Electric Co-op
1	\$21,700	\$23,963	\$31,000	\$31,460	\$31,020
2	\$24,800	\$31,336	\$35,400	\$31,460	\$31,020
3	\$27,900	\$38,709	\$39,850	\$39,580	\$39,060
4	\$31,000	\$46,082	\$44,250	\$47,700	\$47,100
5	\$33,500	\$53,455	\$47,800	\$55,820	\$55,140
6	\$36,000	\$60,828	\$51,350	\$63,940	\$63,180
7	\$38,450	\$62,211	\$54,900	\$72,060	\$71,220
8	\$40,950	\$63,593	\$58,450	\$80,180	\$79,260

* Program data as of March 2, 2015.

LOW-INCOME HOME ENERGY ASSISTANCE PROGRAMS (LIHEAP)

The California Department of Community Services and Development (CSD) helps low-income residents reduce energy costs through federally-funded Low-Income Home Energy Assistance Programs:

- The **LIHEAP Weatherization Program** provides services to improve a household's energy efficiency by providing weatherization services (weather-stripping, insulation, caulking, water heater blankets, heating/cooling system repairs, energy-efficient lighting and other measures). While this program does not include wood stove replacements, it can make a house more energy efficient and reduce heating and cooling costs for residents.
- The **LIHEAP Energy Crisis Intervention Program (ECIP)** provides assistance to low-income households in a crisis situation, such as receiving a notice to disconnect or terminate utility services or an energy-related emergency created by a natural disaster. The **ECIP Heating and**

⁵ California Department of Community Services and Development website, accessed 4/1/15.
<http://www.csd.ca.gov/Services/HelpPayingUtilityBills/EnergyIncomeGuidelines.aspx>

Cooling Services (HCS) program can also provide for the emergency repair or replacement of a home heating and/or cooling system, including a wood stove replacement.

In Portola and Plumas County, the LIHEAP program is administered through the Plumas County Community Development Commission (PCCDC). The PCCDC currently has approximately \$130,000 available for LIHEAP weatherization and \$27,000 available for Energy Crisis Intervention, which may include wood stove replacements in homes with a non-working or unsafe heating appliance. All LIHEAP assistance is distributed based on income, need, energy burden and other qualifications.

U.S. DEPARTMENT OF ENERGY WEATHERIZATION PROGRAM

The PCCDC was awarded \$16,800 in funding from the U.S. Department of Energy for the weatherization homes in the Plumas County area. With remaining funds available, this could include the changeout of approximately three wood stoves.

PLUMAS COUNTY HOUSING REHABILITATION PROGRAM

The Plumas County Housing Rehabilitation Program provides low-interest loans to income-qualifying homeowners and eligible landlords (a landlord with a qualifying tenant) in Plumas County (although not within Portola city limits). Funds for the program are provided through a Community Development Block Grant revolving loan fund:

- Loans are for home repairs to improve health and safety building code violations
- Low-interest loans between 1 to 5 percent, depending on income
- Payments amortized for up to 20 years (owner-occupants or owner/investor)
- Homeowner must meet minimum income requirements (see Table 2 below)

The Plumas County Housing Rehabilitation Program is administered by the Plumas County Community Development Commission. The PCCDC currently has up to \$140,000 available for this loan program available only for homes outside of Portola city limits.

LIBERTY UTILITIES ENERGY SAVINGS ASSISTANCE PROGRAM

Liberty Utilities provides electricity to homes within Portola city limits. The utility offers a weatherization assistance program to all income-qualifying homeowners (see Table 2 above) in Portola that have an electric heat source in the house and meet other qualification requirements for specific measures. Alternative heat sources such as wood may be in use in the home with the electric heat source present and still qualify for the program. This program may – if an electric heat source is present – fix or upgrade an existing electric heat source, but it will not help with wood stove replacements. Other improvements available at no cost may include weatherization, insulation, minor home repairs and refrigerator replacements. This program does apply to renters with landlord authorization. The program is funded through rate-payer funds as approved by the California Public Utilities Commission.

ENERGY ASSISTANCE PROGRAMS

In addition to the home repair and weatherization programs available to Portola and Plumas County residents, there are energy assistance programs that can help residents reduce the amount of their monthly energy bills. These programs include federal and utility programs and some include wood as a heat source.

The **LIHEAP Home Energy Assistance Program (HEAP)** provides financial assistance annually to states to help offset home heating and/or cooling costs for low-income households (defined as below 60% of the state's median income) based on need, energy burden and other qualifications. The PCCDC currently has approximately \$184,000 available for HEAP for wood, wood pellets, electric, gas, propane and oil.

The **Liberty Utilities California Alternative Rates for Energy (CARE) Program** is a program mandated by the California Public Utilities Commission to offer energy assistance to low income households within Portola City limits. The CARE program offers a 20 percent discount on a rate-payer's electric bill each month, if the household meets the income guidelines outlined in Table 2.

Plumas-Sierra Rural Electric Cooperative **Winter Rate Assistance Program (WRAP)** offers a \$0.02 per kilowatt-hour (14 percent) rate discount during the winter heating season to rate-payers in the Plumas-Sierra territory (in non-attainment area, but not in Portola). Program eligibility is based on family income as summarized in Table 2, using an annual income of 200 percent of the federal poverty standard as the income limit. The utility also offers energy efficiency rebates (no income qualification) for heat pumps and ductless systems.

TARGET MARKETS

While it is difficult to estimate the exact number of households that actually use their wood-burning device on a regular basis, the NSAQMD used U.S. Census Block Group data to estimate the number of wood stoves in the Greater Portola nonattainment area. NSAQMD estimates that there are 2,723 households in the nonattainment area (Table 3). Using the April 2015 residential heating survey results indicating that 70 percent of respondents have a wood stove in the home and the assumption that 35 percent of the existing wood stoves are already EPA-compliant, the District estimates that there are approximately **1,239 households** in the nonattainment area that own an uncertified wood stove as either a primary or secondary heating source. These are self-reported numbers and do not count more than one wood-burning device per home, therefore the number of wood stoves in the area's homes is likely higher.

TABLE 3: GREATER PORTOLA NONATTAINMENT AREA DEMOGRAPHIC INFORMATION

Map Label	Designated Area Name	Total Population	Age Over 64	Total Households	Household Median Income
Greater Portola Nonattainment Area		5,825	963	2,723	\$44,996
Block Group 2, Census Tract 3	Plumas County, CA	1,360	295	709	\$37,737
Block Group 4, Census Tract 3 (partial)	Plumas County, CA	42	3	20	\$49,219
Block Group 1, Census Tract 3	Plumas County, CA	966	114	491	\$29,750
Block Group 3, Census Tract 3	Plumas County, CA	1,862	167	709	\$32,264
Block Group 1, Census Tract 2.02 (partial)	Plumas County, CA	6	1	3	\$54,688
Block Group 1, Census Tract 2.01 (partial)	Plumas County, CA	678	46	310	\$54,334
Block Group 2, Census Tract 2.01	Plumas County, CA	910	337	482	\$56,979

Source: U.S. Census Bureau's American Community Survey 2006-2010 File Geodatabase for Block Groups, U.S. EPA Office of Environmental Information (OEI) - Office of Information Analysis and Access (OIAA) (2011)

Using demographic averages in the area, the area's median household income and age of household can be further broken down into the following groupings:

LOW---INCOME HOUSEHOLDS

The median household income (MHI) in Portola in 2013 was \$34,942.⁶ 186 households (16 percent) have income less than \$15,000, which falls well below the income qualifications for all of the state, federal and utility programs and approximately 50% of the households (584) have MHI less than \$35,000. In zip code 96122, which includes Portola and the surrounding area, 16 percent (313) of the households have income below \$15,000 and 43 percent (829) have income below \$35,000.

TABLE 4: HOUSEHOLD INCOME SUMMARY FOR PORTOLA AND PLUMAS COUNTY

Income	City of Portola		Zip 96122		Plumas County	
Median HH Income	\$34,942		\$40,313		\$45,794	
< \$15,000	186	16%	313	16%	1,417	16%
\$15,000 --- \$35,000	398	34%	516	27%	2,162	24%
\$35,000 --- \$50,000	183	16%	295	16%	1,257	14%
\$50,000 --- \$75,000	193	17%	371	20%	1,730	19%
\$75,000 --- \$100,000	101	9%	213	11%	1,090	12%
> \$100,000	94	8%	193	10%	1,341	15%
Total Households	1,155		1,901		8,997	

Source: U.S. Census 2009---2013 American Community Survey 5---year estimates

⁶ U.S. Census 2009---2013 American Community Survey 5---year estimates for Portola, CA, Zip 96122 and Plumas County, CA.

SENIOR POPULATION

According to the U.S. Census data, 18 percent of Portola’s residents (587) are over 62 years of age.⁷ In zip code 96122, the percentage of residents over 62 years is 22 percent (1,048) and in Plumas County, this number increases to 27.5 percent:

TABLE 5: POPULATION AGE SUMMARY FOR PORTOLA AND PLUMAS COUNTY

Age of Resident	City of Portola		Zip 96122		Plumas County	
Average Age	40.2 years		40.9 years		49.9 years	
Under 18 years	669	23%	1,100	24%	3,558	18%
18 to 61 years	1,684	59%	2,549	54%	10,638	54%
62 years and over	587	18%	1,048	22%	5,390	28%

Source: U.S. Census 2009---2013 American Community Survey 5---year estimates

Using these numbers and the assumption that 35 percent of the existing wood stoves are already EPA---compliant, it is estimated that the number of residents in the nonattainment area that might qualify for each of the existing programs could be as high as 600:

TABLE 6: TOTAL POTENTIAL TARGET GROUP FOR LOW---INCOME WOOD STOVE CHANGEOUTS

Number of households with a wood stove	1,907	
Estimated number that are already EPA---compliant stoves	35%	1,239
Estimated number that are in very low---income households (<\$15k)	16%	198
Estimated number that are in low---income households (\$15---35k)	27%	334
Estimated number that are in senior households (>62 years)	22%	272
Estimated overlap (percentage of seniors that are very low---income)	75%	(204)
Total potential target group for low---income change---outs	600	

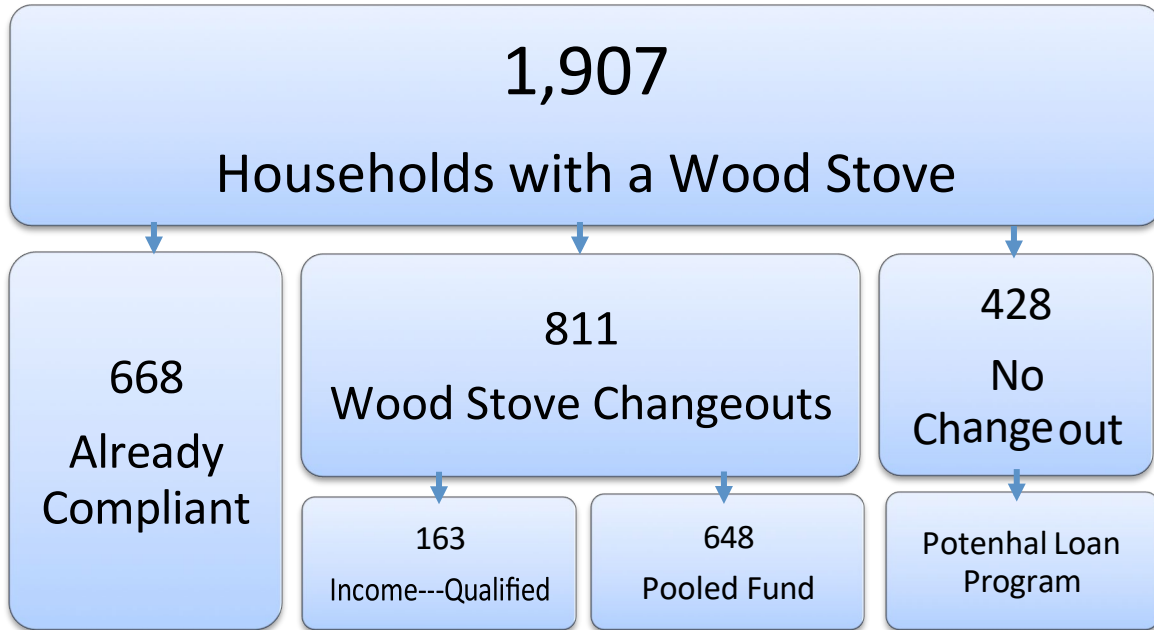
FINANCIAL FEASIBILITY EVALUATION

To assess the financial feasibility of the wood stove changeout financial assistance programs, a series of Excel---based financial models were developed. Key inputs to the models are based on data provided in the U.S. Census Bureau 2009---2013 American Community Survey and information provided by the NSAQMD, EPA and CARB. The analysis takes a tiered approach to wood stove changeouts. The first tier is to use existing programs to fund 100 percent of changeout costs for the income---qualified residents, including very low---income, low---income and senior households. Funds may be used either for a new wood, pellet or gas stove or to repair an existing electric heat source. The next tier is to utilize a \$3.0 million pooled wood stove changeout fund for all income levels that utilizes money from other federal, state, local, or foundation programs (as it becomes available) for a rebate incentive program. The third tier layers on a woodstove replacement loan program for all income levels to assist with the upfront cost of a wood stove changeout.

⁷ U.S. Census 2009---2013 American Community Survey 5---year estimates for Portola, CA, Zip 96122 and Plumas County, CA.

Based on the assumptions in the financial model, a comprehensive woodstove changeout program is summarized in Figure 3 below. Assuming that 35 percent of the estimated 1,907 households with a woodstove in the nonattainment area are already EPA-certified wood stoves and 25 percent of the households would choose not to participate in a wood stove changeout program, an estimated 811 stoves could be changed out, meeting the preliminary changeout goal for the program.

FIGURE 3: NUMBER OF HOUSEHOLDS IN NONATTAINMENT AREA PARTICIPATING IN WOOD STOVE REPLACEMENT PROGRAMS (ESTIMATED)



TIER ONE: WOODSTOVE REPLACEMENT PROGRAM FOR INCOME-QUALIFIED RESIDENTS

Federal assistance programs – including USDA’s Rural Repair and Rehabilitation Grants, the LIHEAP ECIP program and U.S. Dept. of Energy’s low-income weatherization program – are already in place to assist low-income households with energy-related repairs to existing homes. Therefore, this is the first source of funds that should be used to encourage changeouts in the nonattainment area. Assuming that 75 percent of households meeting income and age eligibility requirements for the USDA program participate and funds remain available, 163 wood stove changeouts could be completed, with a total cost of \$570,500.

Target Population:	Income-qualified and senior (over 62 years) residents
Dollar Amount:	Full grant for wood-stove changeout (estimated at \$3,500).
Funding Source:	USDA, LIHEAP, DOE
Number of Changeouts:	163 wood stoves
Total Cost of Programs:	\$570,500

TABLE 7: PARTICIPATION IN INCOME---QUALIFYING WOOD STOVE CHANGEOUT PROGRAMS

Program Name	Estimated Households Eligible*	Participation Rate	Number of Changeouts	Total Cost
Very Low Income Repair and Rehabilitation Grants (USDA)	204	75%	153	\$535,500
Low Income Energy Crisis Intervention Program (LIHEAP ECIP)	7	100%	7	\$24,500
Low Income Weatherization Program (U.S. Dept. of Energy)	3	100%	3	\$10,500
TOTALS	214	76%	163	\$570,500

* Eligibility for program based on income and age restrictions (USDA) and funding amounts (LIHEAP and DOE).

The income---qualified programs are contingent upon availability of funds and the community’s ability to target eligible households that meet both the income and age requirements of the funding programs. As education and outreach continue through outreach partners, these programs should be considered first for wood stove changeout assistance.

TIER TWO: POOLED FUND FOR WOODSTOVE REPLACEMENT (ALL INCOME LEVELS)

Even with existing programs in place for income---qualifying and senior residents, there are many residents who will not qualify for existing programs, but are unable to afford a new wood stove or electric heating appliance. For these households, a pooled fund could be developed using funds from new grants and funding opportunities as they are identified. Based on our analysis, a \$3 million fund has the potential to replace 648 wood stoves with more efficient wood or alternative heat source appliances. This estimate includes a 20 percent administration fee to cover the cost of implementing the program (either by NSAQMD or PCCDC) and a 65 percent participation rate.

- Target Population: All wood---stove owning residents in nonattainment area that do not qualify for the Tier One program outlined above.
- Dollar Amount: Full grant for wood stove changeout (estimated at \$3,500) or replacement with an alternative heating appliance (estimated at \$5,000).
- Potential Funding Sources: EPA 2015 Targeted Air Shed Grant Program, Community Development Block Grants, LIHEAP REACH program, future settlement funds, development / mitigation fees (see program detail below)
- Number of Changeouts: 648 wood stoves
- Total Cost of Program: \$2,838,240

Although the NSAQMD does not currently have funding for a pooled loan program, there are a few potential sources of funds that should be considered for the program:

1. **2015 Targeted Air Shed Grant Program**, U.S. Environmental Protection Agency. This program will assist local, state and/or tribal air control agencies in developing plans, conducting demonstrations, and implementing projects in order to reduce air pollution in nonattainment areas that EPA determines as the top five most polluted areas relative to ozone or PM_{2.5}. This is a competitive opportunity with maximum federal funding per applicant of \$3 million. Deadline for applications is June 1, 2015.
2. **Community Development Block Grants**, California Department of Housing and Community Development. This program provides funding for a variety of economic and community development activities for low- to moderate-income Californians, including Housing Rehabilitation programs and projects. Although the 2015 application deadline has passed (April 10, 2015), a grant application for the 2016 round of funding might be considered to help fund a wood stove changeout program if current CDBG funds can be spent prior to the 2016 application deadline.
3. **LIHEAP's Residential Energy Assistance Challenge (REACH) program**, U.S. Department of Health and Human Services. Though not currently offered as a LIHEAP allocation, the U.S. Department of Health and Human Services has in prior years offered supplemental LIHEAP funding for the implementation of innovative plans to help LIHEAP eligible households reduce their energy vulnerability. If announced as a future program, the Plumas County Community Development Commission could apply for wood stove changeout funding in addition to the regular LIHEAP allocation.
4. **Supplemental Environmental (SEP) and/or Mitigation Funds**, U.S. Environmental Protection Agency or California Environmental Protection Agency. In some cases, air pollution prevention programs (including wood stove changeout programs) have been partially funded by settlements agreements for violation of federal and state environmental laws. Although there is not currently a settlement in the Portola-Plumas County nonattainment area, it remains a potential source of funds if a settlement case were to arise at a future date.
5. **Development / Mitigation Offset Fees**, City of Portola. As the Portola-Plumas County area develops new housing units, the city could adopt a development fee to be used as a mitigation fund for new wood stoves in the area. This fee could be incorporated into the pooled fund and used to replace existing wood stoves in the area.
6. **Foundations** – There are a variety of private foundations that fund air quality projects, including local foundations like the Eastern Plumas Hospital Foundation that might offer cost-share funding in conjunction with any of the previously mentioned funding sources.

TIER THREE: WOODSTOVE REPLACEMENT LOAN PROGRAM (ALL INCOME LEVELS)

If money for a pooled fund is unavailable or not sufficient to help address the number of wood stove changeouts needed to reach attainment, the Greater Portola nonattainment area could consider a wood stove replacement loan program as a third tier of financing. In order to meet the needs of all income levels, this loan program should be developed as a coordinated effort between the USDA Rural Repair and Rehabilitation Loan program for low-income households and a local bank loan program for low to moderate-income households.

Target Population:	All wood-stove owning residents in nonattainment area that do not qualify for the Tier One program outlined above.
Dollar Amount:	Up to \$10,000 per loan (for EPA certified wood, pellet, gas, or electric heater and install)
Potential Funding Sources:	USDA Rural Repair and Rehabilitation Loan Program; and Plumas Bank
Number of Changeouts:	TBD
Total Cost of Program:	TBD

For income-qualifying homeowners (see Table 2), the USDA Rural Repair and Rehabilitation loan currently offers up to \$20,000 to repair and improve a home and must result in the removal of health and safety hazards. Wood stoves do qualify for this loan program. Loans are for up to 20 years at 1 percent interest. For homeowners that do not meet the income requirements of the USDA loan program, there is the potential to work with a local bank to develop a loan program for wood stove replacements, perhaps even broadening the offering to include any “green improvement” like weatherization or energy efficient appliances.

PLUMAS BANK WOOD STOVE LOAN PROGRAM

Plumas Bank, a local bank serving Plumas, Lassen, Modoc, Shasta, Placer, Nevada and Sierra counties, has approved an unsecured consumer loan product to assist qualifying homeowners in the Greater Portola nonattainment area finance the cost of a wood stove replacement.

Type of financing: Unsecured consumer loan

Amount of loan: \$1,000 --- \$10,000. The amount of the loan will depend on the type of device the homeowner chooses as a replacement.

Type of rate: 7.25 – 11.25 percent fixed rate. The rate is dependent upon the applicant’s credit score and the requested loan amount.

Term of loan: 24 to 48 months.

Loan Fees: \$75 documentation fee.

FUTURE LOAN PROGRAM CONSIDERATIONS

Currently, the proposed loan program is available only for wood stove changeouts. If weatherization and/or a new electric appliance is included in the loan offering, it might be possible to work with a local utility to offer on-bill repayment, however this will only be possible for homeowners with electric heating appliances and requires coordination between the utility and the financial institution. Another consideration is to use a credit enhancement (loan loss reserve or interest rate buy down) to fix the interest rate for all borrowers and expand the availability of credit to more risky borrowers with lower credit scores or poor repayment history. The establishment of a loan loss reserve fund (5-10 percent) may be required to offset the additional risk. Considering the small loan amounts and credit risk profile of the households, the additional transaction cost may require an operating subsidy for the lender as well.

LOAN PROGRAM EXAMPLE

Using the assumption that 1,239 households in the Greater Portola nonattainment area need to changeout a wood stove and very low participation rates (1 to 5 percent) in a loan program, a bank could develop a \$250,000 loan fund that would assist with the changeout of at least 112 wood stoves. A lower rate (like the USDA's loan program) or additional incentives from a retailer or manufacturer might help to increase participation rates in the loan program. It should be noted that this program is only necessary if the pooled loan fund in Tier 2 is not large enough to achieve the necessary number of changeouts to reach attainment.

FIGURE 4: EXAMPLE OF A WOOD STOVE REPLACEMENT LOAN PROGRAM

Wood Stove Replacement loan program --- Annual Cost Estimates			
Total Number of HHs	1,239		Input Value
INPUTS		PROGRAM SUMMARY	
Participation Rates		Total households	112
Year 1 --- 2015	5%	Percentage of qualified households	9%
Year 2 --- 2016	3%	3 Year cost of program	\$ 468,720
Year 3 --- 2017	1%	Average cost per household	\$ 4,200
Source of Funds			
(Enter source of funds)	\$ 250,000	Amount of funding is sufficient	
Loan Program Inputs			
Average cost to replace appliance	\$3,500		
Interest rate on loans	9.25%		
Length of loan term (years)	2		
Administrative Costs (% of total costs)	20%		

OTHER PROGRAMS

For all residents and income levels, weatherization programs should be recommended and encouraged in conjunction with all wood stove changeout programs. The LIHEAP and Liberty Utilities weatherization programs can be used for low-income households and the utility assistance programs can be used to help reduce energy costs for households that are interested in changing the primary heat source to electricity.

OVERCOMING CHALLENGES AND BARRIERS

Even with well-developed financing programs in place for wood stove changeouts – including programs that cover 100 percent of the cost of a changeout – there are still a number of barriers and challenges associated with a successful wood smoke reduction program. Behavior-based challenges are inherent in any change program. In the Greater Portola nonattainment area, the roundtable group identified a few key challenges and barriers that will need to be addressed in conjunction with the roll-out of a wood stove changeout program.

“I LIKE THE AMBIANCE OF MY OLD WOOD STOVE”

Many residents in the area choose wood as their primary source of heat not only because it is low-cost and plentiful in the area, but also because of its ambient qualities. The newer, EPA-certified wood stoves can offer the same aesthetically-pleasing characteristics of an older, inefficient wood stove. Wood stove demonstrations, as were done in the March 19 wood stove workshop and peer-to-peer champions will be essential in helping the community overcome this barrier to changeouts.

“WOOD SMOKE ISN'T A PROBLEM IN PORTOLA”

A common misperception of residents in areas with large amounts of wood smoke is that if the smoke can't be seen (for example, at night when many wood stoves are in use), then there isn't a wood smoke problem. This perception challenge can make outreach and education about the importance of wood stove changeouts very difficult. Overcoming this type of challenge will need to focus on educational efforts that explain the actual air quality data in easy-to-understand ways. A comparison with peer communities that have less severe wood smoke problem would also be helpful in changing the perceptions about wood smoke. Implementing an air quality flag program and finding other innovative ways to communicate air quality data could also help raise awareness about air pollution levels in the community.

“I DON'T WANT A HANDOUT”

Many of the programs identified in this evaluation are available to income-qualifying homeowners; however, some homeowners might not be interested in taking advantage of them because they consider the funding a government handout. One way to overcome this potential barrier is to stress the benefits to all residents of a community-based solution for improving air quality. Working together toward a common community goal could help to persuade reluctant homeowners to be part of the “solution.”

“I DON'T WANT SOMEONE IN MY HOME”

Even with funding for a new wood stove or other heating appliance, a few homeowners may be reluctant to let others in their home to change-out the stove due to possible permitting or other issues. Most of the federally-funded programs – including the USDA and LIHEAP programs – have funds available to assist homeowners with repairing health and safety hazards in the home and could be used to fix some permitting issues. Education around the health and maintenance benefits of a wood stove changeout might be helpful in overcoming this objection.

EDUCATION AND OUTREACH

From the previous section on overcoming challenges, it is clear that a key to launching a successful wood stove changeout program will be the education and outreach to Portola and Plumas County residents. NSAQMD has already begun a public outreach strategy in Portola to support the increased use of air quality management practices in the region. The strategy consists of distributing EPA's Burn Wise educational pamphlets to residents, providing a link on the District's website to the Burn Wise webpage and other relevant resources, developing advertisements and fact sheets to promote proper burning practices, facilitating woodstove workshops to help residents learn about wood stoves and proper burning practices, offering incentives to residents to attend workshops, distributing informational surveys, translating literature and other materials into Spanish for the Spanish-speaking residents of Portola, and other educational campaigns. When a full-blown wood stove replacement campaign is launched, these outreach strategies as well as some of the key elements outlined below will be important to the continued success of the program.

KEY ELEMENTS OF PORTOLA'S STRATEGIC COMMUNICATION PLAN:

- ✓ Include air quality educational components consistently and ubiquitously throughout the community on all printed materials, websites, emails and other marketing mediums.
 - ✓ Identify the local populations most affected by fine particulate emissions – including seniors and children.
 - ✓ Help local residents learn and educate each other about the health and economic benefits of efficiently burning wood.
 - ✓ Conduct outreach and host workshops for the community to demonstrate proper burning techniques and the benefits of cleaner, more efficient wood stoves.
 - ✓ Utilize existing government and utility financial assistance programs for income-qualified homeowners to help with wood stove changeouts and weatherization of homes.
 - ✓ Develop strategic partnerships with local wood stove retailers and financial institutions to offer financing alternatives for new wood stoves.
 - ✓ Establish long-term, consistent outreach and education through local schools, fire departments, and community volunteer organizations.
 - ✓ Provide daily data on air quality and educate residents about how to find the information on their own. This could include utilizing the "[Air Now](#)" flag program at schools and community buildings.
-

POTENTIAL TARGET GROUPS

Five groups should be considered as educational targets as part of the community's outreach strategy. Some of these groups will directly benefit from air quality improvements and others might appreciate the economic benefits of more efficient homes and reduced energy use:

1. **Known wood stove users** – In conjunction with the 3/19 wood stove workshop, NSAQMD collected 89 surveys from local residents. Seventy percent of these surveys indicate that the household has one or more wood-burning device. Visual identification of wood-burning homes could also be used for outreach purposes.
2. **Homebound Portola residents** – The Plumas County Public Health Agency estimates that at least 200 of the city's residents are homebound, the majority of which are seniors.
3. **School age children** – There are approximately 600 school-aged kids in the Portola area. Households with kids could be targeted for health messaging and school projects and education in classes will assist in outreach to all community members.
4. **Liberty Utilities "Green Cross" Program** – The utility offers a discounted per kilowatt-hour rate for households that have large medical equipment installations in their homes. These households might be good candidates for weatherization and wood stove replacement if warranted.
5. **LIHEAP, Liberty Utilities CARE and Plumas Sierra WRAP enrollees** – Both local utilities provide utility assistance programs to income-qualifying households. These households, in addition to the homes that receive LIHEAP utility assistance, are perfect target groups for weatherization and wood stove replacement outreach.

POTENTIAL OUTREACH PARTNERS:

In addition to the target groups summarized above, there are other channels for reaching a diverse set of community members, many of whom have wood stoves in their homes. These partners exist today, and with a minimal amount of education they can become strong allies and champions in the outreach effort:

- Community Connections volunteers (includes 200 junior members)
- Churches, Schools, PTAs
- Wood cutters, chimney sweeps, HEAP wood vendors
- Chamber of Commerce, Rotary Club
- Retailers, including stove retailers, Natural Foods Store
- Sports / Bicycling organizations

In addition, the development of an advisory committee of key community stakeholders (church and business leaders, doctors and teachers) can help communicate the economic and health importance of a community-wide wood stove replacement program.

MOVING FORWARD: RECOMMENDATIONS AND CONCLUSIONS

Working with key stakeholders from the Portola and Plumas County community, the EPA and CARB, the NSAQMD has already taken steps towards the development of a comprehensive strategy to bring the Greater Portola area back into attainment. While there is no silver bullet for ensuring that the target levels of PM_{2.5} will be attained, the community's multi-faceted approach to education and outreach, data collection and financing solutions are the cornerstones to a successful wood stove changeout program. In addition, there is a strong desire by all key stakeholders and community leaders to join together to implement a successful program and many of the critical elements are already in place.

The NSAQMD has developed expertise and proven methods for achieving success in improving air quality in the region. The City of Portola and its community partners, the Plumas County Community Development Commission, the Plumas Crisis Intervention and Resource Center and the Plumas County Public Health Agency have fine-tuned mechanisms for public outreach and education, especially for the low-income and senior population. Local utilities, particularly Liberty Utilities and Plumas-Sierra Rural Electric Cooperative, are already partnering with the community to provide energy savings and utility assistance programs. Other key stakeholders such as state and federal agencies and the local branch of Plumas Bank are all aware of the program needs and have expressed interest in moving forward with discussions to develop additional program support.

Given the demographics of the Greater Portola residents and this evaluation of opportunities for providing financial assistance to reduce PM_{2.5} levels in the Greater Portola nonattainment area, the EFC recommends the following tiered approach to financing wood stove changeouts:

- Tier 1: Use existing state, federal and utility programs to change out at least 163 wood stoves for low income and senior residents in the Portola-Plumas County nonattainment area.
- Tier 2: Apply for funding from EPA's 2015 Targeted Air Shed Grant Program or other funding sources to develop a \$3 million pooled fund to change out at almost 650 wood stoves for residents of all income levels.
- Tier 3: Develop a coordinated wood stove replacement loan program in partnership with USDA Rural Services and Plumas Bank to provide funds for any additional wood stove changeout and/or weatherization needs within the community.

In addition, by utilizing existing relationships with partner organizations in the area, the NSAQMD can leverage the outreach it does to residents about air quality and the impacts of wood smoke. With a thorough understanding of the target audiences and the diverse set of challenges and needs of different demographic groups, the District can pull together the partners and develop a comprehensive outreach strategy that includes the following key elements:

- Include air quality educational components consistently and ubiquitously throughout the community on all printed materials, websites, emails and other marketing mediums.
- Facilitate outreach and host workshops for the community to demonstrate proper burning techniques and the economic and health benefits of cleaner, more efficient wood stoves.
- Identify peer-to-peer champions that can help educate others within the community.
- Encourage long-term, consistent outreach and education through local schools and community organizations.
- Disseminate daily air quality data through different communication channels to help educate residents about the air quality problem.
- Provide easy access to information on financing alternatives and education on fuel-switching options.
- Consistently monitor compliance with existing regulations (burn ban days) and ordinances (Woodstove and Fireplace Ordinance).

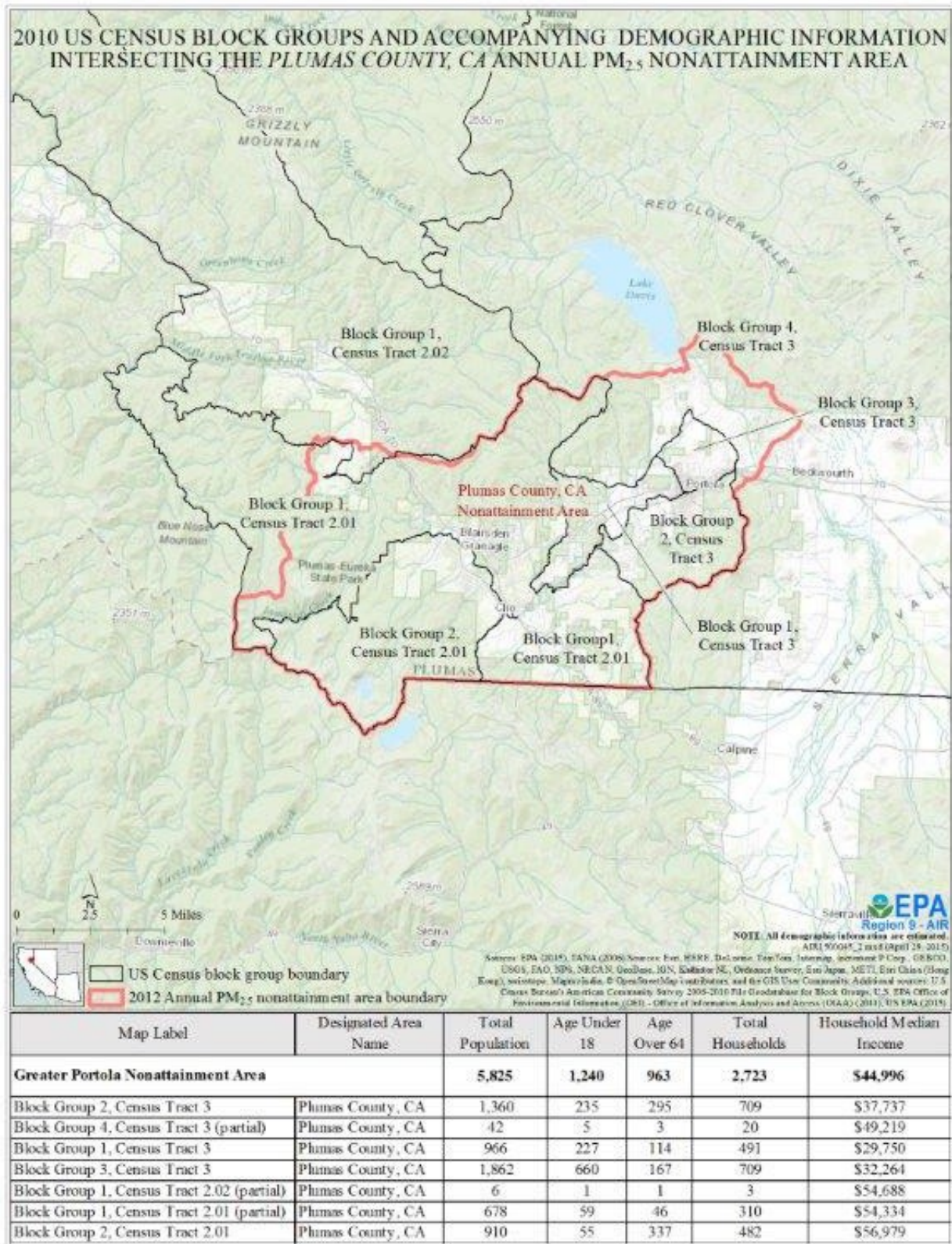
Ultimately, it is the coordination of existing resources and the development of a tiered strategic financial plan that will help the community address not only the financial barriers to wood stove changeouts, but also encourage a community-wide effort to address the air quality challenges. Working together, these elements will help to bring the Greater Portola area back into attainment.

APPENDIX A – ACKNOWLEDGEMENTS

The authors of this report would like to thank the following people for their contribution to this program evaluation:

Name	Job Title	Organization
Larry Brockman	Residential Wood Smoke Reduction Initiative	Environmental Protection Agency – Office of Air and Radiation
Leigh Herrington	Residential Wood Smoke Reduction Initiative	Environmental Protection Agency – Office of Air and Radiation
Katie Stewart	Community Toxics Coordinator	EPA – Region 9 – Air Division
John Ungvarsky	Environmental Scientist, Planning Office	EPA – Region 9 – Air Division
Graham Fitzsimons	Managing Partner	EC/R Incorporated
Gretchen Bennett	Executive Director	Northern Sierra Air Quality Management District
Julie Ruiz	Air Pollution Control Specialist	Northern Sierra Air Quality Management District
Sam Longmire	Air Pollution Control Specialist III	Northern Sierra Air Quality Management District
Kasia Turkiewicz	Air Quality Planning	California Air Resources Board
Robert Meacher	City Manager	City of Portola
Karen Downs	City Planner	City of Portola
Todd Roberts	Building Department	City of Portola
Lori Williams	Program Manager, EE	Liberty Utilities
Corby Erwin	Member and Energy Services Manager	Plumas---Sierra Rural Electric Cooperative
Tom Yagerhofer	Interim Executive Director	Plumas County Community Development Commission
David Mitchell	Weatherization Program Manager	Plumas County Community Development Commission
Mimi Hall	Director, Public Health Officer	Plumas County Public Health Agency
Johanna Downey	Executive Director	Plumas Crisis Intervention and Resource Center (PCIRC)
Leah Irons	Greenville and Quincy Office	PCIRC
Nayeli Macias	Quincy Office	PCIRC
Michelle Peralta	Portola Family Resource Center	PCIRC
Michelle Ridley	Portola Family Resource Center	PCIRC
Ryan Bauer	Forest Fuels Officer	U.S. Forest Service
Cheri Skudlarek	Area Specialist	USDA Rural Development, Redding Office
Kathy Andry		California Dept. of Community Services and Development
Rochelle Ramelli	VP, Branch Manager	Plumas Bank, Portola Branch

APPENDIX B – MAP OF GREATER PORTOLA NONATTAINMENT AREA



APPENDIX C – PORTOLA, CA WOOD STOVE AND FIREPLACE ORDINANCE

Portola, California, Code of Ordinances >>--- PORTOLA, CALIFORNIA MUNICIPAL CODE>> Title
15--- BUILDINGS AND CONSTRUCTION >> Chapter 15.10 ---WOOD STOVE AND FIREPLACE ORDINANCE >>

15 10.010- - - Purpose.

15 10.020 --- Definitions

15 10.030 ---Installation of solid fuel burning appliances.

15.10.040--- Existing wood stove/fireplace Insert---Replacement.

1510.050- - - Violations.

15.10.010--- Purpose.

A. This chapter shall be cited as the "Wood Stove and Fireplace Ordinance."

B. This chapter is enacted for the purpose of improving the air quality within the city limits and protecting the health and general welfare of the citizens and residents of the city of Portola. The city council finds there is a need to regulate and reduce harmful emissions of exhaust gases from wood---burning stoves and fireplaces, and that an appropriate method of regulation is a wood stove and fireplace ordinance.

15.10.020--- Definitions.

As used in this chapter:

"City approved solid fuel burning appliance" means and includes any of the following:

1. Any appliances which are certified in accordance with current standards adopted by the U.S. Environmental Protection Agency ("EPA") as Phase II requirements and/or which appear on the city of Portola official list of certified wood stoves, if the city of Portola chooses to establish and maintain such a list. Appliances meeting these standards shall be deemed "certified" for purposes of this chapter;
2. A wood stove installed in the kitchen which is primarily designed for cooking and has a stove top and an oven. It may also be equipped with gas burners;
3. An open masonry fireplace that burns natural or liquid propane gas as its fuel through a ceramic or otherwise noncombustible gas log that is permanently installed in the fireplace;
4. A pellet---fueled heater, comprising a forced draft heater with an automatic feed which supplies appropriately sized feed material or compressed pellets of wood, coal or other biomass material to the firebox;
5. A zero clearance fireplace that does not meet the EPA Phase II requirements, but is approved for use by the Northern Sierra Air Quality Management District or a successor entity;
6. A "wood stove/fireplace insert," which may be a wood heater, pellet stove, prefabricated zero clearance fireplace or a fireplace heat form with doors or other accessories which

cause the fireplace to function as a wood heater. Wood stoves/fireplace inserts do not include open masonry fireplaces, barbecue devices, portable fire pits, gas-fired fireplaces or cook stoves.

"Control officer" means the city administrator of the city of Portola, or his or her designee.

"Fireplace" means an open hearth or fire chamber or similar prepared place in which a fire may be made and which is built in conjunction with a chimney. It may have doors, provided they are not designed with gaskets, air intake controls or other modifications which create an air starved operating condition. Fireplaces without such modifications are exempt from the emission standards and requirements of Sections 15.10.050 and 15.10.060. Wood-burning devices initially classified as a wood heater (See "Wood heater" definition below) may not be modified to meet the fireplace definition.

"Uncertified" means a wood stove/fireplace insert that cannot be verified as meeting the certified standards and/or does not appear on the city of Portola official list of certified/exempt wood stoves.

"Wood heater" means an enclosed wood-burning appliance capable of, and intended for space heating, domestic water heating or indoor cooking and which has an air-to-fuel ratio of less than thirty-five to one in the low burn cycle. It also must have a usable firebox volume less than twenty cubic feet, weigh less than eight hundred kilograms and have a minimum burn rate less than five kilograms per hour. Appliances that are described as prefabricated fireplaces and are designed to accommodate doors or other accessories that would create the air starved operating conditions of a wood heater, must meet the emission standards if they meet the criteria in the above definition with those accessories in place.

15.10.030-- Installation of solid fuel burning appliances.

A. Emission Standard. It is prohibited for any person to advertise, except when restrictions are noted, sell, offer to sell, or install any wood stove/fireplace insert to any person for installation in any residence or other structure within the city limits if it emits more than seven and one-half grams of particulate matter per hour for a non-catalytic appliance or 4.1 grams of particulate matter per hour for a catalytic appliance. If the U.S. Environmental Protection Agency adopts a wood stove/fireplace emission standard which is more stringent, that emission standard supersedes the standard in this section and becomes effective on the date that the U.S. Environmental Protection Agency standard becomes effective.

B. Enforcement.

1. No local government authority within the city limits may issue a building permit to any person to install an uncertified wood stove/fireplace insert.
2. The control officer shall make available to the public a list of all certified appliances by brand name and model allowed for sale within the city limits.

15.10.040-- Existing wood stove/fireplace Insert--Replacement

A. It is prohibited for any person to complete, or allow the completion of any:

1. Escrow transaction; and/or
2. Title change on any residence or mobile home, or other parcel containing a structure, for the transfer or conveyance of any previously occupied residence, mobile home, or other parcel containing a structure unless the residence, mobile home, or other parcel containing a structure has been certified by the control officer as being in compliance with the wood stove/fireplace certification requirements of these regulations.

B. The buyer and seller of any real property shall observe this section and any disclosure statements supplied by the real estate agents relating to the requirement under this regulation for the inspection of any wood--burning device installed in a residence, mobile home, or structure on the property.

C. Upon inspection of a residence, mobile home, or other structure, the control officer will issue a certificate of compliance if each woodstove/fireplace insert is certified. If the residence, mobile home, or other structure does not contain an uncertified solid fuel burning device, or if special circumstances exist which would make the enforcement of this ordinance impractical or unnecessary the buyer and seller may apply to the city for an exemption. Exemptions shall be granted or denied by the city in its sole discretion, although the city may consult with the control officer in considering an application for exemption.

D. If the report indicates that a wood stove/fireplace insert is uncertified, the wood stove/fireplace insert must be removed from the residence and reinspection is required prior to issuance of a certificate of compliance. If an uncertified wood stove/fireplace insert is removed from a residence, the device must not be stored or installed at any other location on the real property or elsewhere within the city limits without the approval of the control officer.

E. The control officer may issue a certificate of compliance for a residence if a person provides evidence that the certified wood stove/fireplace insert has been installed in compliance with all applicable building, fire and other codes.

F. A certificate of compliance issued pursuant to this section:

1. Remains valid until the residence is transferred or conveyed to a new owner or for nine months, whichever comes sooner.
2. Does not constitute a warranty or guarantee by the control officer that the wood stove/fireplace insert within the residence meets any other standards of operation, efficiency or safety, except the emission standards contained in these regulations.

G. If a residence is to be sold and does not contain a wood stove/fireplace insert, a form approved by the control officer, containing the signatures of both the buyer and seller, attesting to that fact, may be accepted in lieu of an inspection, and a notice of exemption may be issued. The completed notice of exemption shall be submitted to the control officer within ten days of close of escrow. If the residential property contains a wood stove/fireplace insert which is not certified and must be removed, the form must not be executed by either the buyer or seller until the removal has been completed. On any subsequent sale, a new notice of exemption is required.

15.10.050--- Violations.

Any person who violates any of the requirements of this chapter, or who falsely attests as to information as part of compliance with this chapter, is subject to penalties and punishments as set forth in Chapter 1.10 of this municipal code, may be subjected to the applicable penalties and punishments prescribed by law for perjury, and may have any license or permit issued by the city be revoked, including but not limited to a building permit or certificate of occupancy.

APPENDIX D – PORTOLA AREA RESIDENTIAL HEATING SURVEY

Portola Area Residential Heating Survey (One Survey per Household)

BRING THIS SURVEY TO THE WOOD STOVE WORKSHOP ON MARCH 19 (see reverse) OR

**Return this survey to the Northern Sierra Air Quality Management District (NSAQMD) using any of the following:
Portola drop boxes at Plumas Rural Services (171 Nevada St.), Portola Family Resource Center (165 Ridge St.) or the
Portola Library OR Fax to 530-832-0101 OR complete the survey online at www.mvairdistrict.com.**

Completed surveys received by April 15, 2015 will be entered in a drawing for a \$100 gift card to Ace Hardware.

Please circle or fill in answers below.

1. Status of home ownership: OWNER RENTER
2. What year was this home built (approximately)? _____
3. Is this home your primary or secondary residence? PRIMARY SECONDARY
4. Does your residence have a wood burning device? YES NO (skip to #10)
5. If yes, circle the type of device it is (if more than one, the one you use most):

Winters can be very cold... Your answers will help the NSAQMD develop voluntary programs to improve home heating in Portola, saving residents time and money.

WOOD STOVE FIREPLACE PELLET STOVE FIREPLACE INSERT OUTDOOR WOOD BOILER

If your home has a second wood burning device, please indicate the type from the list above:

6. If burning wood, where is it obtained? CUT BUY
7. If purchasing wood, what is the cost per cord? \$ _____
8. How many cords do you use annually? _____
9. Is your main wood burning device EPA certified (tag on back of device)? YES NO NOT SURE
10. What is the primary fuel you use for heating your home?

WOOD PROPANE FUEL OIL ELECTRICITY SOLAR KEROSENE

LPG GENERATOR DIESEL GENERATOR OTHER _____
11. What is the secondary fuel you use for heating your home (if any)?

WOOD PROPANE FUEL OIL ELECTRICITY SOLAR KEROSENE

LPG GENERATOR DIESEL GENERATOR OTHER _____
12. If your residence has a heated outbuilding, what is the fuel used? (If no heated outbuilding, skip question)

WOOD PROPANE FUEL OIL ELECTRICITY SOLAR KEROSENE

LPG GENERATOR DIESEL GENERATOR OTHER _____

Please fill out the contact information below so you may be entered in the drawing and contacted regarding upcoming educational workshops and community programs (all information will be kept confidential):

NAME _____

ADDRESS _____ CITY _____ ZIP _____

PHONE _____ EMAIL _____

Would you be willing to participate in a more in-depth survey by phone? YES NO

Additional optional survey questions:

- | | | |
|--|-----|----|
| Do you receive any assistance from an energy assistance program (i.e. LIHEAP)? | YES | NO |
| Is your annual household income above \$46,000? | YES | NO |
| Are there school-age children in the home (K-12)? | YES | NO |
| Are there any individuals over the age of 55 in the home? | YES | NO |
| Is anyone in the home diagnosed with asthma or any respiratory/breathing disorder? | YES | NO |

Appendix E

Portola Area Residential Heating Survey

Portola Area Residential Heating Survey (One Survey per Household)

BRING THIS SURVEY TO THE WOOD STOVE WORKSHOP ON MARCH 19 (see reverse) OR

Return this survey to the Northern Sierra Air Quality Management District (NSAQMD) using any of the following: Portola drop boxes at Plumas Rural Services (171 Nevada St.), Portola Family Resource Center (165 Ridge St.) or the Portola Library OR Fax to 530-832-0101 OR complete the survey online at www.myairdistrict.com.

Completed surveys received by April 15, 2015 will be entered in a drawing for a \$100 gift card to Ace Hardware.

Please circle or fill in answers below.

1. Status of home ownership: OWNER RENTER
2. What year was this home built (approximately)? _____
3. Is this home your primary or secondary residence? PRIMARY SECONDARY
4. Does your residence have a wood burning device? YES NO (skip to #10)
5. If yes, circle the type of device it is (if more than one, the one you use most):

Winters can be very cold... Your answers will help the NSAQMD develop voluntary programs to improve home heating in Portola, saving residents time and money.

WOOD STOVE FIREPLACE PELLET STOVE FIREPLACE INSERT OUTDOOR WOOD BOILER

If your home has a second wood burning device, please indicate the type from the list above:

6. If burning wood, where is it obtained? CUT BUY
7. If purchasing wood, what is the cost per cord? \$ _____
8. How many cords do you use annually? _____
9. Is your main wood burning device EPA certified (tag on back of device)? YES NO NOT SURE
10. What is the primary fuel you use for heating your home?

WOOD PROPANE FUEL OIL ELECTRICITY SOLAR KEROSENE
LPG GENERATOR DIESEL GENERATOR OTHER _____

11. What is the secondary fuel you use for heating your home (if any)?

WOOD PROPANE FUEL OIL ELECTRICITY SOLAR KEROSENE
LPG GENERATOR DIESEL GENERATOR OTHER _____

12. If your residence has a heated outbuilding, what is the fuel used? (If no heated outbuilding, skip question)

WOOD PROPANE FUEL OIL ELECTRICITY SOLAR KEROSENE
LPG GENERATOR DIESEL GENERATOR OTHER _____

Please fill out the contact information below so you may be entered in the drawing and contacted regarding upcoming educational workshops and community programs (all information will be kept confidential):

NAME _____

ADDRESS _____ CITY _____ ZIP _____

PHONE _____ EMAIL _____

Would you be willing to participate in a more in-depth survey by phone? YES NO

Additional optional survey questions:

Do you receive any assistance from an energy assistance program (i.e. LIHEAP)?	YES	NO
Is your annual household income above \$46,000?	YES	NO
Are there school-age children in the home (K-12)?	YES	NO
Are there any individuals over the age of 55 in the home?	YES	NO
Is anyone in the home diagnosed with asthma or any respiratory/breathing disorder?	YES	NO

Summary of 2015 Home Heating Survey Results

The Air District developed a residential heating survey to be distributed throughout the nonattainment area. The surveys were distributed in various areas; on the District website, local newspaper, public library, local grocery store, hardware store, Portola Family Resource Center, and the Senior Center. Residents were encouraged to complete it by April 15, 2015 in order to be eligible for a gift certificate in a local hardware store.

Additionally, the District requested all participating residents to complete a survey at the March 19, 2015 Wood Stove workshop. Residents completing the survey at the workshop became eligible for a \$1,000 gift certificate which could be used towards the replacement of a non-certified stove with an EPA-certified appliance. The District collected 39 surveys at the workshop. The District picked up an additional 30 surveys at various drop offs throughout town. The District also worked with the public health program which collected 11 surveys from home-bound residents. Another 9 were collected by the Air District from their online survey. A total of 89 surveys were collected by April 15, 2015.

Results of the survey showed that 71% of those surveyed owned their homes. 28% of the homes were built after 1990 (so they likely contained EPA certified appliances). 97% of the residents labeled their home as their primary residence, so there were very few surveyed residents that used their home as a vacation home. 70% of those surveyed stated they owned a wood burning appliance. However, it should be noted that 39 of the total 89 surveys were collected during the wood stove workshop, so those results would be biased towards wood stove owners.

Of special interest was the breakdown of the type of wood burning appliances; 82% owned wood stoves, 9 % owned fireplaces, 6% owned wood stove inserts and only 3% owned pellet stoves. Approximately an equal amount of those who use wood burning appliances cut and/or buy their wood. 87% of those who burn wood use more than 3 cords of wood/year. 47% of those with wood burning appliances stated the appliance was an EPA certified appliance. 58% of those surveyed stated that wood was the primary fuel they used to heat their homes.

Appendix F

Guidance Document for the Greater Portola

Wood Stove Change-out Program

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The forms listed below were developed to facilitate the Greater Portola Wood Stove Change-out Program.

Form Title	Date	Revised
Cover Sheet	3/1/16	6/2/22
Checklist for Final Packet Submissions	5/1/16	6/2/22
Wood Stove Change-out Process Flow Chart	4/9/16	6/2/22
District Approved Retailers	4/18/16	6/2/22
District Approved Retailers-Spanish	7/22/16	6/2/22
Eligibility Criteria Overview	4/1/16	6/2/22
Eligibility Criteria Zone 1	3/1/16	6/2/22
Eligibility Criteria Zone 2	3/1/16	6/2/22
How to Identify Certified Stoves	3/1/16	6/2/22
NSAQMD Application Zone 1	4/1/16	6/2/22
NSAQMD Application Zone 2	4/7/16	6/2/22
Owner Tenant Agreement	3/1/16	6/2/22
Boilerplate Letter to Resident – Pre-Qualified	3/1/16	6/2/22
Boilerplate Letter to Resident – Spanish Pre-Qualified	3/1/16	6/2/22
NSAQMD Letter to Resident – over \$3,500	8/1/16	6/2/22
Program Tracking Form	5/1/16	6/2/22
NSAQMD Training Form	4/7/16	6/2/22
NSAQMD Verification of Destruction	5/18/16	6/2/22
FY2018 TAG Workplan		11/11/2023
FY2020 TAG Workplan		
Revised Workplans	1/29/2023	
Addendum to the 2015,2018 and 2020 TAGs	8/2/2022	12/5/2023



GREATER PORTOLA WOOD STOVE CHANGE-OUT PROGRAM

NSAQMD CHECK LIST

MUST BE COMPLETED BEFORE SUBMISSION TO NSAQMD FOR REIMBURSEMENT

Attach this sheet to the front of each submission packet

Program Tracking Number:	
Date Submitted to NSAQMD:	
Retailer:	
Total Check Request:	
2018 TAG	
2020 TAG	

Done	Item	Responsible Party
	Application (including Home Heating Survey)	Applicant
	Owner/Tenant Agreement, if needed	Applicant
	Estimate signed by NSAQMD staff	Retailer and NSAQMD staff
	Exceeds letter, if needed	Retailer and NSAQMD staff
	Program Tracking Form	Retailer
	Photos of non-EPA certified device	Retailer or NSAQMD staff
	Photos of new installed device	Retailer or NSAQMD staff
	Acknowledgement of Training Form	Retailer
	Verification of Destruction Form	Retailer and City of Portola staff
	Photos of old device destroyed	City of Portola staff
	Final Invoice	Retailer
	Copy of Permit	Retailer

10 Items Required (2 additional, if necessary)

Preparer

Date

Julie Hunter, Executive Director

Date

Check to Retailer:	
Input Into Database:	
Follow Up Survey Completed:	

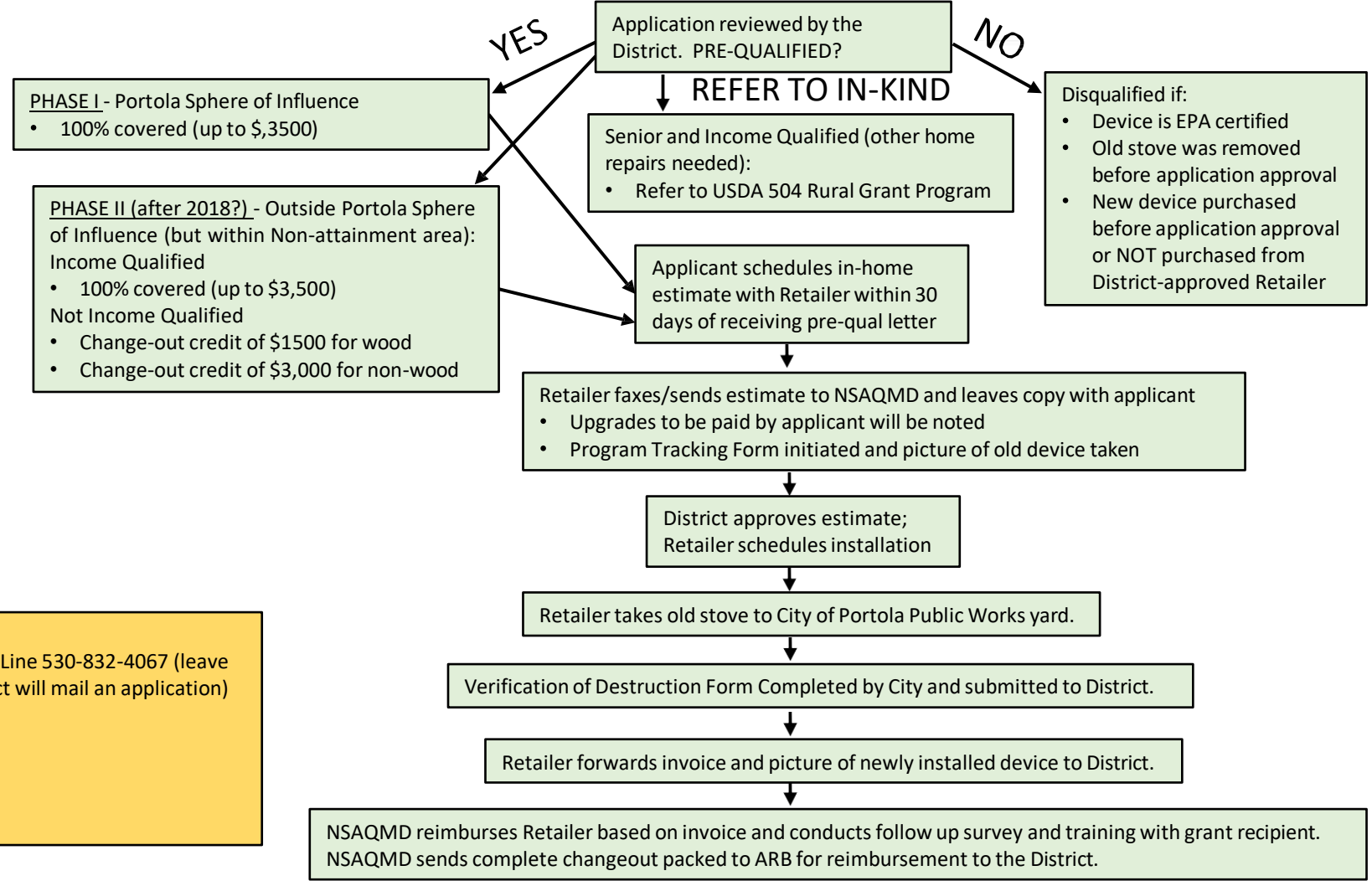
Wood Stove Change-out Process Flowchart - DRAFT

Program start date: 04/09/16 for Phase I

- ACTIVITIES**
- EPA Grant Award Press Release – 11/10/15
 - Home Heating Financial Assistance Workshop – 12/2/15
 - Program Announcement – XX/XX/16??
 - Begin accepting applications – XX/XX/16??
 - Media Kick Off – XX/XX/16??
 - Stove Fair – XX/XX/16??

- FORMS (on website by Program Announcement date)**
- Informational flier (Eligibility Criteria)
 - Application
 - How the Program Works
 - Application
 - Applicant Certification (to be signed)
 - Portola Home Heating Survey

- APPLICATIONS AVAILABLE:**
- Woodstove Change-Out Information Line 530-832-4067 (leave message with address and the District will mail an application)
 - www.myairdistrict.com
 - Wood Stove Retailers
 - Quincy Hot Spot
 - Wolf Creek Wood Stoves
 - Others??



GREATER PORTOLA WOOD STOVE CHANGE-OUT PROGRAM



DISTRICT-APPROVED RETAILERS/CONTRACTORS

Wood, Pellet, Propane and Kerosene Stoves:

Quincy Hot Spot

530-283-2929

2019 East Main Street

Quincy, CA 95971

www.quincyhotspot.com

Wolf Creek Wood Stoves

530-832-9858

530-616-0135 (cell)

55 Delleker Drive

Portola, CA 96122

www.wolfcreekwoodstoves.com

Electric Heat Pumps:

Heat Transfer Systems

530-283-3665

64 Bresciani Lane

Quincy, CA 95971

JTBlust49er@gmail.com

Integrity Heating and Air

530-249-3697

P.O. Box 67

Chilcoot, CA 96105

femsoff@gmail.com

GREATER PORTOLA WOOD STOVE CHANGE-OUT PROGRAM



PROVEEDORES APROVADA POR EL DISTRITO

Estos son los proveedores a donde puede llamar para su estimación de el servicio de Estufas de Madera.

**Estufa de Madera, Pellet,
Propano y Queroseno:**

**Bomba de Calor eléctrica
(Heat Pump):**

Quincy Hot Spot
530-283-2929
2019 East Main Street
Quincy, CA 95971
www.quincychotspot.com

Heat Transfer System
530-283-3665
64 Bresciani Lane
Quincy, CA 95971
JTBlust49er@gmail.com

Wolf Creek Wood Stoves
530-832-9858
530-616-0135 (cell)
55 Delleker Drive
Portola, CA 96122
www.wolfcreekwoodstoves.com

Integrity Heating and Air
530-249-3697
P.O. Box 67
Chilcoot, CA 96105
femsoff@gmail.com

NORTHERN SIERRA AIR QUALITY MANAGEMENT DISTRICTwww.myairdistrict.com**Program Coordinator: 530-832-0102 Ext. 1**

GREATER PORTOLA WOOD STOVE CHANGE-OUT PROGRAM

APPLICATION FOR ZONE 1 – Nonattainment Area

The Northern Sierra Air Quality Management District (District) is offering a change-out program to qualified homeowners within the Greater Portola PM2.5 Non-attainment Area in Plumas County, California for replacement of old, qualified wood/pellet heating devices with new, efficient, clean burning EPA certified devices. This program is funded by the U.S. EPA's 2015, 2018 and 2020 Targeted Air Shed Grant Program, the District's AB2766 program and other agencies. Funding will be available until October 31, 2026, or until funds run out.

1. Zone 1 funding will be available only to applicants within the City of Portola Sphere of Influence (see attached map).
2. To qualify, the applicant must have a currently installed and operating heating device:
 - a. A non-EPA certified wood/pellet stove (typically manufactured prior to 1992); OR
 - b. An EPA certified wood/pellet stove manufactured 20+ years ago with the emission control technology in disrepair, OR
 - c. An EPA certified wood/pellet stove manufactured 20+ years ago, in any condition, to be replaced with a pellet, propane or kerosene heating device, OR
 - d. An open fireplace being used as a primary heating device.
3. If the old device is removed from the home prior to application approval, the applicant will be disqualified from this program.
4. If the new device is purchased before application approval, the applicant will be disqualified from this program.
5. Installation must be completed by a District-approved Retailer/Contractor (Retailer). Self-installation of the new device is NOT eligible.
6. Program covers the replacement of qualified heating devices in manufactured/mobile homes but addition paperwork is required.
7. Program includes renters. An Owner/Tenant agreement must be signed by both parties.
8. If your residence is INSIDE the Portola City Sphere of Influence (Zone 1), then you may be eligible for:
 - Up to \$5,000 to replace a qualified wood heating device with an EPA certified wood burning device that means current New Source Performance Standards (NSPS).
 - Up to \$6,500 to replace a qualified wood/pellet heating device with an EPA certified pellet, propane or kerosene heating device.
 - Up to \$13,500 to replace a qualified wood/pellet heating device with an ENERGY STAR® compliant air source heat pump (electric).
9. Heating device brands/models will be determined by Retailer and approved by the District.
10. Upgrades over and above the approved amount will be paid by the applicant.



11. The old, qualified stove must be surrendered to the Retailer for destruction and scrap recycling. The resale or transfer of the old stove in usable condition, for the purpose of its reuse as a stove, is a violation of the terms of this program and will result in forfeiture of the grant award.
12. A photo will be taken by the Retailer before the old device is removed, a photo will be taken to document destruction and a photo will be taken of the new, certified device after installation.
13. To qualify, each applicant must first complete the attached application. Completed applications must be mailed to the Program Coordinator at the address on the application form. The application will be reviewed to determine if the preliminary qualification requirements have been met. Once pre-qualified, the applicant will contact an approved Retailer to schedule an in-home estimate.

NEXT STEP: Applicants will hear from the District within 21 days of receiving a submitted application. *Submission of an application does not guarantee funding.*

The mission of this program is to reduce health impacts by reducing fine particulate (PM2.5) in the air from wood smoke. These microscopic particles go deep into the lungs where they may become trapped. PM2.5 is linked with premature death, work and school absences, and significant health problems including aggravated asthma, acute respiratory symptoms (such as chest pain and coughing), chronic bronchitis and decreased lung function. Sensitive individuals (those most at risk from exposure to smoke) are the elderly, children, asthmatics, adults with pre-existing heart and lung disease, pregnant women, and people engaging in strenuous outdoor activity.



APPLICANT CERTIFICATION

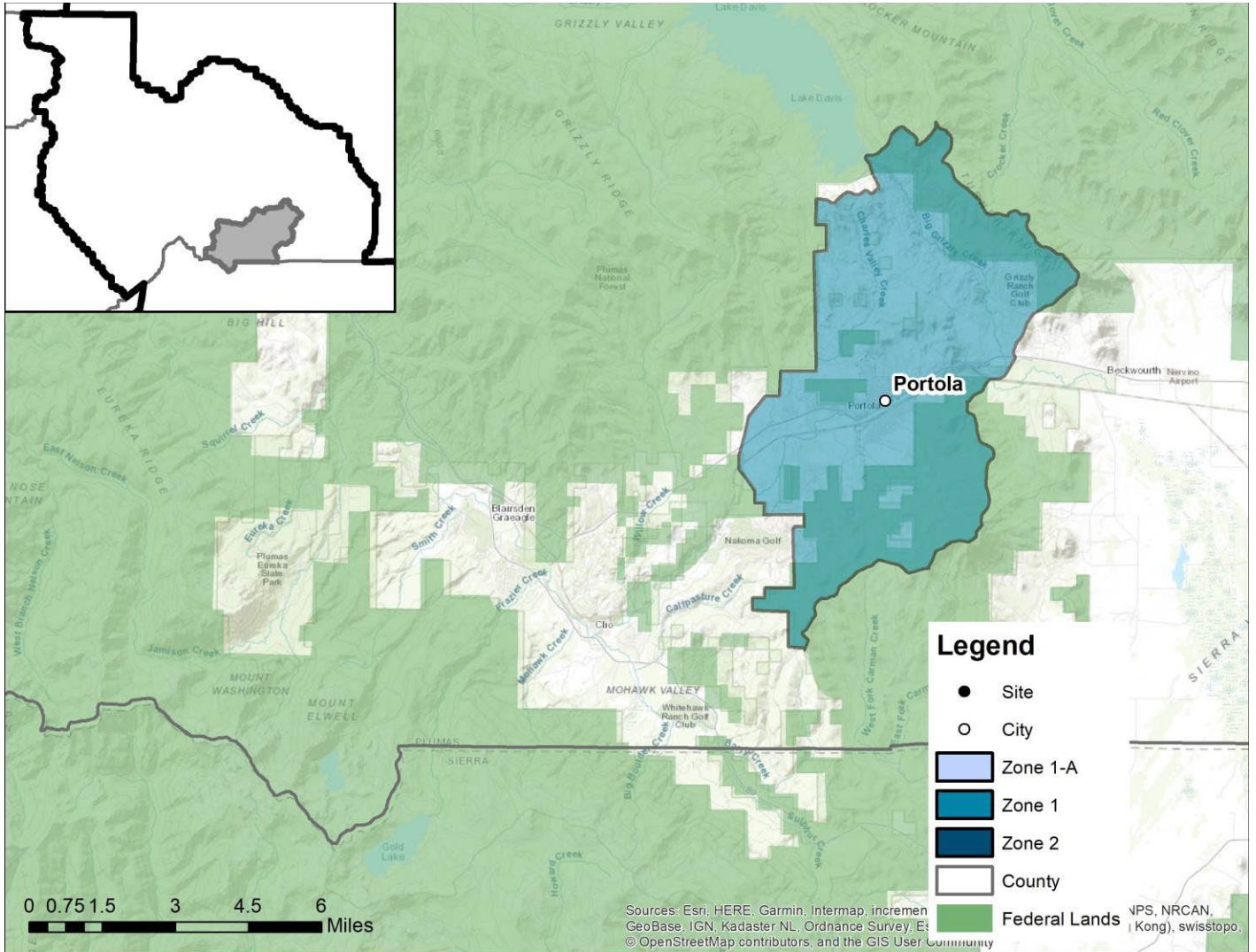
By submitting this application, I certify the following:

- a. I understand that only currently installed and operating qualified wood/pellet heating devices are eligible to be replaced under this program.
- b. No retroactive rebates are available.
- c. I understand I will schedule an estimate with a District-approved Retailer after receiving a letter of pre-qualification from the Northern Sierra Air Quality Management District (District).
- d. I understand that if I qualify, I will use only a District-approved Retailer (Retailer). Devices purchased with funds from this program will be professionally installed. Self-installation of the device is prohibited. Any additional construction or handyman services not done by the Retailer will not be covered under this program.
- e. I will be replacing an operable qualified wood heating device that is currently in use in my residence. The Retailer who installs the new device is responsible for removing the old device (or rendering a fireplace inoperable). The old device will be rendered permanently and irreversibly inoperable.
- f. I understand that I will be disqualified from this program if I provide the District with false information or if the old, qualified wood heating device is removed from the residence prior to application approval or if a new device is purchased prior to application approval.
- g. I understand the District does not warranty any devices purchased under this program, including, but not limited to, the quality, functionality or satisfaction of the device.
- h. I agree to hold harmless the District and its directors, employees and agents from any and all loss, damage, or liability that arises out of or is in any way connected with installation or use of the device purchased in connection with this program.
- i. I will follow proper burning practices as discussed by the Retailer and in accordance with EPA BurnWise educational materials. I will operate this device according to the manufacturer's instructions and I will not burn pressure treated wood, garbage/trash, plastic or any other prohibited materials.
- j. I understand that proper wood burning practices (e.g., burning only dry, natural wood that has been seasoned at least 6 months) and proper stove installation and operation (e.g., maintaining a hot fire) are critical to the effectiveness of my new device.
- k. I will only burn wood that is less than 20% moisture content. The District may provide moisture meter if I don't have one.
- l. I understand that annual cleaning and inspection by a professional chimney sweep is critical to maintaining a wood/pellet device.
- m. I understand that I will participate in follow up training and a survey conducted by the District.



MAP of Zone 1: Nonattainment Area

Please contact the air district for further assistance.



APPLICATION FORM For Zone 1 – Nonattainment Area

All sections of this application must be completed. A copy should be retained by the applicant for his or her records. The District is not responsible for materials lost by mail. Please review the Applicant Certification (page 3) before signing at the bottom. Submit the completed application by email, mail, or hand delivery to:

Mikki Brown, Program Coordinator, NSAQMD
mikkib@myairdistrict.com
P.O. Box 2227
257 E Sierra Ave. Unit E
Portola, CA 96122
530-832-0102 Ext. 1 (PHONE)
530-832-0101 (FAX)

Applicant Information:

Name: _____

Physical Home Address: _____

Mailing Address (if different): _____

Is this a mobile or manufactured home? Yes No

(If yes contact District for additional paperwork)

Phone Number: _____ Email (if available): _____

Existing Primary Wood Heating Device:

Wood Stove Pellet Fireplace Wood Stove Insert

Make/Model: _____ Year Stove Manufactured: _____

The number of people living in the home (including adults and children under 18): _____ (Optional)

The EPA certified device I am interested in: Wood stove Pellet stove
 Propane stove Kerosene monitor Electric heat pump

The District strongly encourages upgrading to a non-wood heating device to further decrease emissions.

Additional Information:

How did you hear about the Change-out Program? _____

Why are you applying? (Please check all that apply.)

- Not satisfied with current device;
- To reduce pollution;
- To save money
- Other: _____

Was the grant funding a significant factor in replacing your stove? Yes No

How many wood burning stoves are on your property? 1 2 3

In a typical heating season, how many cords of wood do you typically burn? _____

Is your wood stove used as a primary source of heat? Yes No

What % of wood is used in your primary stove? 100% 75% 50%

In which room of your house is your wood stove located? _____

Do you own this home? Yes, Owner No, Renter

(If renter contact District for additional paperwork)

I understand and agree to all conditions of this program (pages 1-3): _____

(Applicant signature required) Date



Home Heating Survey

- 1. Status of home ownership: OWNER RENTER
- 2. Is your home a mobile/modular/manufactured home? YES NO
- 3. What year was this home built (approximately)? _____
- 4. What year did you purchase home or move into home? _____
- 5. Is this home your primary or secondary residence? PRIMARY SECONDARY
- 6. What is your monthly income? _____
- 7. How many people live in your household? _____
- 8. Does your residence have a :
 WOOD STOVE FIREPLACE PELLET STOVE FIREPLACE INSERT OUTDOOR WOOD BOILER

If your home has a second wood burning device, please indicate the type:

- WOOD STOVE FIREPLACE PELLET STOVE FIREPLACE INSERT OUTDOOR WOOD BOILER

- 9. If burning wood, where is it obtained? CUT BUY
- 10. If purchasing wood, what is the cost per cord? \$ _____
- 11. How many cords do you use annually? _____
- 12. What is the primary fuel you use for heating your home?
 WOOD PROPANE FUEL OIL ELECTRICITY SOLAR KEROSENE
 LPG GENERATOR DIESEL GENERATOR OTHER _____

- 13. What is the secondary fuel you use for heating your home (if any)?
 WOOD PROPANE FUEL OIL ELECTRICITY SOLAR KEROSENE
 LPG GENERATOR DIESEL GENERATOR OTHER _____

- 14. If your residence has a heated outbuilding, what is the fuel used? (If no heated outbuilding, skip question)
 WOOD PROPANE FUEL OIL ELECTRICITY SOLAR KEROSENE
 LPG GENERATOR DIESEL GENERATOR OTHER _____

- Do you receive any assistance from an energy assistance program (i.e. LIHEAP)? YES NO
- Are there school-age children in the home (K-12)? YES NO
- Are there any individuals over the age of 62 in the home? YES NO
- Is anyone in the home diagnosed with asthma or any respiratory/breathing disorder? YES NO
- Have you upgraded windows or insulation since moving into the home? YES NO
- Would you be willing to participate in a more in-depth survey by phone? YES NO

Date Survey Completed: _____



NORTHERN SIERRA AIR QUALITY MANAGEMENT DISTRICTwww.myairdistrict.com**Program Coordinator: 530-832-0102**

GREATER PORTOLA WOOD STOVE CHANGE-OUT PROGRAM

APPLICATION FOR ZONE 2 – Nonattainment Area

The Northern Sierra Air Quality Management District (District) is offering a change-out program to qualified homeowners within the Greater Portola PM2.5 Non-attainment Area in Plumas County, California for replacement of old, qualified wood/pellet heating devices with new, efficient, clean burning EPA certified devices. This program is funded by the U.S. EPA's 2015, 2018 and 2020 Targeted Air Shed Grant Program, the District's AB2766 program and other agencies. Funding will be available until October 31, 2026 or until funds run out.

1. Zone 2 funding will be available only to applicants within the City of Portola Sphere of Influence BUT within the Greater Portola PM2.5 Nonattainment Area (see attached map).
2. To qualify, the applicant must have a currently installed and operating heating device:
 - a. A non-EPA certified wood/pellet stove (typically manufactured prior to 1992); OR
 - b. An EPA certified wood/pellet stove manufactured 20+ years ago with the emission control technology in disrepair; OR
 - c. An EPA certified wood/pellet stove manufactured 20+ years ago, in any condition, to be replaced with a pellet, propane or kerosene heating device; OR
 - d. An open fireplace being used as a primary heating device.
3. If the old device is removed from the home prior to application approval, the applicant will be disqualified from this program.
4. If the new device is purchased before application approval, the applicant will be disqualified from this program.
5. Installation must be completed by a District-approved Retailer/Contractor (Retailer). Self-installation of the new device is NOT eligible.
6. Program covers the replacement of qualified heating devices in manufactured/ mobile homes but addition paperwork is required.
7. Program includes renters. An Owner/Tenant agreement is must be signed by both parties.
8. In Zone 2, qualified applicants may be eligible for:
 - Up to \$3,500 to replace a qualified wood heating device with an EPA certified wood burning device that means current New Source Performance Standards (NSPS).
 - Up to \$4,500 to replace a qualified wood/pellet heating device with an EPA certified pellet, propane or kerosene heating device.
 - Up to \$13,500 to replace a qualified wood/pellet heating device with an ENERGY STAR® compliant air source heat pump (electric).
9. Heating device brands/models will be determined by Retailer and approved by the District.
10. Upgrades over and above the approved amount will be paid by the applicant.
11. The old, qualified stove must be surrendered to the Retailer for destruction and scrap recycling. The resale or transfer of the old stove in usable condition, for the purpose of its



reuse as a stove, is a violation of the terms of this program and will result in forfeiture of the grant award.

12. A photo will be taken by the Retailer before the old device is removed, a photo will be taken to document destruction and a photo will be taken of the new, certified device after installation.
13. To qualify, each applicant must first complete the attached application. Completed applications must be mailed to the Program Coordinator at the address on the application form. The application will be reviewed to determine if the preliminary qualification requirements have been met. Once pre-qualified, the applicant will contact an approved Retailer to schedule an in-home estimate.

NEXT STEP: Applicants will hear from the District within 21 days of receiving a submitted application. *Submission of an application does not guarantee funding.*

The mission of this program is to reduce health impacts by reducing fine particulate (PM2.5) in the air from wood smoke. These microscopic particles go deep into the lungs where they may become trapped. PM2.5 is linked with premature death, work and school absences, and significant health problems including aggravated asthma, acute respiratory symptoms (such as chest pain and coughing), chronic bronchitis and decreased lung function. Sensitive individuals (those most at risk from exposure to smoke) are the elderly, children, asthmatics, adults with pre-existing heart and lung disease, pregnant women, and people engaging in strenuous outdoor activity.



APPLICANT CERTIFICATION

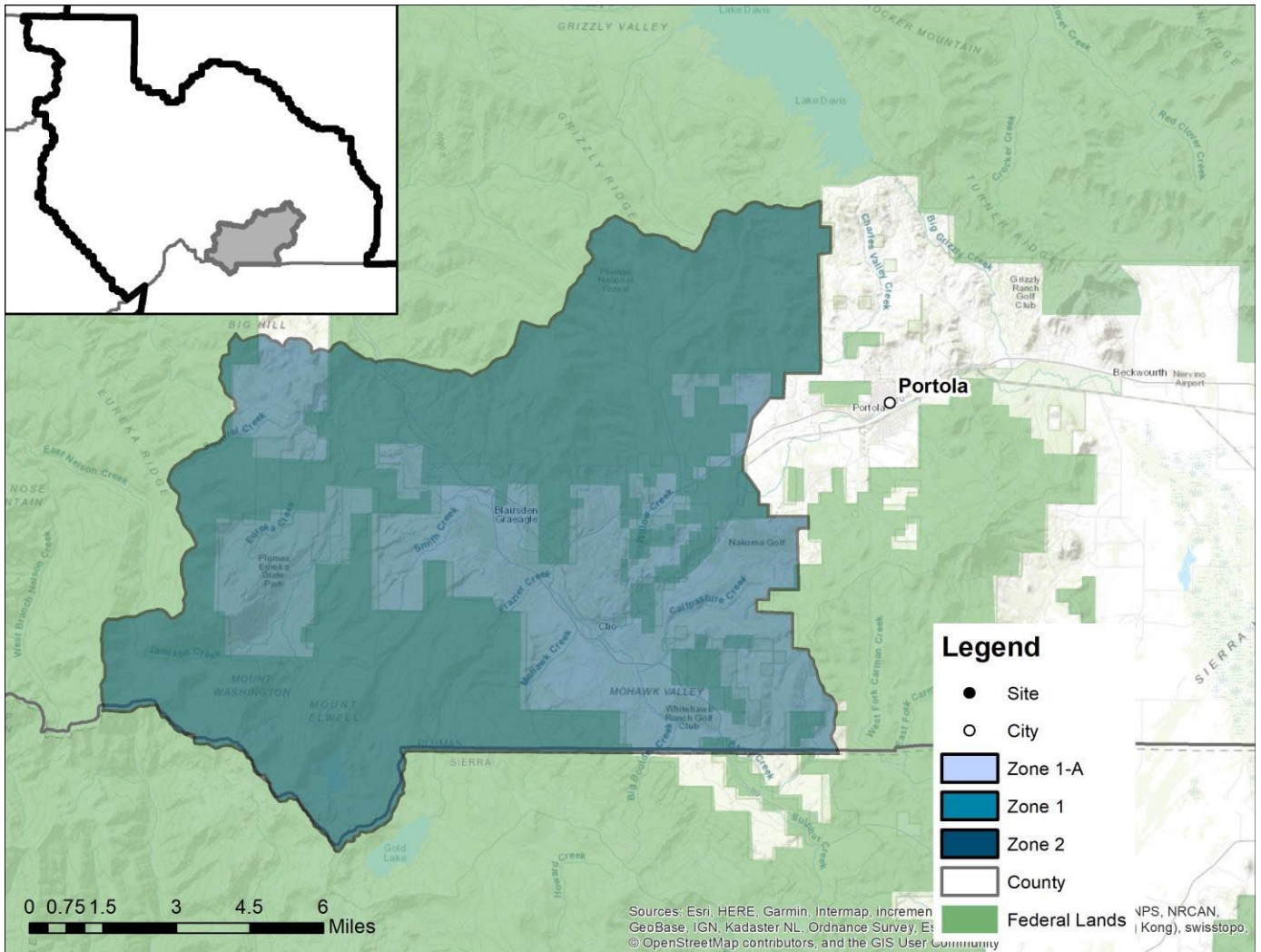
By submitting this application, I certify the following:

- a. I understand that only currently installed and operating qualified wood/pellet heating devices are eligible to be replaced under this program.
- b. No retroactive rebates are available.
- c. I understand I will schedule an estimate with a District-approved Retailer after receiving a letter of pre-qualification from the Northern Sierra Air Quality Management District (District).
- d. I understand that if I qualify, I will use only a District-approved Retailer (Retailer). Devices purchased with funds from this program will be professionally installed. Self-installation of the device is prohibited. Any additional construction or handyman services not done by the Retailer will not be covered under this program.
- e. I will be replacing an operable qualified wood heating device that is currently in use in my residence. The Retailer who installs the new device is responsible for removing the old device (or rendering a fireplace inoperable). The old device will be rendered permanently and irreversibly inoperable.
- f. I understand that I will be disqualified from this program if I provide the District with false information or if the old, qualified wood heating device is removed from the residence prior to application approval or if a new device is purchased prior to application approval.
- g. I understand the District does not warranty any devices purchased under this program, including, but not limited to, the quality, functionality or satisfaction of the device.
- h. I agree to hold harmless the District and its directors, employees and agents from any and all loss, damage, or liability that arises out of or is in any way connected with installation or use of the device purchased in connection with this program.
- i. I will follow proper burning practices as discussed by the Retailer and in accordance with EPA BurnWise educational materials. I will operate this device according to the manufacturer's instructions and I will not burn pressure treated wood, garbage/trash, plastic or any other prohibited materials.
- j. I understand that proper wood burning practices (e.g., burning only dry, natural wood that has been seasoned at least 6 months) and proper stove installation and operation (e.g., maintaining a hot fire) are critical to the effectiveness of my new device.
- k. I will only burn wood that is less than 20% moisture content. The District may provide moisture meter if I don't have one.
- l. I understand that annual cleaning and inspection by a professional chimney sweep is critical to maintaining a wood/pellet device.
- m. I understand that I will participate in follow up training and a survey conducted by the District.



MAP of Zone 2: NONATTAINMENT AREA

Please contact the air district for further assistance.



INCLUDES COMMUNITIES OF IRON HORSE, C ROAD, MOHAWK VISTA, PLUMAS-EUREKA, BLAIRSDEN-GRAEAGLE, GOLD MOUNTAIN, WHITEHAWK, CLIO AND JOHNSTVILLE.



APPLICATION FORM For Zone 2 – Nonattainment Area

All sections of this application must be completed. A copy should be retained by the applicant for his or her records. The District is not responsible for materials lost by mail. Please review the Applicant Certification (page 3) before signing at the bottom. Submit the completed application by email, mail, or hand delivery to:

Mikki Brown, Program Coordinator, NSAQMD
mikkib@myairdistrict.com
 257 E Sierra Ave. Unit E
 P.O. Box 2227, Portola, CA 96122
 530-832-0102 Ext. 1 (PHONE)
 530-832-0101 (FAX)

Applicant Information:

Name: _____

Physical Home Address: _____

Mailing Address (if different): _____

Is this a mobile or manufactured home? Yes No

(If yes contact District for additional paperwork)

Phone Number: _____ Email (if available): _____

Existing Primary Wood Heating Device:

Wood Stove Pellet Fireplace

Make/Model: _____ Year Stove Manufactured: _____

The number of people living in the home (including adults and children under 18): _____ (Optional)

The EPA certified device I am interested in: Wood stove Pellet stove
 Propane stove Kerosene monitor Electric heat pump

The District strongly encourages upgrading to a non-wood heating device to further decrease emissions.

Additional Information:

How did you hear about the Change-out Program? _____

Why are you applying? (Please check all that apply.)

- Not satisfied with current device;
- To reduce pollution;
- To save money
- Other: _____

Was the grant funding a significant factor in replacing your stove? Yes No

How many wood burning stoves are on your property? 1 2 3

In a typical heating season, how many cords of wood do you typically burn? _____

Is your wood stove used as a primary source of heat? Yes No

What % of wood is used in your primary stove? 100% 75% 50%

In which room of your house is your wood stove located? _____

Do you own this home? Yes, Owner No, Renter

(If renter contact District for additional paperwork)

I understand and agree to all conditions of this program (pages 1-3): _____

(Applicant signature required) Date



Home Heating Survey

- 1. Status of home ownership: OWNER RENTER
 - 2. Is your home a mobile/modular/manufactured home? YES NO
 - 3. What year was this home built (approximately)? _____
 - 4. What year did you purchase home or move into home? _____
 - 5. Is this home your primary or secondary residence? PRIMARY SECONDARY
 - 6. If secondary, how many months do you reside in the home? _____
 - 7. What is your monthly income? _____
 - 8. How many people live in your household? _____
 - 9. If your home has a second wood burning device, please indicate the type:
 WOOD STOVE FIREPLACE PELLET STOVE FIREPLACE INSERT OUTDOOR WOOD BOILER
 - 10. If burning wood, where is it obtained? CUT BUY
 - 11. If purchasing wood, what is the cost per cord? \$ _____
 - 12. How many cords do you use annually? _____
 - 13. Please attach proof that wood is your primary heat source. Can be receipts, power bills, etc.
 - 14. What is the Secondary fuel you use for heating your home?
 WOOD PROPANE FUEL OIL ELECTRICITY SOLAR KEROSENE
 LPG GENERATOR DIESEL GENERATOR OTHER _____
 - 15. If there is a third source of heat, please list check which one:
 WOOD PROPANE FUEL OIL ELECTRICITY SOLAR KEROSENE
 LPG GENERATOR DIESEL GENERATOR OTHER _____
 - 16. If your residence has a heated outbuilding, what is the fuel used? (If no heated outbuilding, skip question)
 WOOD PROPANE FUEL OIL ELECTRICITY SOLAR KEROSENE
 LPG GENERATOR DIESEL GENERATOR OTHER _____
- Do you receive any assistance from an energy assistance program (i.e. LIHEAP)? YES NO
- Are there school-age children in the home (K-12)? YES NO
- Are there any individuals over the age of 62 in the home? YES NO
- Is anyone in the home diagnosed with asthma or any respiratory/breathing disorder? YES NO
- Have you upgraded windows or insulation since moving into the home? YES NO
- Would you be willing to participate in a more in-depth survey by phone? YES NO

Date Survey Completed: _____



NORTHERN SIERRA AIR QUALITY MANAGEMENT DISTRICTwww.myairdistrict.com**Program Coordinator: 530-832-0102 ext. 1**

GREATER PORTOLA WOOD STOVE CHANGE-OUT PROGRAM

**WOODSTOVE CHANGE-OUT PROGRAM****APPLICATION FOR ZONE 1-A – Portola City Limits**
FOR AN ELECTRIC HEAT PUMP

The Northern Sierra Air Quality Management District (District or NSAQMD) is offering a wood stove change-out program to qualified homeowners within the Greater Portola PM2.5 Non-attainment Area in Plumas County, California. This program is designed to replace old qualifying wood heating devices with new, efficient, clean burning EPA-compliant devices. Once an EPA-compliant woodstove is installed in the home, the resident may qualify for an additional heating device known as an electric heat pump. This pilot program is funded by the U.S. EPA's 2015, 2018 and 2020 Targeted Air Shed Grant Program, the District's AB2766 program, and funding from other agencies. Funding will be available until October 31, 2026, or until funds run out.

1. Zone 1-A funding will be available to applicants within the City of Portola who are affected by City Ordinance 359 that limits wood stove use during curtailment periods as declared by NSAQMD.
2. If you reside in Zone 1-A and you have an EPA-compliant woodstove you may be eligible for up to \$13,500 for an ENERGY STAR® compliant air source heat pump (electric).
3. Households in Zone 1-A are not required to remove the wood burning device if the following conditions are met: To qualify, the applicant must have a currently installed and operating heating device that is:
 - a. The U.S. EPA certified wood burning device was installed under the District's Woodstove change-out program or has been registered with NSAQMD.
4. If a heat pump is purchased prior to application approval, the applicant will be disqualified from this program.
5. Installation must be completed by a District-approved Retailer/Contractor (Retailer). Self-installation of a heat pump is NOT allowed.
6. The program will cover the placement of qualifying heat pump devices in manufactured/mobile homes at the discretion of the installer. Additional paperwork will be required.
7. The program includes renters. An Owner/Tenant agreement must be signed by both parties.
8. Heat pump brands/models will be determined by the Retailer and approved by the District.
9. Upgrades over and above the approved amount will be paid by the applicant.
10. The resident will agree to utilize the heat pump as their primary heat source to the best of their ability. NSAQMD Wood burning curtailment advisories will be advertised on the website and curtailment line (530-832-4067).
11. To qualify, each applicant must first complete the attached application. Completed applications must be submitted to the Project Coordinator at the address on the application. The application will be reviewed to determine if the preliminary qualification requirements have been met. Once the applicant has received verification that they have pre-qualified for the additional



electric heat pump, the applicant may contact an approved Retailer to schedule an in-home estimate.

NEXT STEP: Applicants will hear from the District within 21 days of receiving a complete and submitted application. *Submission of an application does not guarantee funding.*

The mission of this program is to reduce health impacts by reducing fine Particulate Matter (PM2.5) in the air from wood smoke. These microscopic particles go deep into the lungs where they may become trapped. PM2.5 is linked with premature death, work and school absences, and significant health problems including aggravated asthma, acute respiratory symptoms (such as chest pain and coughing), chronic bronchitis and decreased lung function. Sensitive individuals (those most at risk from exposure to smoke) are the elderly, children, asthmatics, adults with pre-existing heart and lung disease, pregnant women, and people engaging in strenuous outdoor activity.



APPLICANT CERTIFICATION

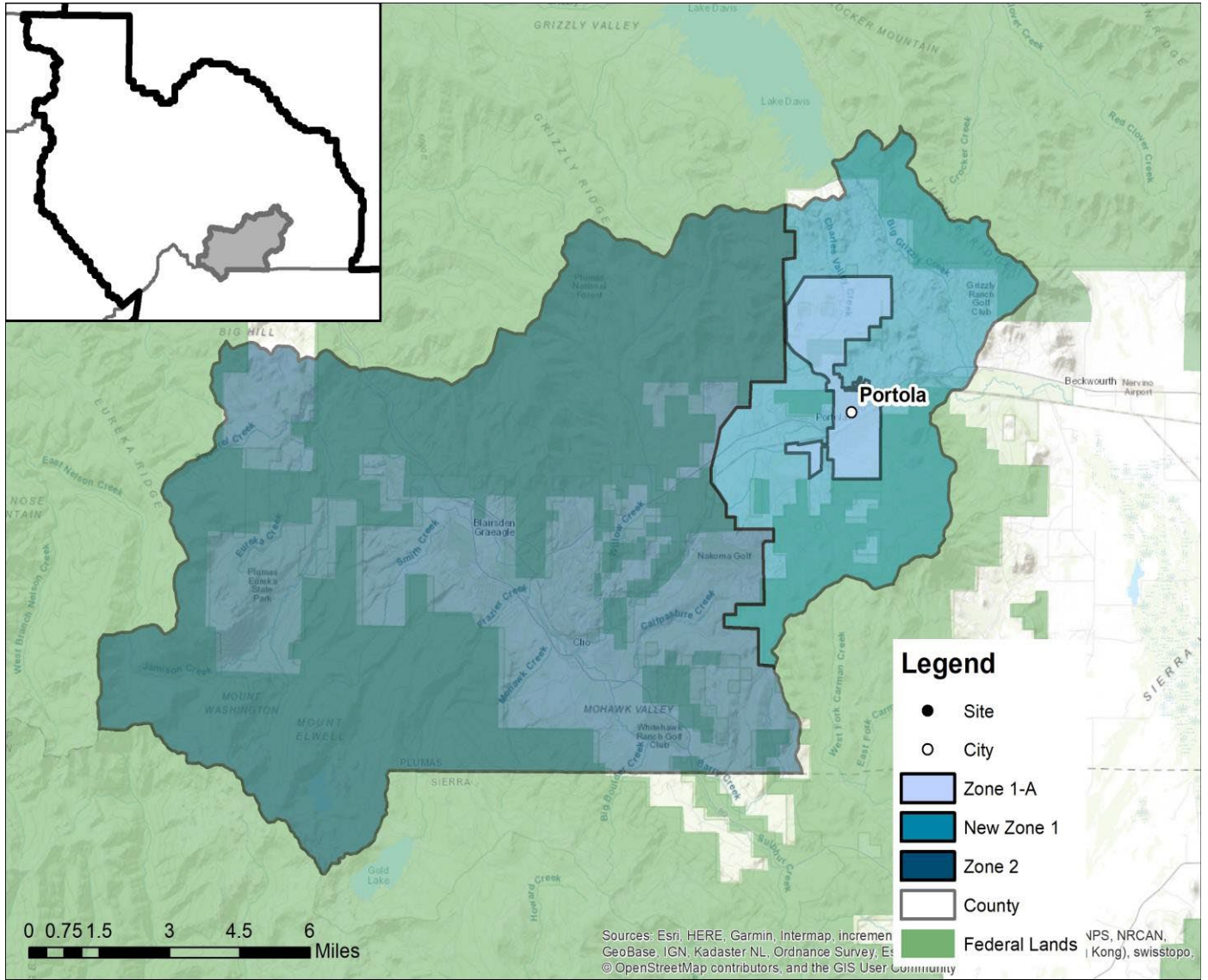
By submitting this application, I certify the following:

- a. I understand that an installed and qualifying EPA-compliant wood heating device is required in the home in order to be eligible to have a heat pump installed in the home.
- b. No retroactive rebates are available.
- c. I understand I will be responsible for scheduling an in-home estimate with a District-approved Retailer after receiving a letter of pre-qualification from the Northern Sierra Air Quality Management District (District or NSAQMD).
- d. I understand that if I qualify, I will use only a District-approved Retailer (Retailer). A heat pump purchased with funds from this program will be professionally installed. Self-installation of a heat pump is prohibited. Any additional construction or handyman services not done by the Retailer will not be covered under this program and will be my responsibility.
- e. Removal of wood heating devices is not required if the following conditions are met:
 - a. The heat pump installer Retailer who installs the heat pump verified that the wood burning device is EPA certified, was installed as part of the Woodstove Change-out Program or registered with the NSAQMD. If the wood heating device is damaged or not EPA-compliant then it must be removed or before moving forward with the electric heat pump installation.
- f. I understand that I will be disqualified from this program if I provide the District with false information or if a heat pump is purchased prior to application approval.
- g. I understand that the District does not warranty any heat pump purchased under this program, including, but not limited to, the quality, functionality or satisfaction of the device.
- h. I agree to hold harmless the District and its directors, employees and agents from any and all loss, damage, or liability that arises out of or is in any way connected with installation or use of the device purchased in connection with this program.
- i. I will operate this device according to the manufacturer's instructions and
- j. I understand that proper wood burning practices (e.g., burning only dry, natural wood that has been seasoned at least 6 months) and proper stove installation and operation (e.g., maintaining a hot fire) are critical when using my back-up wood heating device.
- k. I understand that the electric heat pump will be my primary heat source to the best of my ability.
- l. I agree that I will participate in follow-up training and assessments conducted by the District.



MAP of Zone 1-A: Portola City Limits

Please contact the air district for further assistance.



WOODSTOVE CHANGE-OUT APPLICATION FORM FOR ZONE 1-A PORTOLA CITY LIMITS
RESIDENTS APPLYING FOR AN ELECTRIC HEAT PUMP

All sections of this application must be completed. A copy should be retained by the applicant for their records. The District is not responsible for materials lost by mail. Please review the Applicant Certification (page 3) before signing at the bottom. Submit the completed application by email, mail, or hand delivery to:

Mikki Brown, Project Coordinator, NSAQMD
mikkib@myairdistrict.com
P.O. Box 2227
257 E Sierra Ave Unit E
Portola, CA 96122
530-832-0102 Ext. 1 (PHONE)
530-832-0101 (FAX)

Applicant Information:

Name: _____

Physical Home Address: _____

Is this a mobile or manufactured home? Yes No

Mailing Address (if different): _____

(If yes contact District for additional paperwork)

Phone Number: _____ Email (if available): _____

Existing Primary Wood Heating Device:

Wood Stove Wood Stove Insert Fireplace

Make/Model: _____ Year Stove Manufactured: _____

The number of people living in the home (including adults and children under 18): _____ (Optional)

Additional Information:

How did you hear about the Change-out Program? _____

Why are you applying? (Please check all that apply.)

To reduce workload involved with firewood To reduce pollution.

Difficulty acquiring seasoned wood Other: _____

Was the grant funding a significant factor in adding a heat pump as your primary heating device in lieu of your EPA certified wood stove? Yes No

How many wood burning stoves are on your property? 1 2 3

Did you participate in the Wood Stove Change Out program with your current wood heating device?

If not, is your EPA-compliant wood heating device registered with the District? _____

In a typical heating season, how many cords of wood do you typically burn? _____

Is your wood stove used as a primary source of heat? Yes No

In which room of your house is your primary wood stove located? _____

Do you own this home? Yes, Owner No, Renter

(If renter contact District for additional paperwork)

I understand and agree to all conditions of this program (pages 1-3): _____



Home Heating Survey

- 1. Status of home ownership: OWNER RENTER
- 2. Is your home a mobile/modular/manufactured home? YES NO
- 3. What year was this home built (approximately)? _____
- 4. What year did you purchase home or move into home? _____
- 5. Is this home your primary or secondary residence? PRIMARY SECONDARY
- 6. How many rooms do you need to heat in your home? _____
- 7. What company supplies your home with electricity? _____
- 8. Does your residence have:

- AIR CONDITIONING CENTRAL HEATING PELLET STOVE PROPANE MONITOR KEROSENE MONITOR

If your home has an additional wood burning device, please indicate the type:

- WOOD STOVE FIREPLACE PELLET STOVE FIREPLACE INSERT OUTDOOR WOOD BOILER

- 9. If burning wood, where is it obtained? CUT BUY
- 10. If purchasing wood, what is the approximate cost per cord? \$_____
- 11. How many cords do you use annually? _____
- 12. Do you have a woodshed for storing dry, seasoned wood? _____
- 13. What is the secondary fuel you use for heating your home?
 WOOD PROPANE FUEL OIL ELECTRICITY SOLAR KEROSENE
 LPG GENERATOR DIESEL GENERATOR OTHER _____

- 14. If your residence has a heated outbuilding, what is the fuel used? (If no heated outbuilding, skip question)
 WOOD PROPANE FUEL OIL ELECTRICITY SOLAR KEROSENE
 LPG GENERATOR DIESEL GENERATOR OTHER _____

- Do you receive any assistance from an energy assistance program (i.e., LIHEAP)? YES NO
- Are there school-age children in the home (K-12)? YES NO
- Are there any individuals over the age of 62 in the home? YES NO
- Is anyone in the home diagnosed with asthma or any respiratory/breathing disorder? YES NO
- Have you upgraded windows or insulation since moving into the home? YES NO
- Would you be willing to participate in a more in-depth survey by phone? YES NO

Date Survey Completed: _____



LOW INCOME VERIFICATION FORM

Residents located outside of the City of Portola Sphere of Influence, but within the Nonattainment area who wish to receive the maximum amount of funding based on income, must complete this form and submit it with an application.

2024 Gross Income Guidelines (source: CA Dept. of Community Services & Development):

Family Size	1	2	3	4	5	6	7	8
Monthly Gross Income	\$2,882	\$3,769	\$4,656	\$5,543	\$6,430	\$7,317	\$7,484	\$7,650

Have you previously applied for HEAP/LIHEAP assistance? Yes No

What is the monthly income of your entire household? _____

Be sure to count all of the following incomes:

- Wages
- TANF (AFDC)
- Workers Compensation
- Interest Income
- Social Security, SSI, SSP
- Disability Payments
- Pensions
- Unemployment Benefits
- Child Support
- Spousal Support
- Settlements

How many people live in your household? _____

ATTACH INCOME DOCUMENTATION:

(please include one of the following for each person living at this residence)

- Pay stub or
- Benefit letter or
- Income statement

Please note that these documents will not be returned.

Upon verification of income, applicant will be eligible for:

- Up to \$3,500 to replace a non-certified wood burning device with an EPA certified wood burning device.
- Up to \$4,500 to replace a non-certified wood burning device with a Pellet, Propane or Kerosene heater.
- Up to \$13,500 to replace a non-certified wood burning device with a Heat pump/Mini split device.

I declare, under penalty of perjury, that the information on this application is true and correct:

Signature

Date





GREATER PORTOLA WOOD STOVE CHANGE-OUT PROGRAM

OWNER/TENANT AGREEMENT

Parties: This Owner/Tenant Agreement (Agreement) is for services between the current Tenant
_____ and the Owner (or Owner's Agent)
_____ concerning the real property located at

<i>Address</i>	<i>City</i>	<i>State</i>	<i>Zip Code</i>
----------------	-------------	--------------	-----------------

Grant Award: The subject matter of this Agreement is the Greater Portola Area Wood Stove Change-out Program funded by the U.S. EPA's 2018 and 2020 Targeted Air Shed Grant Programs. This grant award is available to Owners for the replacement of a qualified wood heating device that is currently in operation with an EPA certified wood stove or certified pellet, propane or kerosene stove. Residents with existing EPA-certified devices

Whereas owner and tenant recognize the need for replacing a non-EPA certified wood stove; OR a fireplace being used as a primary heating device; OR repair/replacement of an EPA certified device greater than 20 years old that is no longer controlling emissions; OR having an EPA certified wood stove within Portola City limits and qualifying for an additional electric heat pump. A repaired or new EPA certified device will provide more efficient heating and less emissions into the home and the community.

Whereas owner and tenant desire to cooperate in participating in the Greater Portola Wood Stove Change-Out Program using funds from the U.S. EPA's 2018 and 2020 Targeted Air Shed Grant Programs.

Now, therefore, owner and tenant agree as follows:

1. To allow the Northern Sierra Air Quality Management District (District) and District-approved Retailers into the property noted above for inspection, estimate, installation and permitting. This includes allowing photos to be taken of the current heating device before removal and photos of the new EPA certified device (Device) after installation.
2. The owner shall not raise the rent of the unit for a period of two years or evict the unit's resident because of the increased value of the unit due solely to the newly installed Device.
3. Either owner or tenant may complete an application for the Greater Portola Area Wood Stove Change-out Program. Both parties must review the application and agree to the items on page 3 "Applicant Certification". Submission of an application does not guarantee funding.
4. The tenant shall not take possession of the Device upon vacating the real property noted above. The new EPA certified Device must stay with the property and belongs to the owner.

5. The tenant authorizes the District and the District-approved Retailers access to the property for a year after the new Device is installed for the purpose of education and training.
6. The tenant agrees to participate in a follow up survey by the District after installation of the new Device.
7. The owner understands the device installation may exceed the grant amount and assumes the responsibility of paying any difference when they sign and approve an estimate that the District also signs and approves. Without both parties approving the estimate a device installation can not take place.

I hereby certify that I understand the conditions and requirements for participation in the District's Greater Portola Area Woodstove Change-out Program and agree to fulfill the requirements and comply with the conditions in this agreement. I understand that if any documents are incomplete or falsified, I will be disqualified from the program.

The undersigned represent that they have the authority of their respective parties to execute this Agreement.

Signature Tenant: _____ Date: _____

Printed Name/Title

Signature Owner: _____ Date: _____

Printed Name/Title

Owner's Mailing Address:

Address *City* *State* *Zip Code*



PROGRAM TRACKING FORM

This form is to be completed by participating Retailer/Contractor*

Date: _____ Program Tracking #: _____ Building Permit #: _____
Consumer's Name: _____ Phone: _____
Address: _____ City: _____
County: _____ State: _____ Zip: _____
Email: _____

New Cleaner Burning EPA Certified Device

Manufacturer: _____
Model: _____
Device Serial #: _____
New Stove Type: Wood Pellet Propane Gas Kerosene
Other: _____
Is wood stove: Catalytic Non-Catalytic
Emissions (grams per hour): _____ Efficiency (%): _____
Retailer Name: _____ Phone: _____
Retailer Address: _____
City: _____ State: _____ Zip: _____

Installation

Name of Certified Installer**: _____ Date of Installation: _____

Old Wood Stove or Fireplace

Manufacturer: _____
Model: _____ Device Serial #: _____

If fireplace, was the fireplace rendered unusable by adding an insert or closing off the chimney? Yes

I certify that the old stove was not EPA-certified, greater than 20 years old (repaired or non-repairable), or an open fireplace used as a primary heat source: Yes

I certify that the old stove/fireplace was in use prior to replacement: Yes

I certify that the installed device was new: Yes

Recycling (for Replacement Projects):

I certify that the old wood stove has been removed from the residence: Yes

I certify that the old wood stove has been delivered to the secured City of Portola Public Works yard for destruction before the stove's release to a Recycler: Yes

Name of City of Portola Employee: _____

Signature: _____

I certify that the information contained on this tracking form is accurate and the form is completely filled out. I also agree that I must meet the program requirements and be a participating Retailer in order to receive reimbursement from the Northern Sierra Air Quality Management District. This form must be submitted with **ALL** sections completed along with a copy of the estimate (signed by the District as approval), a copy of the invoice, photograph of stove **prior** to removing it **AND** of newly **installed** hearth appliance in order to receive reimbursement.

Name of Participating Retailer: _____

Signature: _____

- * Participating Retailers must be registered with the District.
- ** The installer must be professionally certified (Chimney Safety Institute of America and/or National Fireplace Institute) and be in possession of a current C-61 (D-34 prefabricated equipment) contractor's license.

To assure quick processing, please make sure you send all items listed.

Checklist of attachments:

- Copy of estimate with District approval signature
- Estimate exceeds \$3,500 letter, if necessary
- Pre and post installation photos
- Acknowledgement of Training form
- Final invoice
- Copy of Permit (City, County or State)

Make sure the following is complete:

- Signatures above
- Program Tracking Number
- Building Permit Number

Mail all to:
Mikki Brown, Project Coordinator
Northern Sierra Air Quality Management District
P.O. Box 2227
Portola, CA 96122
FAX: 530-832-0101
EMAIL: mikkib@myairdistrict.com



GREATER PORTOLA WOOD STOVE CHANGE-OUT PROGRAM

ACKNOWLEDGEMENT OF TRAINING FORM

This form is to be completed by participating Retailer/Contractor AND signed by Owner/Tenant

Date: _____ Program Tracking #: _____ Building Permit #: _____

Consumer's Name: _____ Phone: _____

Address: _____

City: _____ State: _____ Zip: _____

New Cleaner Burning EPA Certified Device

Manufacturer: _____

Model: _____

Device Serial #: _____

New Stove Type: Wood Pellet Propane Gas Kerosene Electric mini split

Retailer Name: _____ Phone: _____

Retailer Address: _____

City: _____ State: _____ Zip: _____

I certify that I received the owner's manual for my new device:

Yes No

I certify that I received training from the Retailer/Contractor on the operation of my new device per manufacturer instructions:

Yes No

I certify that I received training from the Retailer/Contractor on proper fuel for my new device:

Yes No

I certify I will NOT replace, modify OR remove the new certified appliance unless it will be replaced with a cleaner burning appliance.

Yes No

I will comply with all local, state and federal regulations and ordinances pertaining to air quality:

Yes No

Signature (Homeowner/Tenant): _____



VERIFICATION OF DESTRUCTION FORM

This form is to be completed by City of Portola

Program Tracking #: _____ Device Serial #: _____

The method used to render the uncertified device permanently and irreversibly inoperable (please circle all that apply):
Removed Doors Broke Glass Removed/Broke Brick
Cut Holes in Top/Sides Cut Off Fan Motors Deformed/Broke Stove

Date received from Retailer: _____

Name of Retailer: _____

Date device was destroyed: _____

Picture attached of destroyed device with Program Tracking # Yes

Date transferred to Recycler (placed in bin): _____

Name of Recycler: _____

I certify that the information contained on this certification form is accurate and the form is completely filled out. I certify that the uncertified device has been rendered permanently and irreversibly inoperable by the method noted above (and a photo taken). I certify that the device has been released to an approved scrap metal recycler.

City of Portola Employee Name: _____

Signature: _____

Mail, scan or fax form to:
Mikki Brown, Project Coordinator
Northern Sierra Air Quality Management District
P.O. Box 2227
Portola, CA 96122
530-832-0102 (office phone)
530-832-0101 (fax)
mikkib@myairdistrict.com

Julie Hunter, Executive Director

DISTRICT HEADQUARTERS
200 Litton Drive, Suite 320
Grass Valley, CA 95945
(530) 274-9360 / FAX: (530) 274-7546
www.myairdistrict.com
office@myairdistrict.com

NORTHERN FIELD OFFICE
257 E. Sierra, Unit E
Mailing Address: P.O. Box 2227
Portola, CA 96122
(530) 8320102 / FAX: (530) 832 -0101
mikkib@myairdistrict.com



GREATER PORTOLA WOOD STOVE CHANGE-OUT PROGRAM

PROGRAM TRACKING #: _____

ESTIMATE EXCEEDS GRANT FUNDING – to be signed by Applicant

According to the in-home estimate provided by the District-approved Retailer (Retailer), the cost to replace your current heating device with a new, EPA certified heating device exceeds grant maximum incentives. Under the U.S. EPA’s Targeted Air Shed Grant Program, the maximum incentives are as follows:

	Zone 1	Zone 2
Wood Stove	\$5,000	\$3,500
Pellet/Propane/Kerosene	\$6,500	\$4,000
Heat Pump	\$13,500	\$13,500

The Retailer has provided you an estimate, which includes the basic equipment and labor for a new device that meets all permitting and health and safety criteria.

Please initial the option that you are choosing today:

1. Continue with the installation of a new EPA certified heating device. Applicant agrees to pay the Retailer any cost over and above approved grant funding.

_____ (initials)

2. Applicant chooses NOT to continue with the program at this time.

_____ (initials)

If you have any questions please contact the Project Coordinator, Mikki Brown, at (530) 832-0102.

Thank you for your commitment to improving air quality and public health in your community.

Print name of Applicant (Owner)

Signature of Applicant (Owner)

Date

GREATER PORTOLA WOOD STOVE CHANGE-OUT PROGRAM



PROGRAM TRACKING #: EPA2018-00XX

KEEP THIS LETTER – IT IS PROOF OF YOUR PRE-QUALIFICATION

DATE

NAME
ADDRESS
Portola, CA 96122

Dear Mr. NAME,

Thank you for your interest in the Greater Portola Woodstove Change-Out Program. Your application has been received and reviewed by the District. You are pre-qualified for a repair* or replacement of your current wood heating device for your address at:

Please follow these simple steps to finalize your qualification:

1. Contact a “District-Approved Retailer” to set up an appointment for an in-home estimate to determine the best heating device for your home and needs. See the enclosed list of approved Retailers.
2. Your in-home estimate must be completed within 90 days of issue of this letter. If a Retailer has not completed an estimate within 90 days, your application **may** be withdrawn.
3. Note that you are pre-qualified for up to \$5,000 for a Catalytic or Hybrid wood burning device or \$6,500 for a pellet, propane, or kerosene heating device. Or up to \$13,500 for an electric heat pump.

If you have any questions please contact the program at (530) 832-0102.

Thank you for your commitment to improving air quality and public health in your community.

Sincerely,

Mikki Brown, Project Coordinator
Northern Sierra Air Quality Management District

Enclosures: District-approved Retailers and EPA Brochures

**An EPA certified wood stove that is 20+ years old may be repaired when the emission control technology is not functioning properly. If not repairable at a reasonable rate, it may be replaced with a new EPA certified device. This program does not cover general maintenance repairs including, but not limited to, cracked glass doors, cracked brick, worn gaskets, clogged chimney pipe/cap and chimney sweeping/cleaning.*



GRANDIOSO PROGRAMA DE CANVIO DE ESTUFAS DE MADERA

PROGRAMA CLAVE #: EPA2018-00XX

CONSERVE ESTA CARTA ES PRUEVA DE SU PRECALIFICACION

DATE

NAME
ADDRESS
Portola, CA 96122

Felicidades Sr. NAME,

Gracias por su interés en el programa Portola Estufas de Madera. Su aplicación ha sido recibida y aprobada por el Distrito. Usted esta precalificado-a para una reparación* o Nueva unidad EPA certificada para reemplazar su Estufa de Madera.

Por favor siga estos simples pasos para finalizar su calificación:

1. Contactar al proveedor de servicios para hacer una cita para la estimación apropiada de cuerdo a las necesidades de su hogar.
2. Este estimado tiene que ser completado dentro los 90 días a la emisión de esta carta. Si un proveedor no ha completado un presupuesto dentro los 90 días, es posible que se retire su aplicación.
3. Nota que esta precalificado-a hasta \$5,000 para una nueva estufa de madera o hasta \$6,500 para pellet, dispositivo de calentamiento de propano o queroseno y \$13,500 para unidad Heat Pump (Bomba de calor electrica).

Si usted tiene una pregunta por favor comuníquese con la coordinadora de el programa, Mikki Brown, al 530-832-0102 Ext. 1.

Gracias por su interés en mejorar la calidad de el aire y la salud publica de su comunidad.

Sinceramente,

Mikki Brown, Coordinador del Proyecto
Northern Sierra Air Quality Management District

Anexo: Distribuidor y aprobadora de el proyecto e información de el programa (EPA)
Agencia de Protección al Ambiente

**Su estufa que es certificada por EPA que tiene 20+ anos puede ser reparada cuando la tecnología de control de emisiones no este funcionando correctamente. Si no es reparable a un precio razonable, será remplazado con una nueva unidad que es EPA certificado. Este programa no cubre reparaciones generales de mantenimiento que incluyen, pero no se limitan a, puerta de vidrio agrietada, ladrillo agrietado, junta gastada, tubo/tapa de la chimenea obstruida y barrido/ limpieza de la chimenea.*

FY2018 U.S. EPA Region 9 Targeted Airshed Grant (TAG) Work Plan (Revised November 11, 2023)

a. Summary Information Page

i. **Project Title:** Portola PM2.5 Nonattainment Area Air Shed Project

ii. **Applicant Information:**

California Air Resources Board

1001 I Street, P.O. Box 2815

Contact: Kasia Turkiewicz, Air Resources Engineer

Phone: (916) 445-6497

Fax: (916) 327-8524

email: kasia.turkiewicz@CARB.ca.gov

Application submitted on behalf of:

Northern Sierra Air Quality Management District

200 Litton Drive, Suite 320

Grass Valley, CA 95945

Gretchen Bennitt, Executive Director

Phone: (530) 274-9360, Extension 102

Fax: (530) 274-7546

Email: gretchen@myairdistrict.com

iii. **Total Project Cost**

a. Total cost of the project: \$3,212,238

b. EPA funding: \$3,172,238

c. Funding from other sources, including any voluntary leveraged cost-share or in-kind resources: \$40,000

iv. **Project Period:** January 1, 2020 through December 31, 2024

v. **Project Description:** This project will extend a Wood Stove Change-out Program (currently funded by a 2015 Targeted Airshed Grant) and add additional program elements to address needed resources for public outreach and education, enforcement, quality of wood fuel and reduction of emissions from open burning.

vi. **Place of Performance:** Plumas County, CA PM2.5 Nonattainment Area

vii. **DUNS Number:** 195930276

b. Project Summary and Approach

i. Detailed project summary, description of specific actions and methods to be undertaken and the responsible institutions.

In March 2015, the U.S. Environmental Protection Agency (EPA) designated the City of Portola and surrounding parts of Plumas County, California, as a “[nonattainment area](#)” for the annual PM2.5 standard. PM2.5 from residential wood combustion is responsible for 80 percent of the PM2.5 mass annually and 90 percent on an average exceedance day. The objective of the project is to reduce pollution levels so that the Portola area can attain the PM2.5 standard by the end of 2021 and maintain the standard for the years to come. The Northern Sierra Air Quality Management District (or the District) is the local oversight air agency responsible for helping this nonattainment area meet EPA air quality standards.

The nonattainment area is a mountainous region within the Plumas National Forest of Northern California. The City of Portola is located at an elevation of 4,900 feet. It is in a small, mountain basin with predominantly westerly/southwesterly winds during the day and downslope winds during the night. Winters are cold with an average daily low of 21.8 degrees during October through March. The topography and climate contribute to stagnant conditions through the winter, keeping smoke from wood burning in the breathing zone, particularly through the evening, night and early morning. Reducing PM2.5 from wood burning is the only means to improve air quality and reach attainment.

On March 24, 2016, EPA awarded a 2015 Targeted Airshed Grant to the California Air Resources Board (CARB), implemented by the District, to improve air quality by reducing emissions through a Wood Stove Change-out Program. The program is currently in place and will continue through 2020. A total of 600 old stoves/fireplaces are targeted for replacement by the end of 2020. At the time this proposal was originally submitted in early January 2019, approximately 300 stoves have been changed out. Only fireplaces used as primary sources of heat are eligible for this Program. District has a process in place to verify that a fireplace is being used as a primary source of heat. As of December 31, 2018, only 12 out of 281 total completed change-outs were for fireplaces used as primary sources of heat.

In order to achieve emission reduction goals, it is necessary to continue to implement a Wood Stove Change-out Program past 2020 and add further program elements. While there is some improvement in air quality, more emission reductions are needed. New EPA certified stoves should have significantly lower emissions; however, operator usage of these stoves produces variable results. Experience with the current program has led to a few observations:

- There is a learning curve to using the new devices. Many program participants report that it takes time to adjust burning practices in new, EPA certified wood stoves that function quite differently than previous, uncertified wood stoves. A follow up visit by District staff, stove installers and/or chimney sweep providers is especially helpful in educating the participants. All participants are trained in using the new stove at the time of installation. But if the installation is completed in the summer months, they likely do not recall all the information provided by the time the stove is used in the winter. One to two additional visits must be made to each change-out participant between installation and the follow-up customer survey visit.
- Restricting wood stove and pellet replacement devices to under 2 grams/per hour of emissions is likely to gain additional emission reductions on top of the

- reductions achieved by replacing higher emitting older stoves and fireplaces.
- Those least resistant to changing out stoves have now participated in the program. Soliciting applications has become more time consuming. Knocking on doors, targeted mailings and follow up calls are becoming more important to reach those that either have not heard about the program or have been hesitant to participate. More staff resources are needed to focus efforts on identifying potential applicants and follow applicants through the process until a new heating device is installed.
- An extension of the Wood Stove Change-out Program is crucial with a mandatory wood burning curtailment program commencing January 1, 2021. At that point, Portola residents who were unaware of the program or hesitant to participate, will be motivated to upgrade to an EPA certified stove. When there is a mandatory curtailment, residents will be able to burn only in EPA certified wood stoves for heating needs.
- The District also sees value in adding electric heat pump systems to the option for cleaner burning technology upgrades. Operator usage contributes greatly to the success or failure of achieving emission reductions from wood-to-wood replacement. Installing a greater percentage of propane, kerosene and electric heating options is a more certain way to achieve emission reductions as operator usage is taken out of the equation.

This Portola PM2.5 Nonattainment Area Air Shed Project will include the following elements:

Program Element	Sub-Element
1. Wood Stove Change-Out Program	
2. Burnwise Coordinator	a. Education and outreach
	b. Wood shed program
	c. Seasoned Wood program
	d. Certified stove database registration
3. Chimney Sweep Vouchers	
4. Weatherization	
5. Residential Yard Waste Collection	
6. Enforcement Coordinator	a. Indoor wood burning enforcement
	b. Open burning enforcement

Program Element 1: Wood Stove Change-out Program

The District received an EPA 2015 Targeted Airshed Grant that included funding to change out 600 wood stoves through a Wood Stove Change-out Program. The District estimates another ~~300~~ **163** wood stoves/fireplaces will need to be replaced with cleaner and more energy efficient home heating alternatives. Under this grant, Wood Stove Change-out Program funding for approximately ~~300~~ **163** replacement devices includes purchasing the devices, permitting and installation costs. Also included in costs are emergency backup power generators, smoke/carbon monoxide detectors, moisture meters, stove thermometers and destruction of uncertified stoves.

To qualify for a Wood Stove Change-out, the currently installed and operating wood burning device must be one of the following:

- A non-EPA certified wood stove (typically manufactured/installed prior to 1992); OR

- An EPA certified wood stove manufactured 20+ years ago with the emission control technology in disrepair¹; OR
- An EPA certified wood stove manufactured 20+ years ago, in any condition, to be replaced with a pellet, electric heat pump, propane, or kerosene heating device; OR
- An open fireplace being used as a primary heating device.

Qualified residents may choose a replacement device from the following options:

- EPA certified wood stoves and pellet stoves with emissions not exceeding 2 grams/hour
- Propane or kerosene stoves or furnaces
- Electric systems, such as heat pump systems (such as ductless, mini-split heat pumps) ENERGY STAR® compliant

The District will prioritize the installation of heat pumps, especially electric ductless mini-split heat pumps. These heating systems can be used to provide electric heating at homes without heating ducts. The District will make sure to fund a replacement using only ENERGY STAR® compliant devices and hire an installer familiar with the product and its installation. Since ductless heat pumps can operate using 25% to 50% less energy than electric resistance and forced air systems, consumers can expect a much lower energy bill. The estimated cost of an electric heat pump system is expected to be \$5,000-10,000. The maximum allowed per installation would be \$10,700, which includes heat tracking sensor equipment, but does not include the cost of backup generators. In rare cases this maximum cap may be waived if justification is provided to EPA in writing and EPA approves in writing.

Residents have expressed a disinterest in either the heat pump or pellet stove primarily due to not being able to use these heat sources during power outages. In order to further incentivize the purchase of electric heat pump systems and pellet stoves, the District intends to pay for emergency power backup generators that provide a reliable source of electric power when necessary. The estimated cost is \$600 per generator, for emergency backup power for pellet stoves (cost is currently unknown for electric heat pumps). Approximately 20-30 emergency backup generators may be provided. A backup generator will only be supplied if there is no other emergency backup electricity power source in the home. To the extent available, priority should first be given to provide zero-emission emergency backup power generators.

Pellet stove installations currently make up 11% of all new installations in the 2015 Targeted Airshed Grant program. The District expects that rate to continue with the 2018 Targeted Airshed Grant, thus 33 pellet stoves are expected to be installed. For cost estimate purposes, the District plans 8% of all installations to be electric heat pump systems (20 installations). Approximately 12 propane or kerosene stoves and 235 wood stoves are estimated to be installed during this grant program.

Replacement heat device incentives will range from \$1,500-\$5,000 per installation (and up to \$10,700 for heat pumps). Incentives will vary based on the replacement device type and whether the resident is in Zone 1 (Portola Sphere of Influence; higher priority area) or in Zone 2 (the entire non-attainment outside of Portola Sphere of Influence). Cost per installation is expected to be slightly higher during this grant period (compared to the 2015 Targeted Airshed Grant) due to higher manufacturer prices that represent imposed steel tariffs and higher cost per unit for wood stoves that meet the 2 grams/per hour emissions requirement.

¹ An EPA certified wood stove that is 20+ years old may be repaired when the emission control technology is not functioning properly. If not repairable at a reasonable rate, it will be replaced with a new EPA certified device. .

It is imperative to ensure that qualified existing wood stoves that have been replaced are rendered inoperable per the EPA Terms and Conditions. Destruction of stoves is currently handled by the City of Portola Public Works under an MOU between the City and the District (2015 Targeted Airshed Grant). This MOU would be extended an additional 5 years under the 2018 Targeted Airshed Grant. The cost of the MOU is expected to be \$17,700 for 5 years for the administration and destruction of qualified existing wood stoves (not to exceed \$25,000).

New device installation must be conducted by a certified or licensed professional (e.g., National Fireplace Institute, Chimney Safety Institute of America, or equivalent) or under the approval and supervision of a certified installer. Self-installation or installation by non-licensed contractors is not eligible for funding.

To fund this program element, \$1,297,600 will be needed to cover all changed out wood burning devices and installation costs, emergency backup power generators, smoke and carbon monoxide detectors (if necessary), moisture meters, fire starter and stove thermometers (if necessary).

Program Element 2: Burnwise Coordinator (1.0 FTE)

Sub-Element a: Education and Outreach

Emissions from wood stoves depends considerably on user behavior. Users can strongly influence emissions by adjusting burning conditions and fuel quality. Adequate burning conditions, especially with regard to air flow and underload, can significantly reduce PM emissions. One of the most common mistakes, especially for long-term users of uncertified stoves who recently switched to certified stoves, is firing at part load (underloading). This can increase emissions two-fold.² Unnecessary use of excess air also leads to a two- to three-fold increase in PM emissions due to reduced residence time within combustion region.³ The District needs to expand its educational component by adding another staff entitled the Burnwise Coordinator, who will be in charge of the following:

- 1) Conduct follow-up visits - Each house participating in the Wood Stove Change-out Program will be visited at least once, after the first winter of using the device installed through the program. Homes where problems are discovered (visible smoke, wet wood, etc.) will be visited subsequently until issues are resolved;
- 2) Neighborhood outreach within the City of Portola to promote the Wood Stove Change-out Program;
- 3) Plan and participate in community events to provide information on the benefits of proper burning techniques and using seasoned wood, as well as promoting the Wood Stove Change-out Program to solicit applications;
- 4) Develop and distribute vouchers for a one-time Chimney Sweep visit after a year of using the new heating device.
- 5) Develop and implement a Wood Shed Program.
- 6) Develop and implement a Seasoned Wood Program.
- 7) Maintain a database of owners/addresses with EPA certified heating devices within the City of Portola (per Ordinance 354). And ensure database access for any City of Portola compliance officer(s).

² Kindbom, K., Mawdsley, I., Nielsen, O.-K., Saarinen, K., Jónsson, K., & Aasestad, K. (2018). Emission factors for SLCP emissions from residential wood combustion in the Nordic countries: Improved emission inventories of Short Lived Climate Pollutants (SLCP). Copenhagen. <https://doi.org/10.6027/TN2017-570>

³ Fachinger, F., Drewnick, F., Giere, R., Borrmann, S., How the user can influence particulate emissions from residential wood and pellet stoves: Emission factors for different fuels and burning conditions, Atmospheric Environment 158 (2017)216-226.

- 8) Other duties to further the goals of improving air quality in the greater Portola area.

The Burnwise Coordinator position requires a full-time employee. The hourly rate is expected to be approximately \$22/hour. At 40 hours per week, over 5 years, the total staff time for this program element is expected to require \$198,000 in funding.

Sub-Element b: Wood Shed Program

The Burnwise Coordinator will research, develop and implement a Wood Shed Program to provide dry storage to individual residents that have participated in the Wood Stove Change-out Program and do not have the resources to provide storage to keep wood seasoned and dry. According to the U.S. EPA BurnWise program, wood moisture should be less than 20%. Greater moisture content leads to excessive smoke, as well as creosote buildup in the chimney pipe.

The District will contract with local construction companies, local schools, boy scout troops and other agencies to build and distribute wood sheds in the nonattainment area. These woodsheds, to the extent possible, should be modeled after EPA's Burn Wise wood shed design (<https://www.epa.gov/burnwise>). According to the EPA site, the cost of materials per shed is estimated \$290, depending on locality. Due to the snow load in the winter, metal roofing should be added to the design, wood staining and placing on cement blocks to extend the shed's longevity, and the roof extended to ensure full coverage of the wood from rain and snow. In addition to building the sheds, the District would need to contract delivery of the sheds to residents, as equipment and resources are not available to the District. This would increase the total cost to approximately ~~\$500~~ **\$850** per shed.

At the time of installation, the Burnwise Coordinator, Program Coordinator and/or stove retailer/installer will assess fuel storage for each participant. If deficient, the provision of a wood shed will be assessed. Additionally, the Burnwise Coordinator will determine the need for sheds based upon visits with residents who have participated in the program. If the resident does not have adequate storage to keep firewood dry, the Burnwise Coordinator will engage a contractor to build and deliver the shed. Residents participating in the Wood Shed Program will be properly educated and trained, including by the stove retailer/installer, on how to properly use the wood shed to store and use seasoned wood and sign an agreement not to give away or sell the wood shed during the life of this project. Any funds generated will follow EPA's Program Income Terms and Conditions. The District estimates that approximately ~~400~~ **59** wood sheds would be needed. The cost for ~~400~~ **59** wood sheds is estimated to be \$50,000 (including labor and delivery).

Sub-Element c: Seasoned Wood Program

The Burnwise Coordinator will research, develop and implement a program to ensure a supply of dry, seasoned firewood. Using EPA-certified woodstoves does not guarantee emission reductions because emissions also depend on the quality of firewood. Certified stoves are highly sensitive to wet wood due to limited capacity of the air systems⁴. Burning wet wood in a certified stove can increase PM2.5 emissions fivefold. Households must use properly dried firewood in order to achieve optimal emission reductions.

The Portola PM2.5 Nonattainment Area experiences significant fluctuation in quantity and quality of firewood available for purchase. To a large extent, seasonal workers, who try to

⁴ Kindbom, K., Mawdsley, I., Nielsen, O.-K., Saarinen, K., Jónsson, K., & Aasestad, K. (2018). Emission factors for SLCP emissions from residential wood combustion in the Nordic countries: Improved emission inventories of Short Lived Climate Pollutants (SLCP). Copenhagen. <https://doi.org/10.6027/TN2017-570>

take advantage of other employment in order to maximize their income, supply firewood in Plumas County. For example, in 2018, due to a strong economy, residents have found it difficult to procure wood fuel because seasonal firewood providers have found other employment. In order to minimize fluctuation in wood availability and ensure that residents have access to properly seasoned, locally-sourced wood at a reasonable price, multiple options will be considered.

A coupon/voucher program with wood providers would be investigated to subsidize the availability of seasoned wood at a reduced rate to purchasers in the non-attainment area. The wood providers would be certified through the District, or another designated agency, to provide only locally sourced wood that has been seasoned and verified at 20% or less moisture content. Also to be researched would be a community wood bank, and other methods to ensure a supply of dry, seasoned wood. This could include a partnership between the District, and/or the City of Portola and/or the U.S. Forest Service in and near the Nonattainment area, potentially partnering with the Sierra Institute or other agencies/non-profits, such as the Portola Family Resource Center, churches, and local wood suppliers. Residents participating in the Seasoned Wood program would be educated and trained on how to properly store and use the wood and would agree to burn the wood at their own residence only, not to give away or sell the wood during the life of this project. Any funds generated will follow EPA's Program Income Terms and Conditions, although it is unlikely that funds would be generated in this program element

Using grant money, the District may purchase firewood, commercial firewood processing equipment, (and maintain it), drying equipment, secure a wood bank location and build the necessary platform and shelter to keep wood seasoned and dry, or partner with a local organization to oversee these activities. Staffing and security may also need to be considered. Multiple, localized fuel storage sites may also need to be considered (i.e. dry storage for a mobile home park). There is the potential to partner with an agency or non-profit already performing this function. Transportation of seasoned firewood from a location outside the non-attainment area may be necessary. The Burnwise Coordinator will research and determine the appropriate fuel pricing based on the quality of wood fuel and household income. The estimated cost for the researching, developing, implementing and running a Seasoned Wood Program for 5 years is difficult to determine without further research. At a minimum, it is expected that \$295,000 of the grant money would be allocated to this program element.

Sub-Element d: Certified Stove Database Registration

In order to implement a mandatory indoor wood burning curtailment program, there must be a database to identify households with EPA certified devices. During a curtailment period, wood burning will be permitted only in EPA certified devices (per City of Portola Ordinance No. 354, passed in August 2019). A certified stove database must be created with a front end that allows the District and residents to access it through the District website. Once the database is created, the Burnwise Coordinator will enter the owners/addresses with devices installed through the Wood Stove Change-out Program. Residents that did not participate in the program but have EPA certified wood heating devices, will register the device in the database, with verification documentation. The Enforcement Coordinator and possibly other agencies, such as the City of Portola, will need to reference this database in order to identify violators on mandatory curtailment days.

This program element is currently being developed and implemented under the 2015 Targeted Airshed Grant amendment of March 2019 (cost not to exceed \$10,000). The District estimates \$3,000 in funding for maintenance and revisions of this program

element.

Program Element 3: Chimney Sweep Vouchers

Proper maintenance of wood burning appliance and chimney prevents creosote build-up, improves appliance combustion reducing the risk of home heating fires and reducing smoke indoors and outdoors. According to the National Fire Protection Association, wet wood is the #1 cause of creosote build-up. Annual chimney sweeping and inspection by a reputable chimney sweep is recommended. The cost of a chimney sweep visit can vary from \$125-\$300, depending on the time of year the maintenance is done, the size of the home, the type of wood burning device, etc. Due to the low average household income in the Nonattainment area, annual chimney maintenance is often neglected or performed by the homeowner only when an issue arises, such as a clogged chimney cap. Grant funding will allow the District to provide a one-time chimney sweep voucher to be used only with District-approved chimney sweep providers for residents with EPA-certified wood and pellet stoves installed through the Wood Stove Change-out Program. Approved chimney sweep providers will have a Chimney Safety Institute of America (CSIA) or equivalent certification, and should commit to taking the free online BurnWise CSIA course prior to beginning work under the grant. If the use of non-certified sweep providers is deemed necessary, the District must submit qualifications -- including continuing education -- to EPA for review and approval. At a minimum, any participating sweep must take the free online CSIA Burnwise course.

After one year of participation in the Wood Stove Change-out Program, the District will combine a follow-up educational visit with a one-time free chimney sweep voucher to be used with a District approved provider. The Burnwise Coordinator will provide the follow up educational visit with a re-introduction on proper use of the EPA certified wood heating device and will troubleshoot any issues the resident has been having. The Burnwise Coordinator will also distribute a chimney sweep voucher, with an estimated value of up to \$250. Chimney sweeps offer a valuable education component. By inspecting the chimney and appliance, burning practices can be diagnosed and issues can be addressed with the participant.

The Burnwise Coordinator will develop and implement the voucher system, keeping track of distributed vouchers and collecting vouchers from District-approved chimney sweep providers. By the end of the existing 2015 Targeted Airshed Grant, 600 old wood stoves are anticipated to be changed out to cleaner EPA certified heating devices. This proposal requests funding for an additional ~~300~~ **163** EPA certified heating devices. The Burnwise Coordinator will distribute 100 chimney sweep vouchers with funding from the 2015 Targeted Airshed Grant by the end of 2020. The estimated cost for providing approximately 710 vouchers for one chimney sweep service for every wood and pellet stove installed through the Wood Stove Change-out Program is \$177,500. This assumes that wood and pellet stoves will make up 90% of the 900 total heating devices expected to be installed by 2024, totaling 810. The 100 vouchers distributed through the 2015 Targeted Airshed Grant is subtracted for a total of 710 vouchers funded through this grant.

Program Element 4: Heat Weatherization Conservation Activities

Proper heat-related weatherization of existing residential units in the Nonattainment Area would significantly reduce the use of wood fuel for heating in residences that participate in the Wood Stove Change-out Program. The Plumas County Community Development Commission (PCCDC) provides weatherization services based on income eligibility and funding availability ("Opportunities for Reducing Wood Smoke in the Portola, California

Area” by Jennifer Weiss, April 30, 2015). An allocation of funding through this grant will expand the weatherization services that PCCDC is able to provide.

The entities conducting the weatherization activities must be pre-approved by PCCDC. An energy audit is required prior to any weatherization activities by a professional pre-approved energy auditor. This audit should include: an analysis of the energy bills; a blower-door (pressurized) test of the infiltration of outside air into the home and any existing duct systems; and an inspection of all energy equipment for health and safety. The auditor will provide the resident with a recommended list of energy heat conservation measures that may be undertaken. The resident will determine which energy heat conservation weatherization activities will be undertaken by a pre-approved provider trained in home energy services. Following the undertaken weatherization activities, a certified third-party inspector will review the performed activities, ensuring all equipment is operating properly and safely.

All approved weatherization activities must be energy heat-related in existing residential units, which may include: insulation, reducing air infiltration and pressure imbalances, window repairs or replacements, sealing and/or repairing ducts or major holes in roofs or walls, and/or balanced ventilation. Weatherization activities will not include new roofing, siding, or similar structural improvements for permanent residences, however repairs (such as patching holes) that are necessary to keep cold air out/warm air in may be considered within the total cost cap. Weatherization activities for existing mobile homes may also include a roof upgrade.

At the time the wood stove changeout application is processed, District staff will request a weatherization/energy audit from PCCDC, as needed, if the applicant meets the guidelines. The District estimates providing weatherization for 30 residential units over the 5-year period at a cost not to exceed \$9,000 per home/unit, including labor, which may include inspections and audits. Total funding requested for this program element is \$240,000.

Program Element 5: Residential Yard Waste Collection Program

The District regulates residential open burning through a combination of the California Health & Safety Code, [Section 41800](#) et seq, [Title 17](#) of the California Code of Regulations, [Regulation III](#) of the Northern Sierra Air Quality Management District and various local ordinances.

There are approximately [900 households](#) in the City of Portola. The overwhelming majority of households have a need to remove green waste (yard waste) from their properties for defensible space to protect property from fire danger. The City of Portola is surrounded by the Plumas National Forest and yards contain pine trees and other shrubbery that contributes to an accumulation of green waste on the property. The local waste management company (Intermountain Disposal, Inc.) has recently begun implementing a curbside yard waste collection program within the city limits of Portola. A curbside collection program is crucial to Portola since the majority of households burn yard waste in open piles. District staff will develop a program to work with the waste management company and the residents of Portola to provide the initial cost (first season) of curbside green waste pickup to help households transition from open burning. Providing an alternative to the open burning of yard waste for residents in the nonattainment area is crucial since the District committed to adopting an open burning rule prohibiting open burning during the months of the strongest inversions and during peak residential wood heating.

Currently, green waste curbside collection is offered April through October at a cost of \$8.03/month (this rate is adjusted annually through a contract between the City of Portola and Intermountain Disposal, Inc.). The cost to provide one year of collection is \$56.21 per household for a total of \$50,589 for all 900 households in Portola.

In addition to curbside collection, the District will work with the Portola FireWise Committee and the City of Portola to establish a program for collecting large items, like branches and tree trunks, or large amounts of yard waste. Containers (20 foot), with locking lids, will be placed in several neighborhoods where residents will be able to dispose of large yard waste free of charge in both the spring and fall in order to accomplish the goal of the FireWise Committee to provide a buffer around Portola and individual homes within the City to be fire safe. The District will work with the City of Portola and Intermountain Disposal, Inc. to transport yard waste to a shredding facility and/or a biomass facility. Establishing and operating a large yard waste collection program over five years is estimated to cost \$40,000. This is based on the assumption that at least 11 bins will be collected twice a year at 11 various sites around Portola at a cost of \$360 per bin.

The estimated cost to provide this program element is \$90,589.

Program Element 6: Enforcement Coordinator (0.5 FTE)

Sub-Element a: Indoor Wood Burning Enforcement

In August 2019, the City of Portola adopted Ordinance No. 354, Chapter 15.10 – Woodstove and Fireplace Ordinance. This ordinance prohibits the burning of wood burning heaters, wood burning fireplaces, wood-fired fire pits and wood-fired cookstoves during stagnant conditions. EPA certified wood heating devices are exempt from the mandatory wood burning curtailment. However, all residents are asked to refrain from burning wood, if at all possible. The District may enforce opacity regulations for excessive smoke production, whether the heating device is EPA certified or not. The District determines when curtailments are necessary, based on expected PM2.5 levels, and is tasked with enforcing the compliance of the ordinance. The ordinance is in effect four months of the year – November, December, January and February (this curtailment period may be expanded if attainment criteria is not met). Since November 2017, a voluntary curtailment has been in place to inform the public of stagnant conditions through a health advisory.

The District does not currently have the resources for this type of enforcement. Grant funds will be used to hire an Enforcement Coordinator or enter into a MOU with the City of Portola to provide this service. This coordinator will work approximately 20 hours per week. This position will be tasked with enforcing the City of Portola ordinance on days when wood burning is allowed only in EPA certified wood heating devices. The Enforcement Coordinator will utilize the certified stove database and inspection techniques to determine compliance.

Sub-Element b: Open Burning Enforcement

The Enforcement Coordinator will enforce the District's open burning rules, as well. Enforcement of open burning typically takes place November through June. During the months of July through October, the Enforcement Coordinator will assist the Burnwise Coordinator with other duties related to this grant funding, including conducting additional follow up visits after a stove change-out. The Enforcement Coordinator position requires,

at a minimum, a half-time employee. The hourly rate is expected to be approximately \$22/hour. At 20 hours per week, over 5 years, this program element requires \$99,000 in funding.

ii. Description of ongoing, significant reductions of PM2.5 emissions

Replacing ~~300~~ **163** wood stoves with more efficient heating devices will greatly decrease PM2.5 emissions from indoor wood burning. These new devices are expected to last 20-30 years resulting in a decrease of at least ~~375~~ **200** tons of PM2.5 over the lifetime of the installations. Additional PM2.5 reductions from the other program elements will further decrease emissions necessary to achieve attainment for the Plumas County PM2.5 Nonattainment area.

iii. Analysis of PM2.5 emissions inventory in the nonattainment area

The proposal focuses on directly emitted PM2.5 from wood burning, because it is the most important source to target in order to attain the standards. Wood burning is responsible for 80 percent of the PM2.5 mass annually and 90 percent on an average exceedance day. All other sources combined contribute about 3 ug/m3 of PM2.5 annually. Cleaner burning stoves will significantly reduce emission of other pollutants including carbon monoxide, formaldehyde, sulfur dioxide and various gases such as nitrogen oxides that can irritate the lungs. Equally important will be the reduction in emissions of HAPs which include carcinogens and others that are associated with respiratory, cardiovascular, neurological, and numerous other non-cancer causing health effects.

The PMF model identified “Refuse Burning” as one of the sources contributing to PM2.5 mass. Even though the source contributes very little PM2.5 mass, it may include toxic pollutants. The most likely sources of refuse burning are non-wood items burned in wood stoves or open burning piles. Plastic, foam, and the colored ink on magazines and boxes produce harmful chemicals when burned and also damage the wood-burning appliance. The education campaign will highlight the danger of burning non-wood items to the individual and the community as a whole.

iv. Strategy for achieving greatest amount of emission reductions possible

Switching out fireplaces and uncertified wood stoves will achieve the greatest PM2.5 reductions. Repairing/replacing older (20 years or older) certified wood stoves will achieve additional emission reductions. Eliminating outdoor open burning further decreases PM2.5. Public outreach and education is critical for assisting residents to operate wood burning devices to achieve the maximum emission reductions possible.

v. Support of EPA’s Strategic Plan

EPA’s strategic plan has a goal to meet statutory requirements. The program elements in this proposal will assist the EPA in that these program elements assist the District in meeting SIP requirements by implementing the Portola Fine Particulate Matter Attainment Plan (Plan). The Plan includes; emission inventory of PM emission sources, an attainment demonstration, a reasonable further progress demonstration including milestones, an assessment of reasonable available control measures, motor vehicle transportation budgets and identification of contingency measures – needed if the area fails to meet the progress milestones or attainment by the attainment date. The plan is required to show linear progress towards reaching attainment by 2021. Milestone years of 2019 and 2022 have been set by the EPA and rely heavily upon a phased-in schedule to replace non-

certified stoves with certified devices. Between 2016 and 2020, the District plans to change out between 100 to 150 stoves per year. The District has committed to tracking, quantifying and reporting to the EPA progress towards attainment. The first report is due January 2020. Additionally, implementing these program elements will result in real emission reductions, per EPA's Strategic Plan.

c. Community Benefits, Engagement and Partnerships

The District has been and will continue to make a concentrated effort to enlist participation from low income residents in the nonattainment area. Not only will the owners of the older stoves benefit by upgrading to the newer stoves, all of the residents of the PM2.5 nonattainment area will benefit from significant improvements in air quality. The most current [ACS online census data for 2017](#) shows 900 households in Portola. Of these households, 25% have an annual household income under \$15,000 and just over 50% are below \$35,000. The median household income is \$28,150. Grant funding is critical to assist this low-income community to replace old wood stoves and fireplaces, decrease PM2.5 emissions and improve public health. Portola and much of the surrounding nonattainment area is a designated [AB1550 low income community](#) .

Residents who participate in the Wood Stove Change-out Program will also benefit from a public education follow-up visit by the BurnWise Coordinator and a voucher for chimney sweep services. The Spanish-speaking community will continue to be served through a translator currently working with the District (currently funding is supplied through the 2015 Targeted Airshed Grant).

The District has established partnerships with the United States Department of Agriculture (USDA), the United States Department of Energy (DOE), and the Low Income Home Energy Assistance Program (LIHEAP) to assist very low income residents with residential wood stove replacements. The District will continue to partner with the local wood stove retailers. The retailers will assist in the outreach and marketing of the project, as well as the installation of certified appliances and the proper removal and demolition of uncertified appliances. Stove retailers also train participants in the proper use and maintenance of the new device, proper fuel (especially dry, seasoned wood for wood stoves), how to store fuel and best burning practices. In addition, the District will develop partnerships with chimney sweep providers and wood vendors.

The City of Portola will continue to be an active partner throughout the project. The City will continue to enforce a City ordinance as a change-of-ownership requirement that when a home is sold, all wood burning appliances must be EPA Certified as well as any newly installed wood burning appliance. The City or Plumas County or the State will inspect new installations of wood stoves as required. The City will actively promote the change-out project during City Council Meetings and participate in community events.

Finally, the District will partner with additional groups to enhance the outreach of the project. These groups include the Hearth, Patio and Barbeque Association (HPBA), chimney sweeps, the local waste management agency, contractors, schools, local businesses, social services groups, health and medical care organizations, fire departments, home builders and remodelers, realtors, local opinion leaders, media representatives, social service groups, and others who can reach large numbers of people and may share its goal of improved air quality and public health. The District will continue to contract with a Spanish translator to reach the Spanish-speaking segment of the community.

All residents within the nonattainment area will benefit from a steady supply of seasoned

firewood. All residents within the City of Portola will be eligible for one year’s payment for curbside collection of yard waste, resulting in a reduction of emissions from open burning. Residents within the City of Portola will benefit from the enforcement of the City of Portola’s adopted mandatory wood burning curtailment of uncertified stoves.

d. Project Sustainability

The District believes that emission reductions will continue past the final year of the grant when considering each program element. Removing high emission heating devices permanently reduces emissions from these very outdated appliances. Replacing high emission heating devices with lower emitting devices that (on average) have a useful life of 20 years will ensure the continuing reductions. The District believes that the once a program has been established to provide a steady supply of seasoned wood, residents will continue to demand this quality of fuel after this grant period has ended. Although the grant only provides for the hiring and maintaining of the BurnWise Coordinator for 5 years, the education that the Coordinator provides to each resident will continue. Once weatherization is provided, this will decrease the need for heating in homes that have been better insulated for the lifetime of the home. Once residents have participated in the green waste curbside pickup program, it is expected they will continue to participate in the program and the emission reductions from the open burning of green waste will continue well into the future.

Additionally, the Northern Sierra Air Quality Management District has developed and written the Portola Fine Particulate Matter (PM2.5) Attainment Plan (PM Plan) which requires commitments to continue efforts to reduce emissions after the EPA funding for this project has ended.

e. Environmental Results

Table 2 summarizes outputs, outcomes, and performance measures for each activity. The District fully expects to complete the expenditure of all U.S. EPA grant funds awarded within five years of receipt. The first two years will overlap with the current 2015 Targeted Airshed Grant. The only equipment charged to the 2018 Targeted Airshed Grant will be electric heat pump system installations. In the last year of the grant, 2024, the only installations will be those that just cannot, for any reason, be completed within 2023. Applications will not be accepted after December 31, 2023.

Table 1. Number of Stoves Changed Out per Year

Year	Number of Stoves Changed Out
2020	10
2021	100 50
2022	100 50
2023	85 50
2024	5 3

Table 2. Environmental results

Activity	Outputs	Outcomes	Performance Measures
	Total emission reductions from all outputs below. See the Emission Calculations attachment on the methodology for calculating estimated emission reductions.	Annual Emission Reductions: <ul style="list-style-type: none"> • 41.4 tons of PM2.5 • 0.07 tons of SO2 • 0.7 tons of NOx • 64.7 tons of CO Emission Reductions Over 5 Years: <ul style="list-style-type: none"> • 207 tons of PM2.5 • 0.4 tons of SO2 • 3.3 tons of NOx • 323.7 tons of CO 	
Replace 300 163 wood stoves	235 77 woodstoves are changed out for NSPS Step 2 certified woodstoves. 33 25 woodstoves are changed out for Step 2 pellet stoves. 20 53 woodstoves are changed out for heat pumps. 42 8 woodstoves are changed out for kerosene or propane heating.	Annual Emission Reductions: <ul style="list-style-type: none"> • 10.4 tons of PM2.5 • 0.07 tons of SO2 • 0.7 tons of NOx_x • 64.7 tons of CO Emission Reductions Over Device Lifetime (20 Years): <ul style="list-style-type: none"> • 209 tons of PM2.5 • 1.5 tons of SO2 • 13.2 tons of NOx • 1294.8 tons of CO 	Number of devices replaced Applies across all categories Air Quality Trends <ul style="list-style-type: none"> • PM2.5 FRM and BAM • Speciation data, particularly carbon and levoglucosan
Burnwise Coordinator/ Education and Outreach	Provide outreach and education on proper burning techniques of woodstoves.	Reduce wet wood burning 50% and under-loading 50% in 1/3 of the households. <ul style="list-style-type: none"> • 11.8 tons of PM2.5/Year • 70.7 tons of PM2.5/6 Years 	
Wood Shed Program	Build 400 59 woodsheds for residents who don't have a proper wood storage space. Average woodshed lasts 10 years.	Reduce burning wet wood in 100 households by 75% <ul style="list-style-type: none"> • 0.94 tons of PM2.5/Year • 9.4 tons of PM2.5/10 Years 	Number of sheds built
Seasoned Wood Program	Reduce the number of residents using wet wood by 70% (assuming 1/3 households use wet wood)	Annual Emission Reductions: <ul style="list-style-type: none"> • 13.2 tons of PM2.5/Year • 66 tons of PM2.5/5 Years 	Amount of dry wood provided
Certified stove database registration	Registered EPA certified stoves in the nonattainment area.	Enable tracking devices violating wood burning curtailment Prevent PM2.5 concentrations from exceeding 24-hr standard on high PM2.5 days	
Chimney Sweep Voucher	Sweep 710 chimneys. Provide outreach and education on proper stove operation and maintenance.	Reduce PM2.5 emissions 20% <ul style="list-style-type: none"> • 2.2 tons of PM2.5/Year • 11 tons of PM2.5/5 Years 	
Weatherization	Conduct in-home inspection and energy audits and weatherize 30 homes.	Reduce wood use 50% Annual Emission Reductions <ul style="list-style-type: none"> • 2.2 tons of PM2.5/Year • 44 tons of PM2.5/20 Years 	Amount of wood used annually
Residential Yard Waste Collection	Collect yard waste from 900 households.	Annual Emission Reductions: <ul style="list-style-type: none"> • 0.0001 tons of PM2.5/Year • Help public understand that all burning is harmful to their health 	Green waste collected
Enforcement Coordinator	Enforce the woodburning curtailment and open burning. Ensure that no visible smoke emitted from chimneys and no open burning is conducted.	Minimize violation of woodburning curtailment and open burning regulation	Reduction in number of violations of wood burning ban

Table 3. Approximate Project Timeline January 1, 2020 to December 31, 2024*

	2020	2021	2022	2023	2024
Wood Stove Change-out Program					
Maintain partnership with retailers	X	X	X	X	X
Assist residents with applications	X	X	X	X	
Process applications	X	X	X	X	
Educate and work with retailers throughout the project	X	X	X	X	
Inspect and verify non-certified wood stoves are destroyed	X	X	X	X	X
Promote and advertise the project in the community	X	X	X	X	
Maintain website with program information	X	X	X	X	
Track applications from approval to reimbursement of stove retailers	X	X	X	X	X
Maintain a network of key stake holders to promote project	X	X	X	X	
Host annual outreach events	X	X	X	X	
Burnwise Coordinator (1.0 FTE)					
Hire and utilize Burnwise Coordinator (BC)	X	X	X	X	X
BC will visit resident homes and troubleshoot operation of wood stoves	X	X	X	X	X
Track participants in certified stove database	X	X	X	X	X
Wood Shed Program					
Develop program (once Burnwise Coordinator is hired)	X				
Implement program	X	X	X	X	X
Seasoned Wood Program					
Develop program (once Burnwise Coordinator is hired)	X	X			
Implement program	X	X	X	X	X
Chimney Sweep Vouchers					
Develop program and vouchers (once Burnwise Coordinator is hired)	X				
Implement program	X	X	X	X	X
Residential Yard Waste Collection Program					
Develop program through partnership with the City of Portola and local solid waste provider	X	X			
Implement program by providing grant funds to the local solid waste provider	X	X	X	X	X
Enforcement Coordinator (0.5 FTE)					
Hire and utilize Enforcement Coordinator	X	X	X	X	X
Implement program for indoor wood burning curtailment enforcement	X	X	X	X	X
Implement program for open burning enforcement	X	X	X	X	X
Grant reporting and oversight					
Compile reports on number of stoves changed out and associated cost	X	X	X	X	X
Verify projected reductions in ambient PM2.5 concentrations and emissions	X	X	X	X	X

*Some 2019 work is currently being done as part of the 2015 EPA Targeted Airshed Grant.

f. Programmatic Capability and Past Performance

The District has successfully changed out 300 stoves within the nonattainment area in the past 3.5 years with funding from the EPA 2015 Targeted Airshed Grant, as well as implemented a voluntary wood burning curtailment program and participated in a variety of public outreach events. The District has maintained partnerships with local stove installers, the City of Portola, and various agencies to further the goal of decreasing PM_{2.5} in the nonattainment area. The District is working closely with City of Portola city officials, Plumas County agencies, local community organizations and state and federal government organizations to reach attainment by 2021. The District will use the same procedures, forms and tracking techniques used in the current 2015 Targeted Airshed Grant for the Wood Stove Change-Out Program element. The principal and responsible parties of the District assigned to the project are:

- Executive Director, Gretchen Bennitt
- Air Pollution Specialist II, Julie Ruiz
- Air Pollution Specialist I, Melissa Klundby
- Deputy Executive Director, Joe Fish
- Accounting Clerk, Dawn Lunsford
- Air Pollution Specialist III, Sam Longmire

Julie Ruiz has been the Program Coordinator for the Portola program. Gretchen Bennitt and Joe Fish have been processing invoices, developing disbursement requests and, along with Julie Ruiz, have been producing quarterly progress reports to the EPA. In addition to the Portola wood stove change out program, Sam Longmire is currently administering a woodstove change-out program for all three District counties using California Climate Investments funding. To date, 103 stoves have been changed out. In addition, the District has successfully administered \$2,224,000 of incentive funds from the CARB Lower Emission School Bus Program and \$2,281,808 from the Carl Moyer program.

CARB staff will assist with annual verification of progress including estimating reductions in emissions and PM_{2.5} concentrations. Kasia Turkiewicz, Air Resources Engineer, will oversee the project on behalf of CARB to ensure that funds are passed to the District in a timely manner. Eugene Kim, Air Resources Engineer, will provide technical support to track emission reductions and evaluate progress towards attainment of the PM_{2.5} standard. With respect to grant management, CARB has accepted several U.S. EPA grants in the past three years, including: Section 105 Air Pollution Control Financial Assistance Grant (Grant Number A-00901315), PM 2.5 Monitoring Network Grant (Grant Number PM-98960901), and the State Clean Diesel Grant (Grant Number DS-00T87901). Each of these recent grants represents a continuation of a multi-year, multi-million dollar grant from U.S. EPA. For each grant, CARB has completed all grant agreement terms and completed (or expects to complete) the approved work plans to expeditiously apply funds to shared U.S. EPA and CARB air quality goals. CARB has documented progress on these grants through submittal of required reports and inputting collected data into state and national databases, as appropriate per the grant terms.

Additionally, CARB has extensive experience implementing multi-million dollar incentives programs, such as the Lower-Emission School Bus Program, the Carl Moyer Memorial Air Quality Standards Attainment (Moyer) Program, Goods Movement Emission Reduction (Goods Movement) Program, the Air Quality Improvement Program (AQIP), and the Providing Loan Assistance for California Equipment (PLACE) Program. CARB's experience in these programs has established solid working relationships with air districts as well as engine/equipment and retrofit manufacturers and vendors necessary for successfully implementing the proposed project.

g. Performance Measures

- 1) Quarterly reports
 - a) For the duration of this grant CARB will submit quarterly reports within 30 days after the end of each calendar quarter.
 - b) Quarterly reports will include summary information on technical progress and expenditures, and planned activities for the next quarter
- 2) The following outcomes will be tracked and reported in each report, along with any other outcomes included in the Quarterly and Final Report Tracking Spreadsheet template:
 - a) Change-out Program – Total number of completed change-out projects, chimney sweeps, and an estimated reduction of fuel use per year
 - b) Weatherized Program - Total number of residential homes that have received assistance and types of activities that have occurred
 - c) Seasoned Wood Program - Total number of cords of seasoned wood sold or provided and total number of participants
 - d) Wood Shed Program - Total number of wood sheds provided
 - e) Chimney Sweeps –Total number of completed chimney sweeps
 - f) Yard Waste Collection - Total number of participants and total amount of green waste collected
 - g) Burnwise Coordinator – Number of home visits, type and number of outreach events, number of 'No Burn' declarations and program feedback such as testimonials received from residences, hearth retailers and other partners
 - h) Enforcement Coordinator – Number of inspections and investigations, number of complaints from public, summary of follow-up activities.
- 3) Final Report
 - a) Within 90 days of the end of the grant agreement CARB will submit a final report.
 - b) The final report will include all of the information required for quarterly report, as listed in the Final Report Tracking Spreadsheet, summarized for the duration of the project. In addition, the final report will include the following, along with any other outcomes included in the Final Narrative Report template:
 - i) Narrative summary of the project
 - ii) Project outcomes
 - iii) Emission benefits calculations
 - iv) Impact on air quality including 24-hour and annual PM2.5 trends, concentrations, and design values.

h. Budget and Budget Narrative

The budget for this project is \$3,212,238. This includes \$3,172,238 in EPA Targeted Airshed Grant funds and \$40,000 in District funds. CARB will pass the majority of the funds, \$2,970,612, directly to the District (total sub-award). Table 4 includes a detailed budget.

Table 4. Proposed Budget for Portola PM2.5 Nonattainment Area Air Shed Project

Line Item & Itemized Cost	EPA Funding	Non-Federal Cost Share
CARB Personnel		
Project Manager @53.57/hr X 1687 hrs	\$90,373	
CARB TOTAL PERSONNEL	\$90,373	\$0
CARB Fringe Benefits		
Base	\$90,373	
Rate	55.74%	
CARB TOTAL FRINGE BENEFITS	\$50,374	\$0
CARB Travel		
Milage for PM: 300 miles/trip @ \$0.58/mi x 10 trips	\$1,740	
Residential Wood Smoke Workshop (PM travel)	\$1,700	
CARB TOTAL TRAVEL	\$3,440	\$0
OTHER - SUBAWARD:		
Equipment (wood stove change-out program)		
Electric Heat Pumps (Increase from \$214,000 to \$714,000)	\$714,000	
Pellet	\$151,800	
Propane	\$40,500	
Kerosene	\$13,500	
Wood (decrease from \$860,100 to \$360,100)	\$360,100	\$40,000
MOU with the City of Portola for stove destruction	\$17,700	
Other (moisture meters, thermometers, CO/Smoke detectors, etc.)	\$32,450	
TOTAL EQUIPMENT	\$1,330,050	\$40,000
Program Elements		
Burnwise Coordinator	\$198,000	
Wood Shed Program	\$50,000	
Seasoned Wood Program	\$295,000	
Certified Stove Database Registration	\$3,000	
Chimney Sweep Vouchers	\$177,500	
Weatherization	\$240,000	
Residential Yard Waste Collection	\$90,589	
Enforcement Coordinator	\$99,000	
TOTAL PROGRAM ELEMENTS	\$1,153,089	\$0
District Personnel		
District Project Manager	\$111,198	
Project Coordinator	\$132,480	
Business Manager	\$47,214	
Project Staff #1	\$33,738	
Project Staff #2	\$38,803	
Fringe Benefits (27%)	\$98,127	
TOTAL DISTRICT PERSONNEL	\$461,560	\$0
District Travel and Public Outreach		
Public Outreach and Education	\$22,505	
Travel (Including Conference or Workshop)	\$3,408	
TOTAL DISTRICT TRAVEL AND PUBLIC OUTREACH	\$25,913	\$0
TOTAL OTHER - SUBAWARD	\$2,970,612	
CARB Indirect Charges		
(Federal Negotiated Indirect Cost Rate = 40.81%)	40.81%	
Federal ICR x (Personnel +Fringe)= Indirect Costs	\$57,439	\$0
CARB TOTAL INDIRECT	\$57,439	\$0
TOTAL FUNDING	\$3,172,238	\$40,000
TOTAL PROJECT COST *		\$3,212,238

* Cost share funds include \$40,000 District funds from local fees.

CARB proposes to reallocate \$500,000 within the Equipment Category of the subgrant agreement budget from Wood Stoves to Heat Pumps. As part of an effort to meet the moderate attainment date, the District focused on replacing uncertified wood stoves and fireplaces used as primary sources of heat with certified wood or pellet stoves. Despite exceeding the emission reduction target, the air quality did not improve enough to meet the moderate attainment deadline. Many factors may be contributing to this. There is a lot of uncertainty associated with the wood stove certification program suggesting that certification tests could be adjusted to ensure the stove meets NSPS. This elasticity in stove certification fails to ensure stoves exhibit a similar performance in the field. Two other factors impacting emissions are quality of firewood and device operation. The District has established a program to educate households on the importance of both using seasoned wood and following proper stove operational instructions, but these factors are difficult to correct and account for when estimating emission reductions. After reclassification to a serious nonattainment area, the District decided to prioritize heat pump installations, hoping the emission reductions and associated air quality improvements will be more reliable. Heat pumps are more expensive to install and operate than wood stoves, requiring a significantly higher incentive to entice households into installing them and agreeing to use them as primary sources of heat. The original budgets include funding for 20 heat pumps and 235 wood stoves over a five-year period. By redirecting \$500,000 from the wood stove budget and factoring increased incentive, as concurred in August 2022, we estimate being able to fund 77 wood stoves and 53 heat pumps.

Personnel: One staff member (CARB Project Manager) will be managing the project on behalf of CARB. CARB has estimated it will take 1,687 hours of staff time over the five years of the grant timeframe to manage the project.

Travel: The CARB Project Manager will travel from Sacramento to Portola to attend the annual public outreach events. This person will attend one event in each of the five years. The round-trip mileage from Sacramento to Portola, at the current rate of \$0.58 per mile, is estimated to be \$1,740. In addition, during the life of the grant, the CARB Project Manager will attend one workshop or a conference dedicated to woodsmoke issues at an estimated cost of \$1,700.

Sub-award: Majority of the funds, \$2,970,612, will be sub-awarded to the Northern Sierra Air Quality Management District (District). This includes all District costs incurred for the duration of the program, including Equipment (Wood Stove Change-Out Program), additional Program Elements, District Personnel/Fringe Benefits, District travel and public outreach. Table 5 provides more a detailed description of how the District will allocate the funds.

Table 5. District Program Elements

Program Element	Total Cost (\$)
Burnwise Coordinator	\$198,000
Wood Shed Program	\$50,000
Seasoned Wood Program	\$295,000
Certified Stove Database Registration	\$3,000
Chimney Sweep Voucher	\$177,500
Heat Weatherization Conservation Activities	\$240,000
Residential Yard Waste Collection Program	\$90,589
Enforcement Coordinator	\$99,000
Total Program Elements	\$1,153,089

Wood Stove Change-out – Allowed Replacement Equipment and Associated Cost: The overwhelming proportion of the request for the EPA funding will go towards a wood stove change-out program. Table 6 provides a detailed listing of the type of equipment and associated costs

Table 6. Sub-award Equipment Cost

HEATING DEVICE INSTALLATIONS	Max. unit cost	number of installs	total cost
Electric heat pump systems	\$13,500.00	20 53	\$714,000.00
Pellet	\$6,500/\$4,500	33 25	\$151,800.00
Propane	\$6,500/\$4,500	9 6	\$40,500.00
Kerosene	\$6,500/\$4,500	3 2	\$13,500.00
Wood	\$5,000/\$3,500	235 77	\$360,100.00
Destruction of old wood stoves (MOU with City of Portola)			\$17,700.00
Total		300 163	\$1,297,600.00

Note the unit cost is the highest amount (maximum) offered per change-out. The nonattainment area is split into two zones. Zone 1 is the City of Portola Sphere of Influence and Zone 2 is the rest of the nonattainment area (less densely populated). There are no income guidelines in Zone 1. In Zone 2, applicants must meet low income guidelines used by Plumas County and the California Department of Community Services and Development in order to receive the maximum incentive. If low income guidelines are not met, a reduced incentive is offered. The District reserves the right to modify the allocation of resources in order to achieve maximum emission reductions.

There is an OTHER Equipment category that includes smoke/CO detectors, generators for 25% of the pellet and heat pump installations, stove thermometers, and moisture meters, **and tarps** for a total of \$32,450, as noted in Table 4.

District Personnel and Fringe Benefits: Table 7 includes a listing of district personnel and fringe benefits necessary for implementing the project.

Table 7. Cost of District Personnel and Fringe Benefits

Line Item and Itemized Cost	Rate (\$)	Hours per Week	# of Weeks per Year	# of Years	Cost (\$)
District Personnel					
(1) District Project Manager	\$51.72	10	43	5	\$111,198.00
(2) Project Coordinator	\$29.44	20	45	5	\$132,480.00
(3) Business Manager	\$21.96	10	43	5	\$47,214.00
(4) Project Staff #1	\$39.23	4	43	5	\$33,737.80
(5) Project Staff #2	\$45.12	4	43	5	\$38,803.20
Fringe Benefits (27%)					\$98,126.91
Total District Administration Cost					\$461,559.91

District Travel and Public Outreach: Public outreach and education includes the cost of annual stove fairs, printing costs for outreach and education materials, and advertising. Travel cost is for two District employees to attend the EPA Residential Wood Smoke Workshop (Workshop) in New Orleans, from March 10 – March 12, 2020. Table 8 lists the cost of District public outreach and education and travel.

Table 8. Cost of District Travel and Public Outreach.

Category	Cost
Public Outreach and Education	\$22,505.09
Travel (EPA Wood Stove Workshop, March 2020, 2 attendees)	\$3,408.00
Total	\$25,913.09

Indirect Costs: Some indirect costs will be incurred by CARB as noted in Table 4.

i. Voluntary Cost Share/Match and Leveraged Funds

The District will request \$40,000 from the District Board of Directors (District Board) to be utilized to leverage this grant. This funding will be allocated from the annual AB2766 DMV surcharge fund for Plumas County. This can be allocated by a quorum vote of the six directors on the District Board during a regularly scheduled meeting. The District Board of Directors has approved leveraging of these funds and this amount in the past for the 2015 Targeted Airshed Grant. These funds will be used to augment equipment costs.

j. Attachments

A. Estimated Emission Reduction Calculations

FY2020 U.S. EPA Region 9 Targeted Airshed Grant (TAG) Work Plan

a. Summary Information Page

- i. **Project Title:** Portola PM2.5 Nonattainment Area Airshed Project (EPA 2020 Targeted Airshed Grant)
- ii. **Applicant Information:**
California Air Resources Board
1001 I Street, P.O. Box 2815
Contact: Kasia Turkiewicz, Air Resources Engineer
Phone: (916) 445-6497
Fax: (916) 327-8524
email: kasia.turkiewicz@arb.ca.gov

Application submitted on behalf of:
Northern Sierra Air Quality Management District
200 Litton Drive, Suite 320
Grass Valley, CA 95945
Gretchen Bennitt, Executive Director
Phone: (530) 274-9360, Extension 102
Fax: (530) 274-7546
Email: gretchen@myairdistrict.com
- iii. **Total Project Cost**
 - a. Total cost of the project: \$2,882,469
 - b. Amount of funding requested from EPA: \$2,842,469
 - c. Funding from other sources, including any voluntary leveraged cost-share or in-kind resources: \$40,000
- iv. **Project Period:** September 1, 2021 through August 30, 2026
- v. **Project Description:** This project will extend a Wood Stove Change-out Program (currently funded by a 2015 and 2018 Targeted Airshed Grant) and add additional program elements to address needed resources for public outreach and education, enforcement and wood fuel quality.
- vi. **Place of Performance:** Plumas County, CA PM2.5 Nonattainment Area
- vii. **DUNS Number:** 195930276

b. Project Summary and Approach

b. i. Detailed project summary, description of specific actions and methods to be undertaken and the responsible institutions.

In March 2015, the U.S. Environmental Protection Agency (EPA) designated the City of Portola and surrounding parts of Plumas County, California, as a "[Nonattainment Area](#)" for the annual particulate matter (PM) 2.5 standard. PM2.5 from residential wood combustion is responsible for 80 percent of the PM2.5 mass annually and 90 percent on an average exceedance day. The objective of the project is to reduce pollution levels so that the Portola area can attain and maintain the PM2.5 standard for the years to come.

The Nonattainment Area is a mountainous region within the Plumas National

Forest of Northern California. The City of Portola is located at an elevation of 4,900 feet. It is in a small, mountain basin with predominantly westerly/southwesterly winds during the day and downslope winds during the night. Winters are cold with an average daily low of 21.8 degrees during October through March. The topography and climate contribute to stagnant conditions through the winter, keeping smoke from wood burning in the breathing zone, particularly through the evening, night and early morning. Reducing PM2.5 from wood burning is the only means to improve air quality and reach attainment.

On March 24, 2016, EPA awarded a 2015 Targeted Airshed Grant to the California Air Resources Board (ARB), implemented by the District, to improve air quality by reducing emissions through a Wood Stove Change-out Program. The program is currently in place and will continue through 2020. A total of 600 old stoves/fireplaces are targeted for replacement by the end of 2020. At the time of this proposal submittal, approximately 400 stoves have been changed out. On June 5, 2020 EPA awarded the 2018 Targeted Airshed Grant work plan, which includes 300 additional change-outs, among other wood stove change-out related emission reduction activities.

In order to achieve emission reduction goals, it is necessary to continue to implement a Wood Stove Change-out Program past 2020 and add further program elements. While there is some improvement in air quality, more emission reductions are needed. New EPA certified stoves should have a significantly lower emissions; however, operator usage of these stoves produces variable results. Experience with the current program has led to a few observations:

- There is a learning curve to using the new devices. Many program participants report that it takes time to adjust burning practices in new, EPA certified wood stoves that function quite differently than previous, uncertified wood stoves. A follow up visit by District staff, stove installers and/or chimney sweep providers is especially helpful in educating the participants. All participants are trained in using the new stove at the time of installation. But if the installation is completed in the summer months, they likely do not recall all the information provided by the time the stove is used in the winter.
- Restricting wood stove and pellet replacement devices to under 2 grams/per hour (or 2.5 grams if tested with cordwood) of emissions may gain additional emission reductions on top of the reductions achieved by replacing higher emitting older stoves and fireplaces.
- Step 2 stoves operate poorly with high moisture fuel. Additional education and outreach are required to ensure only seasoned fuel (< 20% moisture content) is used. With this grant, a seasoned wood program will be developed.
- Those least resistant to changing out stoves have now participated in the program. Soliciting applications has become more time consuming. Knocking on doors, targeted mailings and follow up calls are becoming more important to reach those that either have not heard about the program or have been hesitant to participate. More staff resources are needed to focus efforts on identifying potential applicants and follow applicants through the process until a new heating device is installed. A Citizen

Advisory Committee will be formed to inform and educate residents through peers and neighbors.

- An extension of the Wood Stove Change-out Program is crucial with a mandatory wood burning curtailment program commencing in the winter of 2020/2021. At that point, Portola residents who were unaware of the program or hesitant to participate, will be motivated to upgrade to an EPA certified stove. When there is a mandatory curtailment, residents will be able to burn wood only in EPA certified wood stoves for heating needs.
- The District also sees value in adding electric heat pump systems to the option for cleaner burning technology upgrades. Operator usage contributes greatly to the success or failure of achieving emission reductions from wood-to-wood replacement. Installing a greater percentage of propane, kerosene and electric heating options is a more certain way to achieve emission reductions as operator usage is taken out of the equation. Fuel subsidies for propane, kerosene and/or electric heat pumps may be included.

This Portola PM2.5 Nonattainment Area Airshed Project will include eleven elements.

Program Element 1: Wood Stove Change-out Program

The District received an EPA 2015 Targeted Airshed Grant that included funding to change out 600 wood stoves through a Wood Stove Change-out Program. Another 300 change-outs are currently funded through the EPA 2018 Targeted Airshed Grant. The District estimates another 80 wood stoves/fireplaces will need to be replaced with cleaner and more energy efficient home heating alternatives. An enforceable mandatory wintertime curtailment program began on January 1, 2021, though enforcement has been limited due to COVID. However, it is expected that homeowners, who were previously unmotivated to change out an old, uncertified stove, may come forward. Wood Stove Change-out Program funding includes equipment, permitting and installation. Also included in equipment costs are emergency backup power generators for electricity-powered heating devices, smoke/carbon monoxide (CO) detectors, stove thermometers, moisture meters, firestarters and permanent destruction of uncertified stoves. A home with more than one wood burning device will be eligible to replace multiple qualified devices. This also applies to wood burning devices in a garage, shop or other outbuilding that are in operation at the time of application. However, only one qualified wood burning device per home may be replaced with an EPA certified wood stove. Any additional qualified wood burning devices must be replaced with a pellet stove or another non-wood heating device.

To qualify for a Wood Stove Change-out, the currently installed and operating wood burning device must be one of the following:

- A non-EPA certified wood stove (typically manufactured/installed prior to 1992);

- An EPA certified wood stove manufactured 15+ years ago with the emission control technology in disrepair¹;
- An EPA certified wood stove manufactured 10+ years ago, in any condition, to be replaced with a pellet stove, electric heat pump, or propane or kerosene heating device.
- An open fireplace being used as a primary heating device; or
- A non-EPA certified pellet stove (15+ years old) may be changed out for an EPA certified pellet stove, electric heat pump or propane or kerosene heating device (not an EPA certified wood stove).

Multiple stoves at one residence – if one stove has already been replaced through the program (or is an existing EPA certified wood stove), additional stoves used as primary sources of heat, which may include shops, garages, etc., may only be replaced with a non-wood heating device. The EPA Project Officer will be contacted for approval of additional change out activities on a case-by-case basis.

Qualified residents may choose a replacement device from the following options:

- EPA certified wood/pellet stoves with emissions not exceeding 2/2.5 grams/hour (depending on test method) and better than 75% efficiency.
- Propane or kerosene stoves; or
- Electric heat pump system, ENERGY STAR® compliant.

The District will prioritize the installation of electric heat pumps. These heating systems can be used to provide electric heating at homes without heating ducts. The District will make sure to fund a replacement using only an ENERGY STAR® compliant devices and hire an installer familiar with the product and its installation. Since ductless heat pumps can operate using 25% to 50% less energy than electric resistance and forced air systems, consumers can expect a much lower energy bill. The estimated cost of an electric heat pump system is expected to be no more than \$13,500 per installation.

Residents have expressed a disinterest in either the heat pump or pellet stove primarily due to not being able to use these heat sources powered by electricity during power outages without a non-electric backup heat source. In order to further incentivize pellet stoves, the District intends to pay for emergency power backup generators when necessary. The estimated cost is \$600 per generator, for emergency backup power for pellet installations. A backup generator will only be supplied if there is no other emergency backup source in the home.

Incentives will range from \$1,500-\$13,500 per installation. Incentives will vary based on the replacement device type and whether the resident is in Zone 1 (Portola Sphere of Influence; higher priority area) or in Zone 2 (the portion of the non-attainment area located outside of Portola Sphere of Influence). The maximum incentive may not exceed the following amounts:

- \$3,500 for cordwood stove.

¹ An EPA certified wood stove that is 15+ years old may be repaired when the emission control technology is not functioning properly. If not repairable at a reasonable rate, it will be replaced with a new EPA certified device.

- \$4,500 for pellet, kerosene, or propane; and
- \$13,500 for heat pumps.

It is imperative to ensure that old, uncertified stoves are rendered inoperable. Destruction of stoves is currently handled by the City of Portola Public Works under an MOU between the City and the District (through previous Targeted Airshed Grants). This MOU would be extended an additional 5 years to destroy up to 80 old stoves.

“Other” funds in this category will be used for:

- Emergency back-up generators, if needed, for pellet installations.
- Bounty program - \$250 will be offered to anyone turning in an old, uncertified wood stove to be scrapped and recycled.
- Repair program – repairs will be offered to applicants with qualified and unqualified stoves as long as the repairs improve (or decrease) emissions.
- Stove thermometers.
- Smoke and CO detectors.
- Moisture meters.
- Firestarters.

To fund this program element, \$445,893 will be needed to cover all equipment costs.

Program Element 2: Burnwise Coordinator (1.0 FTE)

Emissions from wood stoves depends considerably on user behavior. Users can strongly influence emissions by adjusting burning conditions and fuel quality. Step 2 stoves work poorly when fuel moisture content is too high. Burning wet wood in a new stove may prevent achieving emissions as stated by the manufacturer. Adequate burning conditions, especially with regard to air flow and underload, can significantly reduce PM emissions. One of the most common mistakes, especially for long-term users of uncertified stoves who recently switched to certified stoves, is firing at part load (underloading). This can increase emissions two-fold.² Unnecessary use of excess air also leads to a two- to three-fold increase in PM emissions due to reduced residence time within combustion region.³ The District needs to expand its educational component by continuing the functions of the Burnwise Coordinator (past the 2018 Targeted Airshed Grant), who will be in charge of the following:

- 1) Conduct follow-up visits - Each house participating in the Wood Stove Change-out Program will be visited once, after one winter of using the new device, to be surveyed about usage. Homes where problems are discovered (visible smoke, wet wood, etc.) will be visited subsequently until issues are resolved. In the case that a new stove is installed March-August,

² Kindbom, K., Mawdsley, I., Nielsen, O.-K., Saarinen, K., Jónsson, K., & Aasestad, K. (2018). Emission factors for SLCP emissions from residential wood combustion in the Nordic countries: Improved emission inventories of Short Lived Climate Pollutants (SLCP). Copenhagen. <https://doi.org/10.6027/TN2017-570>

³ Fachinger, F., Drewnick, F., Giere, R., Borrmann, S., How the user can influence particulate emissions from residential wood and pellet stoves: Emission factors for different fuels and burning conditions, Atmospheric Environment 158 (2017)216-226.

- every effort will be made to provide a 'refresher' training during September-November before the stove is used;
- 2) Neighborhood outreach within the City of Portola to promote the Wood Stove Change-out Program;
 - 3) Plan and participate in community events to provide information on the importance of proper burning techniques and using seasoned wood, as well as promoting the Wood Stove Change-out Program to solicit applications;
 - 4) Distribute chimney sweep vouchers;
 - 5) Develop and implement a Wood Shed Program;
 - 6) Develop and implement a Seasoned Wood Program;
 - 7) Maintain a database of owners/addresses with EPA certified heating devices; and
 - 8) Other duties to further the goals of improving air quality in the Greater Portola Area.

The Burnwise Coordinator position requires a full-time employee. The hourly rate is expected to be approximately \$25/hour. At 40 hours per week, over 3 years, this program element is expected to require \$150,000 in funding.

Program Element 3: Wood Shed Program

The Burnwise Coordinator will continue the current wood shed program to provide dry storage to individual residents that do not have the resources to keep wood seasoned and dry. According to the EPA BurnWise program, wood moisture should be less than 20%. Greater moisture content leads to excessive smoke. The District will contract with local construction companies to build and distribute wood sheds in the Nonattainment Area. These woodsheds will be modeled after EPA's Burn Wise wood shed design (<https://www.epa.gov/burnwise>). Due to the snow load in the winter, metal roofing should be added to the design. Overall, the cost of materials, construction, and delivery is estimated at \$850 per shed.

The Burnwise Coordinator will determine need during follow up visits. If the resident does not have adequate storage to keep firewood dry, the Burnwise Coordinator will engage a contractor to build and deliver the shed. The District estimates that approximately 70 woodsheds would be needed. The cost for 70 wood sheds is estimated to be \$60,000.

Program Element 4: Seasoned Wood Program

The Burnwise Coordinator will research, develop and implement a Seasoned Wood Program. Using EPA-certified woodstoves does not guarantee emission reductions because emissions depend on the quality of firewood. Certified stoves are highly sensitive to wet wood due to limited capacity of the air systems⁴. Burning wet wood in a certified stove can increase PM2.5 emissions fivefold. Households must use properly dried firewood in order to achieve optimal emission reductions.

The Portola PM2.5 Nonattainment Area experiences significant fluctuation in

⁴ Kindbom, K., Mawdsley, I., Nielsen, O.-K., Saarinen, K., Jónsson, K., & Aasestad, K. (2018). Emission factors for SLCP emissions from residential wood combustion in the Nordic countries : Improved emission inventories of Short Lived Climate Pollutants (SLCP). Copenhagen. <https://doi.org/10.6027/TN2017-570>

quantity and quality of firewood available for purchase. To a large extent, seasonal workers, who try to take advantage of other employment in order to maximize their income, supply firewood in Plumas County. For example, in 2018, due to a strong economy, residents have found it difficult to procure wood fuel because seasonal firewood providers have found other employment.

In order to minimize fluctuation in wood availability and ensure that residents have access to properly seasoned, locally-sourced wood at a reasonable price, a voucher program will be researched and implemented, if determined feasible. This program would certify wood providers that can show proof of less than 20% moisture content. Vouchers would only be redeemed with providers certified by the District.

In addition, a fuel processing and storage facility will be researched. It will likely develop as a partnership between the District, City of Portola, local churches, U.S. Forest Service, the Sierra Institute and/or local agencies such as the local fire district and the Portola Family Resource Center. Using grant money, the District may purchase commercial firewood processing equipment (and maintain it), secure a processing and storage location and build the necessary platform and shelter to keep wood seasoned and dry. Staffing and security may also need to be considered. A program for supplying manufactured logs will also be considered.

The estimated cost for the developing, implementing and running a Seasoned Wood Program for 5 years is difficult to determine without further research. At a minimum, it is expected that \$350,000 of the grant money would be allocated to this program element.

Program Element 5: Mandatory Curtailment Program

In order to enforce a mandatory indoor burning curtailment program, there must be a database to identify households with EPA certified devices. During a curtailment period, wood burning will be permitted only in EPA certified devices (per City of Portola Ordinance No. 354). The Enforcement Coordinator will need to reference this database in order to identify violators on mandatory curtailment days. The District's IT provider has created this database with funds from the 2015 Targeted Airshed Grant. In order to cover any additional expenses that may come up, including revisions and maintenance, the District estimates a total of \$3,000 in funding for this grant period.

The District may need assistance with forecasting curtailment days and/or communicating enforcement days to the community. A partnership with Sonoma Technology, Inc. (STI) will be explored. With a monthly fee of approximately \$5,000 for four months of curtailment for four winters, the total would be approximately \$83,000. There is a start-up fee of \$5,000. This total program element cost is estimated to be \$88,000.

Program Element 6: Chimney Sweep Vouchers

Proper maintenance of the chimney prevents creosote build-up, reducing the risk of home heating fires and reducing smoke coming out of the chimney. According

to the National Fire Protection Association, wet wood is the #1 cause of creosote build-up. Annual chimney sweeping and inspection by a reputable chimney sweep is recommended. The cost of a chimney sweep visit can vary from \$125-\$300, depending on the time of year the maintenance is done, the size of the home, the type of wood burning device, etc. Due to the low average household income in the Nonattainment Area, annual chimney maintenance is often neglected or performed by the homeowner only when an issue arises, such as a clogged chimney cap. Grant funding will allow the District to provide chimney sweep vouchers to be used only with District-approved chimney sweep providers. This is a continuation of the Chimney Sweep Voucher program in the 2015 and 2018 Targeted Airshed Grants.

In order to protect the investment made in the community by installing wood stoves under the 2015 and 2018 Targeted Airshed Grants, the Burnwise Coordinator will provide additional follow up to make sure the appliance is working correctly and maintained properly. Chimney sweep vouchers will be offered to homeowner who have previously participated in the change-out program, as well as homeowners who have not.

The Burnwise Coordinator will also distribute a chimney sweep voucher, with an estimated value of up to \$250. Chimney sweeps offer a valuable education component. By inspecting the chimney, burning practices can be diagnosed and issues can be addressed with the participant.

Funding for this program element totals \$150,000 for 600 vouchers.

Program Element 7: Heat Weatherization Conservation Activities

Proper weatherization of homes in the Nonattainment Area would significantly reduce the use of wood fuel for heating in residences that participate in the Wood Stove Change-out Program. The Plumas County Community Development Commission (PCCDC) provides weatherization services based on income eligibility and funding availability (“Opportunities for Reducing Wood Smoke in the Portola, California Area” by Jennifer Weiss, April 30, 2015). An allocation of funding through this grant will expand the weatherization services that PCCDC is able to provide and possibly work with another agency if one is identified. Funding may also be used to identify a qualified contractor to evaluate weatherization needs once an application is approved by the District. All approved weatherization activities must be energy heat-related and limited to the following homes:

- Homes with an uncertified wood burning device only if the uncertified device will be replaced with a clean home heating (certified wood or pellet, kerosene, propane, or heat pump) device; or
- Homes with a certified wood or pellet stove.

Homes with existing non-wood heating will not be eligible for weatherization. The District estimates providing weatherization for 42 homes over the 5-year period at a cost of \$8,000 per home. Total funding requested for this program element is \$336,000.

Program Element 8: Marketing/Education Campaign

With limited resources and expertise, the District has been challenged to reach all residents with messaging that is impactful and behavior changing. With grant funds, potential marketing agencies will be evaluated and procured for 3 years. Community based social marketing will be considered as it has been shown to effectively change behavior. Besides reaching residents in the Nonattainment Area to apply for the change-out program, outreach would include best burning practices and targeted outreach to the local medical community. Data presented at the 2020 EPA Residential Woodsmoke Workshop indicates the importance of information delivered from a trusted source, such as a primary doctor or pulmonologist. However, data shows that 83% of those surveyed are never informed by a doctor of air quality impacts on personal health (Gillian Gawne-Mittelstaedt, Tribal Healthy Homes Network, March 2019).

Other Targeted Airshed Grant recipients have had success reaching students with educational programs and using these students to carry important air quality messaging back to families. Implementing an educational outreach component is expected to reduce emissions from residential wood smoke (one grantee estimated 6% reduction in emissions through the implementation of an extensive education outreach program). This 3-year campaign would involve all three primary education schools in Portola. Partnerships with Feather River College and University of Nevada, Reno, will be investigated for collaborating on curriculum and training local educators, as well as facilitating in-class programs on air quality and health impacts. Local medical professionals may also partner in this endeavor. Part of a successful primary curriculum is the use of handheld, low-cost sensors. Other grantees have successfully used Wynd portable sensors. Cost for approximately 100 sensors is \$10,000. This would allow up to three classrooms to use them at any given time.

For both the marketing and education outreach campaigns to be successful, the programs will need funding of \$200,000.

Program Element 9: Home Safety Campaign

According to the National Fire Protection Association (NFPA), home heating equipment is a leading cause of house fires in the U.S. An average of 52,000 fires per year result in almost 500 civilian deaths and \$1B in property damage. The local fire department, Eastern Plumas Rural Fire Protection District, is interested in partnering with the District to install smoke alarms and CO detectors in homes within the Nonattainment Area. The fire chief, captain and other staff are considered expert voices within the community. This visit to homes is an additional educational opportunity from another voice in the community. In addition to installing smoke alarms and CO detectors, the fire department will educate residents in the dangers of burning wet wood, which leads to creosote buildup and potentially flue fires. Dampening down overnight also decreases the temperature in the flue, leading to excess creosote. Changing these behaviors will decrease smoke emitting from the chimney, as well as keeping the home fire safe. Funds would be expended over a 5-year period for this project to improve safety in 400 units. Each home may receive up to 3 10-year smoke alarms and one CO detector (this is the protocol used by the American Red Cross for the “Sound the

Alarm” campaign). Total funds required for this program element is \$70,000.

Program Element 10: Residential Yard Waste Collection Program

The District regulates open burning through a combination of the California Health & Safety Code, [Section 41800](#) et seq, [Title 17](#) of the California Code of Regulations, [Regulation III](#) of the Northern Sierra Air Quality Management District and various local ordinances. The City of Portola passed Ordinance No. 354 in 2019 banning all residential open burning within City limits. There are 900 households in the [City of Portola according to the U.S. Census](#). The overwhelming majority of households have a need to remove green waste (yard waste) from their properties for defensible space to protect property from fire danger. In order for the open burn ban to be effective, reducing emissions from open burning, households need financial incentives. Funds from the 2018 Targeted Airshed grant of just over \$90,000 will be used to pay for curbside green waste pick up by the local waste management company, Intermountain Disposal, Inc. (IMD) monthly from April through October. Funds are also used to provide a month of yard waste drop off at the IMD transfer station in Delleker each spring. Providing an alternative to the open burning of yard waste for residents in the Nonattainment Area is crucial since the District committed to adopting an open burning rule prohibiting open burning during the months of the strongest inversions and during peak residential wood heating (State Implementation Plan).

The District is working with the Portola FireWise Committee and the City of Portola (and potentially other community groups) to establish a program for collecting large items, like branches and tree trunks, and large amounts of yard waste. Containers (20 foot), with locking lids, will be placed in several neighborhoods where residents will be able to dispose of large yard waste free of charge in both the spring and fall in order to accomplish the goal of the FireWise Committee to provide a buffer around Portola and individual homes within the City to be fire safe. The District will work with the City of Portola and IMD to transport green waste to a shredding facility and/or a biomass facility.

The City of Portola is surrounded by the Plumas National Forest and Plumas County has constantly dealt with the issue of disposing of green waste. For the last few years, a biomass boiler has operated in proximity to the Nonattainment Area. The District was able to negotiate transport of green waste from the Nonattainment Area at no charge, as long as an entity was able to provide transport to the facility. That facility is now shut down. Residents of the non-attainment area must pay a fee to deposit green waste at a transfer station or a community collection site. The green waste is then either transported by IMD to a biomass facility (which is quite a distance to transport since the local option is no longer available) or transported out of state in the solid waste stream. Because of the fee, residents are prone to illegally burn green waste or illegally dump in the surrounding forest. The District will investigate a partnership with IMD to accept green waste at no fee or a reduced fee. This will greatly decrease emissions from illegal open burning within the City of Portola as well as legal open burning in the rest of the Nonattainment Area. Grant money may be used for processing equipment and transportation costs. The estimated total cost to provide this program element is \$243,601.

Program Element 11: Enforcement Coordinator (0.5 FTE)

In 2019, the City of Portola adopted Ordinance No. 354 Chapter 15.10 – Woodstove and Fireplace Ordinance. This ordinance prohibits using wood burning heaters, wood burning fireplaces, wood-fired fire pits and wood-fired cookstoves during stagnant conditions. EPA certified wood heating devices are exempt from the wood burning curtailment. The District determines when curtailments are necessary, based on expected average daily PM2.5 levels of 30 micrograms/cubic meter or higher, and is tasked with enforcing the compliance of the ordinance. The ordinance is in effect four months of the year – November, December, January, and February. Since November 2017, a voluntary curtailment has been in place to inform the public of stagnant conditions through a health advisory. The curtailment program is known as “Clear the Air; Check Before You Light”. An EPA school flag program has been established in conjunction with this curtailment program with the local charter school. Expansion to the local public elementary school and junior/senior high school is expected within the next year. Residents are asked to refrain from any wood burning, if possible. However, the Ordinance (and the State Implementation Plan) requires extending the 4 months of mandatory curtailment to 8 months and requires a mandatory curtailment at 20 micrograms/cubic meter, daily average, if attainment is not achieved by the end of 2021.

The District does not currently have the resources for this type of enforcement. Grant funds will be used to extend the Enforcement Coordinator position another 3 years. This position is originally funded through the 2018 Targeted Airshed Grant. This coordinator will utilize the certified stove database and VEE inspection techniques to determine compliance. Opacity greater than 20% emitting from a chimney, excluding 20 minutes of start-up, will be considered a violation. The Enforcement Coordinator will enforce the City of Portola’s open burning rules, as well. This position requires a half-time employee. The hourly rate is expected to be approximately \$25/hour. At 20 hours per week, over 3 years, this program element requires \$75,000 in funding.

ii. Description of ongoing, significant reductions of PM2.5 emissions

Reliable access to seasoned wood in the Nonattainment Area has been a long-standing problem. Therefore, the largest emission reductions are expected from the Seasoned Wood Program. Outreach and education is also estimated to significantly reduce PM2.5 emissions. Replacing 100 wood stoves with more efficient heating devices will greatly decrease PM2.5 emissions from indoor wood burning. These new devices are expected to last 20-30 years resulting in a decrease of at least 126 tons of PM2.5 over the lifetime of the installations. Additional PM2.5 reductions from the other program elements will further decrease emissions necessary to achieve attainment for the Plumas County PM2.5 Nonattainment Area. All program elements combined are estimated to reduce PM2.5 emissions in the Nonattainment Area by 59.9 tons annually or 299.4 tons over five years. Project will also achieve innovative emission reductions by promoting new heating options, heat pumps, in the community.

iii. Analysis of PM2.5 emissions inventory in the Nonattainment Area

The proposal focuses on directly emitted PM_{2.5} from wood burning, because it is the most important source to target in order to attain the standards. Wood burning is responsible for 80 percent of the PM_{2.5} mass annually and 90 percent on an average exceedance day. All other sources combined contribute about 3 ug/m³ of PM_{2.5} annually. Cleaner burning stoves will significantly reduce emission of other pollutants including CO, formaldehyde, sulfur dioxide and various gases such as nitrogen oxides that can irritate the lungs. Equally important will be the reduction in emissions of hazardous air pollutants, which include carcinogens and others that are associated with respiratory, cardiovascular, neurological, and numerous other non-cancer causing health effects.

The PMF model identified “Refuse Burning” as one of the sources contributing to PM_{2.5} mass. Even though the source contributes very little PM_{2.5} mass, it may include toxic pollutants. The most likely sources of refuse burning are non-wood items burned in wood stoves or open burning piles. Plastic, foam, and the colored ink on magazines and boxes produce harmful chemicals when burned and also damage the wood-burning appliance. The education campaign will highlight the danger of burning non-wood items to the individual and the community as a whole.

iv. Strategy for achieving greatest amount of emission reductions possible

Switching out fireplaces and uncertified wood stoves will achieve the greatest PM_{2.5} reductions. Repairing/replacing older (15 years or older) certified wood stoves will achieve additional emission reductions. Eliminating outdoor open burning further decreases PM_{2.5}. Public outreach and education is critical for assisting residents to operate wood burning devices to achieve the maximum emission reductions possible.

v. Support of EPA’s Strategic Plan

EPA’s strategic plan has a goal to meet statutory requirements. The program elements in this proposal will assist the EPA in that these program elements assist the District in meeting SIP requirements by implementing the Portola Fine Particulate Matter Attainment Plan (Plan). The Plan includes; emission inventory of PM emission sources, an attainment demonstration, a reasonable further progress demonstration including milestones, an assessment of reasonable available control measures, motor vehicle transportation budgets and identification of contingency measures – needed if the area fails to meet the progress milestones or attainment by the attainment date. The plan is required to show linear progress towards reaching attainment by 2021. Milestone years of 2019 and 2022 have been set by the EPA and rely heavily upon a phased-in schedule to replace non-certified stoves with certified devices. Between 2021 and 2025, the District plans to change out between 100 stoves with the 2020 Targeted Airshed Grant. It is expected that between 600-900 stoves would be changed out using previous Targeted Airshed Grants. The District has committed to tracking, quantifying and reporting to the EPA progress towards attainment annually. The first report was submitted on July 10, 2017. Additionally, implementing these program elements will result in real emission reductions, per EPA’s Strategic Plan.

c. Community Benefits, Engagement and Partnerships

The District has been and will continue to make a concentrated effort to enlist participation from all residents in the Nonattainment Area, making sure that low-

income residents are not excluded from any funds. Not only will the owners of the older stoves benefit by upgrading to the newer stoves, all of the residents of the PM2.5 Nonattainment Area will benefit from significant improvements in air quality. The most current [ACS online census data for 2018](#) shows approximately 900 households in Portola. The median household income is \$41,053 and unemployment is high. There are approximately 900 households in the City of Portola. Grant funding is critical to assist this low-income community to replace old wood stoves and fireplaces, decrease PM2.5 emissions and improve public health. Portola and much of the surrounding Nonattainment Area is a designated [AB1550 low-income community](#).

Residents who participate in the Wood Stove Change-out Program will also benefit from a public education follow-up visit by the Burnwise Coordinator and a voucher for chimney sweep services. The Spanish-speaking community will continue to be served through a translator currently working with the District (current funding is supplied through the 2015 Targeted Airshed Grant).

The District has established partnerships with the United States Department of Agriculture (USDA), the United States Department of Energy (DOE), and the Low Income Home Energy Assistance Program (LIHEAP) to assist very low-income residents with residential wood stove replacements. The District will continue to partner with the local wood stove retailers and chimney sweeps. The retailers and chimney sweeps will assist in the outreach and marketing of the project, as well as the installation and maintenance of certified appliances and the proper removal and demolition of uncertified appliances.

The City of Portola will continue to be an active partner throughout the project. The City will continue to enforce a City ordinance as a change-of-ownership requirement that when a home is sold, all wood burning appliances must be EPA Phase II Certified, as well as any newly installed wood burning appliance. The City or Plumas County or the State will inspect new installations of wood stoves as required. The City will actively promote the change-out project during City Council Meetings and participate in community events. The District will develop a stronger partnership with the local fire department and local schools through this grant period.

Finally, the District will partner with additional groups to enhance the outreach of the project. These groups include the Hearth, Patio and Barbeque Association (HPBA), the local waste management agency, contractors, schools, local businesses, social services groups, health and medical care organizations, fire departments, home builders and remodelers, realtors/property managers, local opinion leaders, media representatives, social service groups, and others who can reach large numbers of people and may share its goal of improved air quality and public health.

All residents within the Nonattainment Area will benefit from a steady supply of seasoned firewood that will be supplied through the seasoned wood program. Property and individuals in the Nonattainment Area will be safer and emit less emissions as a result of the home safety program. Residents within the City of Portola will be eligible for curbside collection of yard waste, free yard waste drop off each spring, and community green waste collections, resulting in a reduction of

emissions from open burning and relieving some of the financial burden imposed by the open burn ban. Residents within the City of Portola will benefit from the enforcement of the City of Portola's adopted mandatory wood burning curtailment of uncertified stoves. And all school families will benefit through the education campaign by becoming more aware of air quality and health issues.

d. Project Sustainability

The District believes that emission reductions will continue past the final year of the grant when considering each program element. Removing high emission heating devices permanently reduces emissions from these very outdated appliances. Replacing high emission heating devices with lower emitting devices that (on average) have a useful life of 20 years will ensure the continuing reductions. The District believes that the once the seasoned wood program has been established, it will continue to be maintained and utilized by the City, agency or non-profit group. The education provided by the Burnwise Coordinator and the education program will remain with the families served. Smoke alarms installed through the home safety program will last for 10 years. Wood sheds with weather-proof roofing will last a homeowner many years. Once weatherization is provided, this will decrease the need for heating in homes that have been better insulated for the lifetime of the home. Once residents have participated in the residential yard waste programs, it is expected they will continue to participate and emission reductions from the open burning of green waste will continue well into the future. Additionally, the Northern Sierra Air Quality Management District has developed and written the Portola PM2.5 Attainment Plan which requires commitments to continue efforts to reduce emissions after the EPA funding for this project has ended.

e. Environmental Results

Table 2 summarizes outputs, outcomes, and performance measures for each activity. The assumptions used in estimating emission reductions are described in detail in Attachment B, Emission Reductions Calculations. Progress in air quality will be evaluated on an ongoing basis, and, after each calendar year, a thorough evaluation will be conducted using PM2.5 FRM, PM2.5 BAM, PM2.5 speciated data, and meteorological data, with a special emphasis on trends in woodburning marker data (levoglucosan, mannosan, and galactosan).

Table 2. Environmental results

Activity	Outputs	Outcomes	Performance Measures
Total	Total emission reductions from all outputs below. See the Emission Calculations attachment on the methodology for calculating estimated emission reductions.	Annual Emission Reductions: <ul style="list-style-type: none"> • 58.8 tons of PM2.5 • 0.03 tons of SO2 • 0.3 tons of NOx • 29.9 tons of CO Emission Reductions Over 5 Years: <ul style="list-style-type: none"> • 293.8 tons of PM2.5 • 0.1 tons of SO2 • 1.4 tons of NOx • 149.4 tons of CO 	
Replace 80 wood stoves	30 woodstoves are changed out for NSPS Step 2 certified woodstoves 30 woodstoves are changed out for Step 2 pellet stoves. 20 woodstoves are changed out for non-wood heating devices.	Annual Emission Reductions: <ul style="list-style-type: none"> • 5.1 tons of PM2.5 • 0.03 tons of SO2 • 0.3 tons of NOx • 29.9 tons of CO Emission Reductions Over Device Lifetime (20 Years): <ul style="list-style-type: none"> • 102.1 tons of PM2.5 • 0.6 tons of SO2 • 5.8 tons of NOx • 597.7 tons of CO 	Number of devices replaced
Burnwise Coordinator/ Education and Outreach Elements 2, 8 and 9	Provide outreach and education on proper burning techniques of woodstoves	Assume 2/3 of households uses wet wood and 1/3 underloads. Reduce wet wood burning and under loading by 50%. <ul style="list-style-type: none"> • 21.0 tons of PM2.5/Year • 105 tons of PM2.5/5 Years 	Reduction in visible smoke upon opacity reading
Wood Shed Program	Build 70 woodsheds for residents who don't have a proper wood storage space. Average woodshed lasts 10 years.	Reduce burning wet wood 75% in 70 households <ul style="list-style-type: none"> • 3.3 tons of PM2.5/Year • 33 tons of PM2.5/10 Years 	Number of sheds built
Seasoned Wood Program	Reduce the number of residents using wet wood by 70%.	Reduce PM2.5 emissions 70%: <ul style="list-style-type: none"> • 26.1 tons of PM2.5 / Year • 130.76 tons of PM2.5 / 5 Years 	Amount of dry wood provided/Families served
Chimney Sweep Voucher	Sweep 600 chimneys Provide outreach and education on proper stove operation and maintenance	Reduce PM2.5 emissions 20% <ul style="list-style-type: none"> • 1.9 tons of PM2.5 / Year • 9.3 tons of PM2.5 / 5 Years 	Number of chimneys swept
Heat Weatherization Conservation	Conduct in-home inspection and energy audits and weatherize 42 homes	Reduce wood use 30% <ul style="list-style-type: none"> • 0.2 tons of PM2.5 / Year • 3.9 tons of PM2.5 / 20 Years 	Number of homes weatherized for heat conservation
Home Safety Campaign	Install 1,200 smoke alarms and 400 CO detectors	Reduce fire and health hazard Improve burning efficiency	Number of alarms and detectors installed
Green Waste Collection	Collect yard waste from 900 households	Annual Emission Reductions: <ul style="list-style-type: none"> • 0.02 tons of PM2.5/Year • Help public understand that all burning is harmful to their health 	Amount of green waste collected
Mandatory Woodburning Curtailment/ Enforcement Coordinator	Enforce woodburning curtailment and open burning Ensure that no visible smoke emitted from chimneys and no open burning is conducted	Enforce 75% compliance on curtailment days <ul style="list-style-type: none"> • 1.1 tons of PM2.5 / Year • 5.7 tons of PM2.5 / 5 Years 	Number of violations issued

The District fully expects to complete the expenditure of all EPA Grant funds awarded within five years of receipt. Table 3 illustrates the approximate timeline

Table 3. Approximate Project Timeline September 1, 2021 to August 30, 2026

	2021	2022	2023	2024	2025	2026
Wood Stove Change-out Program Equipment						
Burnwise Coordinator						
Wood Shed Program						
Seasoned Wood Program						
Mandatory Curtailment Program						
Chimney Sweep Vouchers						
Heat Weatherization Conservation Activities						
Marketing/Education Campaigns						
Home Safety Campaign						
Residential Yard Waste Program						
Enforcement Coordinator						
Grant Reporting and Oversight						

f. Programmatic Capability and Past Performance

The District has successfully changed out approximately 400 stoves within the Nonattainment Area in the past 4 years with funding from the EPA 2015 Targeted Airshed Grant, as well as implemented a voluntary wood burning curtailment program and participated in a variety of public outreach events. The District has maintained partnerships with local stove installers, chimney sweeps, the City of Portola, and various agencies to further the goal of decreasing PM2.5 in the Nonattainment Area. The District is working closely with Portola city officials, Plumas County agencies, local community organizations and state and federal government organizations to reach attainment by 2021. The 2020 annual design value of 13.1 ug/m³ is a substantial improvement over the 2015 design of 15.0 ug/m³. This is evidence that the measures implemented under the 2015 Targeted Airshed Grant are beginning to show improvement in air quality. The District will use the same procedures, forms and tracking techniques used in the current Targeted Airshed Grant for the Wood Stove Change-Out Program element. The principal and responsible parties of the District assigned to the project are:

- Executive Director, Gretchen Bennitt
- Air Pollution Specialist III, Julie Ruiz
- Deputy Executive Director, Joe Fish
- Accounting Clerk, Dawn Lunsford
- Air Pollution Specialist III, Sam Longmire
- Air Pollution Specialist I, Melissa Klundby

Julie Ruiz has been the Program Coordinator for the Portola program. Melissa Klundby has been the Burnwise Coordinator since August 2019. Gretchen Bennitt and Joe Fish have been processing invoices, developing disbursement requests and, along with Julie Ruiz, have been producing quarterly progress reports to the EPA. In addition to the Portola wood stove change out program, Sam Longmire is currently administering a woodstove change-out program for all three District counties using California Climate Investments funding. To date, 103 stoves have

been changed out. In addition, the District has successfully administered \$2,224,000 of incentive funds from the ARB Lower Emission School Bus Program and \$2,281,808 from the Carl Moyer program.

ARB staff will assist with annual verification of progress including estimating reductions in emissions and PM_{2.5} concentrations. Kasia Turkiewicz, Air Resources Engineer, will oversee the project on behalf of ARB to ensure that funds are passed to the District in a timely manner. Kasia has over 20 years of experience evaluating air quality, meteorological, and emissions data to better understand the nature and causes of elevated PM concentrations. For the past four years she has managed CARB's Woodsmoke Reduction Program funded with \$8M from the Greenhouse Gas Reduction Fund. With respect to grant management, ARB has accepted several EPA grants in the past three years, including: Section 105 Air Pollution Control Financial Assistance Grant (Grant Number A-00901315), PM 2.5 Monitoring Network Grant (Grant Number PM-98960901), and the State Clean Diesel Grant (Grant Number DS-00T87901). Each of these recent grants represents a continuation of a multi-year, multi-million-dollar grant from EPA. For each grant, ARB has completed all grant agreement terms and completed (or expects to complete) the approved work plans to expeditiously apply funds to shared EPA and ARB air quality goals. ARB has documented progress on these grants through submittal of required reports and inputting collected data into state and national databases, as appropriate per the grant terms.

Additionally, ARB has extensive experience implementing multi-million-dollar incentives programs, such as the Lower-Emission School Bus Program, the Carl Moyer Memorial Air Quality Standards Attainment (Moyer) Program, Goods Movement Emission Reduction (Goods Movement) Program, the Air Quality Improvement Program (AQIP), and the Providing Loan Assistance for California Equipment (PLACE) Program. ARB's experience in these programs has established solid working relationships with air districts as well as engine/equipment and retrofit manufacturers and vendors necessary for successfully implementing the proposed project.

g. Budget Narrative and Voluntary Cost Share/Match and Leveraged Funds

Table 4 illustrates a proposed budget. Due to rounding, numbers in Table 4 may not add up precisely to the indicated total amount. The District will request \$40,000 from the District Board of Directors to be utilized to leverage this grant. This funding will be allocated from the annual AB2766 DMV surcharge fund for Plumas County. This can be allocated by a quorum vote of the six board of directors during a regularly scheduled air district board meeting. The District Board of Directors has approved leveraging of these funds and this amount in the past for the 2015 and 2018 Targeted Airshed Grants. These funds will be used to augment equipment costs.

Table 4. Proposed Budget for Portola PM2.5 Nonattainment Area Airshed Project

Line Item & Itemized Cost	EPA Funding	Non-Federal Cost Share
CARB Personnel		
Project Manager @59.87/hr X 6hrs X 52 weeks X 5 Years	\$93,397	
TOTAL CARB PERSONNEL	\$93,397	\$0
CARB Fringe Benefits @34.98%		
TOTAL CARB FRINGE BENEFITS	\$32,670	\$0
CARB Travel		
Milage for PM: 300 miles/trip @ \$0.58/mi x 10 trips	\$1,740	
Conference or workshop (1 trip)	\$1,700	
TOTAL CARB TRAVEL	\$3,440	\$0
OTHER - SUBAWARD:		
Equipment (wood stove change-out program)*		
electric heat pump systems	\$135,000	
pellet	\$126,000	
propane	\$31,500	
kerosene	\$13,500	
wood	\$93,000	\$40,000
MOU with the City of Portola for stove destruction	\$8,896	
Other (moisture meters, thermometers, CO/Smoke detectors, etc.)	\$37,997	
TOTAL EQUIPMENT	\$445,893	\$40,000
Program Elements		
Burnwise Coordinator	\$150,000	
Wood Shed Program	\$60,000	
Seasoned Wood Program	\$350,000	
Mandatory Curtailment Program	\$88,000	
Chimney Sweep Vouchers	\$150,000	
Heat Weatherization Conservation Activities	\$336,000	
Marketing/Education Campaigns	\$200,000	
Home Safety Campaign	\$70,000	
Residential Yard Waste Program	\$243,601	
Enforcement Coordinator	\$75,000	
TOTAL PROGRAM ELEMENTS	\$1,722,601	\$0
District Personnel		
District Project Manager	\$111,198	
Project Coordinator	\$132,480	
Business Manager	\$47,214	
Project Staff #1	\$33,738	
Project Staff #2	\$38,803	
Fringe Benefits (27%)	\$98,127	
TOTAL DISTRICT PERSONNEL	\$461,560	\$0
District Travel and Public Outreach		
Public Outreach and Education	\$22,505	
Travel (Conference or workshop for two staff)	\$3,408	
TOTAL DISTRICT TRAVEL AND PUBLIC OUTREACH	\$25,913	\$0
TOTAL OTHER - SUBAWARD	\$2,655,967	
CARB Indirect Charges @45.21% of (Personnel + Fringe)		
TOTAL CARB INDIRECT	\$56,995	\$0
TOTAL FUNDING	\$2,842,469	\$40,000
TOTAL PROJECT COST[3]		\$2,882,469
Other Leveraged Funds[4]		\$40,000

* Cost share funds include \$40,000 District funds from local fees.
 Due to rounding, numbers in Table 4 may not add up precisely to the indicated total amount.

**Residential Wood Stove Changeout Project
in the Plumas County PM2.5 Nonattainment Area**

January 29, 2023

California Air Resources Board
1001 I Street, P.O. Box 2815
Sacramento, CA 95812

Work plan prepared in coordination with:
Northern Sierra Air Quality Management District
200 Litton Drive, Suite 320
Grass Valley, CA 95945

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1. PROJECT SUMMARY

The Northern Sierra Air Quality Management District (District) is implementing a residential wood stove changeout program (Program) to improve air quality in the Portola area and help the area attain PM2.5 standards. In January 2015, the U.S. Environmental Protection Agency (U.S. EPA or EPA) designated the City of Portola (City) and surrounding parts of Plumas County, California, as a nonattainment area for the annual PM2.5 National Ambient Air Quality Standard (NAAQS). The objective of this project is to reduce pollution levels so the Portola area can attain the PM2.5 NAAQS. U.S. EPA grant funds will be used to replace older wood stoves in the community with cleaner-burning and more energy efficient home heating and to help residents establish good habits for device operation and maintenance and wood storage.

The District will use the grant money to implement a financial incentive program to encourage owners of older uncertified stoves within the nonattainment area to switch to cleaner-burning and more energy efficient devices. To qualify for this program, the uncertified stove must be operable and currently in use in the residence. At the start of the Program estimated 623 households within the City of Portola and 616 households outside of the city limits, but within the nonattainment boundary, used an uncertified wood stove as either a primary or secondary heating source. Table 1 shows the data used to estimate the number of households using uncertified stoves.

Table 1. Estimating the number of stoves subject to changeout

Item	Data Source	Percent (%)	Nonattainment Area	City of Portola
Households	Census ¹	--	2723	1369
Households using wood stoves	District Survey	70	1906	958
Households using uncertified wood stoves	EPA Burn Wise ²	65	1239	623

From 2016 through early 2024, the District will offer financial incentives for replacing old wood and pellet burning stoves with cleaner-burning and more energy efficient home heating devices. As of November 1, 2021, incentive levels for space heating devices were modified to reflect current pricing. Table 2 lists original and revised incentive levels.

¹ US Census Bureau's 2009-2013 5-Year American Community Survey (2015)

² <http://www2.epa.gov/burnwise>

Table 2. Greater Portola Woodstove Change-out Program incentive levels.

Replacement Device	Incentive Level (Prior to November 2021)			Incentive Level (Starting November 2021)	
	Zone 1	Zone 2		Zone 1	Zone 2
		Standard Incentive	Low Income		
Wood stove	\$3,500	\$1,500	\$3,500	\$5,000	\$3,500
Pellet Stove, Propane, or Kerosene	\$4,500	\$3,000	\$4,500	\$6,500	\$4,500
Heat Pump	\$10,700	\$10,700	\$13,500	\$13,500	\$13,500

Zone boundaries for the purpose of the Woodstove Change-out Program will be drawn as follows:

1. Zone 1 will encompass the Portola Sphere of Influence as well as communities of Delleker, Iron Horse, and the southern edge of Lake Davis. These communities will be included in Zone 1 due to their proximity to Portola and their population densities. City of Portola will be considered a subset of Zone 1 and labeled as Zone 1.A. Zone 1.A will be subject to the same incentive levels as Zone 1, but households will be eligible for a heat pump and a certified wood stove combo providing their woodburning device is registered with the District for mandatory woodburning curtailment.
2. The remaining portion of Portola PM2.5 Nonattainment Area will be considered Zone 2. Zone 2 is now subject to uniform incentive levels, regardless of income level. Based on the implementation of the Greater Portola Woodstove Change-out Program (Program) so far, few households in Zone 2 qualified for higher incentives based on their income. Offering uniform incentives across Zone 2 will simplify the review and approval process.

2. PROGRAM COMPONENTS

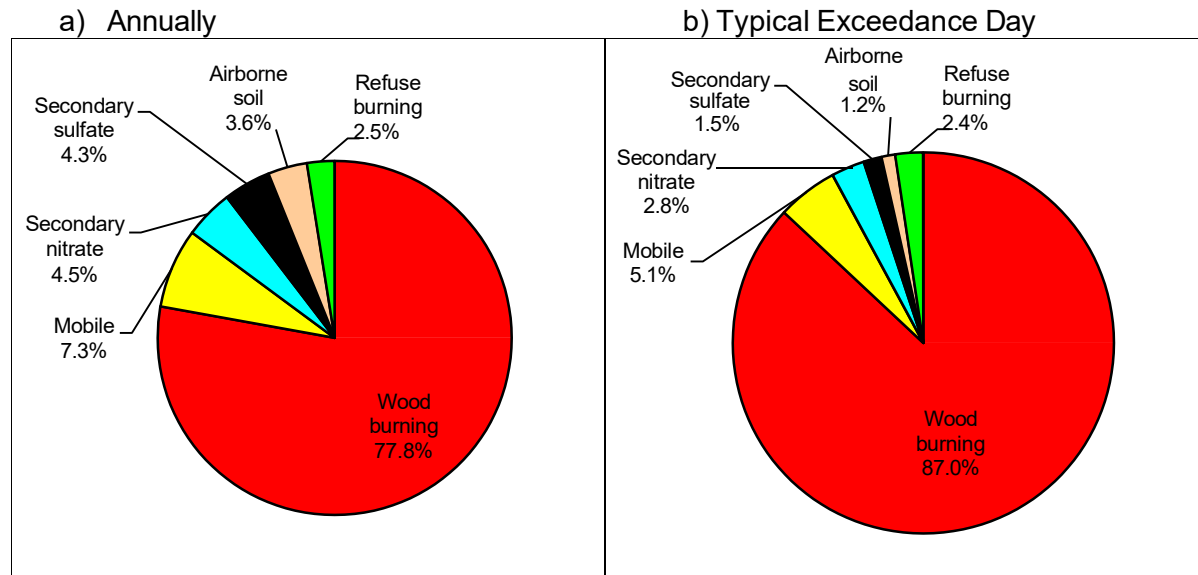
There is strong evidence that changeout programs are a cost effective way to significantly improve air quality in communities where the use of woodstoves is widespread. This project will help the area attain both the annual and the 24-hour PM2.5 NAAQS.

a. Environmental Results

The impact of a wood stove changeout on PM2.5 concentrations was estimated by Air Resources Board (ARB) staff using a Positive Matrix Factorization (PMF) model and a “PM2.5 Benefit Calculator” (Calculator), a spreadsheet-based calculator developed by ARB staff (see Attachment C). PMF was used to identify PM2.5 sources in the Portola nonattainment area and determine their contribution to both the annual and 24-hr

design values. The PMF model identified wood burning as a major contributor to PM2.5, responsible for 78 percent of the PM2.5 mass annually and 87 percent on exceedance days (Figure 1). Since all other sources combined contribute only a very small portion of the total PM2.5, changes in emissions contributing to these lesser sources would have a negligible impact on the total PM2.5 mass.

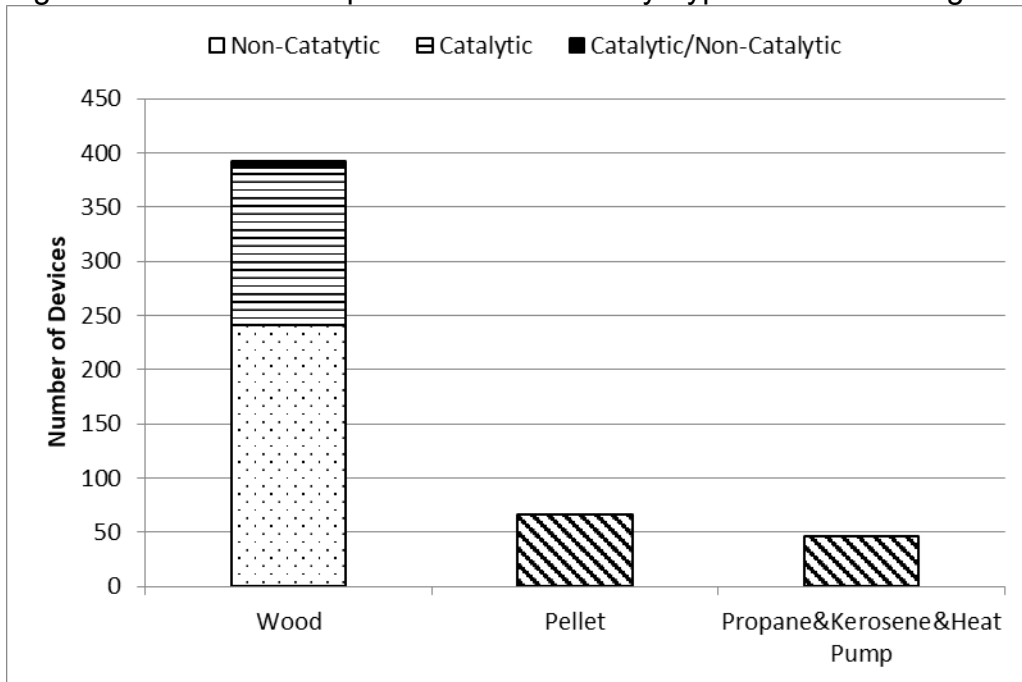
Figure 1. Average Source Contribution in Portola Based on 2011-2014 Data



The PMF results were built into the Calculator spreadsheet to estimate the impact on PM2.5 concentrations of replacing the older wood stoves with newer, EPA-certified appliances. The Calculator was used to estimate PM2.5 mass from wood burning by applying a percent contribution derived from the PMF model to quarterly average PM2.5 concentrations. The total PM2.5 contribution from wood burning was parsed out between EPA-certified and uncertified stoves. The PM2.5 contribution from uncertified stoves was further parsed out into uncertified stoves that will remain in operation, and those that will be upgraded to newer EPA-certified stoves. The PM2.5 mass generated by the upgraded stoves was estimated by applying a 60 percent reduction in emissions and factoring in the improvement in stove efficiency, consistent with the EPA-developed emissions calculator. Estimated Portola PM2.5 concentrations were then calculated as the sum of wood burning contributions from EPA-certified stoves currently in operation, upgraded stoves, remaining uncertified stoves, and other minor source contributions resolved by PMF analyses.

The original workplan target assumed that between 2016 and 2022, 600 uncertified stoves will be replaced with Phase II certified stoves with an average tested emission rate of 7.5 grams/hour (g/hr). By October 18, 2022, 506 devices were replaced. The replacement devices were significantly cleaner than the original estimate and included 393 wood stoves with average emission rates of 2.4 g/hr, 67 pellet stoves with an average emission rate of 1.3 g/hr, 39 propane or kerosene stoves, and 7 heat pumps. Figure 2 illustrates the devices replaced through October 18, 2022, grouped by the device type.

Figure 2. Number of Replacement Devices by Type Installed through 10/18/2022



Data from PM2.5 monitors located in the highest population concentration area of the City of Portola are used to track progress towards meeting air pollution reduction goals. The monitoring site includes a PM2.5 Beta Attenuation Monitor (BAM) Federal Equivalence Monitor (FEM), and a PM2.5 speciation sampler. PM2.5 FEM BAM data will be used to track progress towards attainment of the standard and to verify the impact of PM2.5 reductions on diurnal patterns. Once the project is implemented, PM2.5 concentrations during early morning and at night should decrease significantly. PM2.5 speciated data will be used to verify reductions in carbonaceous aerosols, a main component of wood burning, as well as wood burning markers including potassium and levoglucosan.

PM2.5 design values and emission reductions will be calculated annually to verify that the area is on track to meet air quality and emission reduction goals. The PM2.5 benefit calculator will be used to verify the relationship between the number of stoves changed out and PM2.5 concentrations and the U.S. EPA Burn Wise Calculator will be used to track reductions in emissions of PM2.5 as well as other pollutants associated with wood burning.

b. Environmental Justice

This project will improve the air quality for residents of the Portola PM2.5 nonattainment area. Most Portola residents would not be able to afford new EPA-certified stoves without some financial assistance and most would need funding adequate to cover 100 percent of a changeout cost. About 16 percent of the nonattainment area residents have household incomes less than \$15,000 and close to 50 percent below \$35,000. Portola's unemployment rate of 22.3 percent is well above the national and state averages. According to the U.S. census, about 20 percent of residents are over the age of 62 and more susceptible to adverse reactions from air pollution. The Plumas County Public Health Agency estimates that at least 200 of the City's residents are homebound and the majority of these are seniors.

Replacing old stoves in Portola PM2.5 nonattainment area will not only improve the overall air quality in the area, increasing health benefits for the entire community, but will also ensure that residents have safer and more efficient stoves. The District will partner with the United States Department of Agriculture (USDA), the United States Department of Energy (DOE), the Low Income Home Energy Assistance Program (LIHEAP), the Energy Conservation Investment Program (ECIP), and the local Portola Resource Center to identify eligible low income residents and assist them in applying for changeout incentives. The District will encourage all residents to consider switching to a non-wood appliance, but especially residents who are homebound or have limited mobility. The retailers and partner agencies will be asked to highlight the benefits of operating a non-wood appliance to all potential customers. The District will discuss non-wood fuel subsidies with agencies providing services to low income residents in the area.

c. Education and Outreach

The key to launching a successful wood stove changeout program will be the education and outreach to all residents of the nonattainment area. The District has already begun a public outreach campaign by hosting a wood stove workshop for Portola residents to educate them on proper burning techniques and the benefits of cleaner, more efficient wood stoves. The District also intensified the distribution of educational materials throughout the community. The District will continue promoting the project in the Portola PM2.5 nonattainment area using existing community contacts, libraries, schools, grocery and hardware stores, community resource groups, the faith community, and City of Portola and Plumas County officials and staff. Co-marketing the project with these organizations will be a key strategy for public education and participant recruitment. The District is actively recruiting peer-to-peer champions to help educate others within the community. The District will also prepare a simple presentation about the project that can be used for public talks. The District will rely heavily on the area's only local newspaper, the Portola Reporter, as a way of publicizing the project and educating the public about the advantages of cleaner burning hearth appliances. The District will use letters to the editor, news articles, ads, and advertising inserts. The District will also promote the project on the District's website and contact the local radio station to appear on a night-time talk show. The District will repeat this media campaign

throughout the five years of the program as needed.

The District plans to conduct a “Wood Stove Changeout Kick-Off” press conference to publicize the project in each year of the five year project. The District will invite an EPA spokesperson to these events to highlight the project’s national, regional, and local significance. Participating wood stove retailers will also be invited.

The District will supply its participating retailers with the EPA Burn Wise materials to be distributed with each new EPA-certified wood stove to emphasize the need to burn wood properly. Whenever possible, the District will also take advantage of opportunities from any of its participating retailers to obtain sponsored advertising.

The District will work with local wood stove retailers in the Portola area and Plumas County to discuss outreach and financial assistance strategies to encourage wood stove changeouts to ultimately reduce wood smoke in the area and lead to attainment of the air quality standards. The District will formally enlist retailers through a written agreement that will identify the EPA-certified wood stove retailer as a participant. The agreement will stipulate that they will accept the project vouchers, follow best practices in hearth appliance installation procedures, and attest that they will remove and properly dispose of, or otherwise permanently render inoperable, the older stoves. The retailer will agree to promote switching to non-wood appliances by highlighting their benefits to project participants. To further promote installation of non-wood appliances, the District will provide additional incentive, using District’s funding, of up to \$1,000 for a total of \$4,500 towards the purchase and installation of a non-wood heating appliance. The retailer will agree to train homeowners on proper appliance operation and acceptable fuels to maximize the emission reductions. Homeowners will be required to sign a form stating that they were trained to properly operate their new heating device. Verification of training will be required before payment will be issued to the retailer. Only qualified retailers with signed agreements will be eligible to participate in the project. Upon verification and approval, the District will submit final payment to the retailer. The participating retailers will also provide education to the new owner on the proper use of the new wood stove. The District will follow up with each owner with a customer satisfaction survey to assure that the wood stove is being used properly.

3. PROJECT OPERATION

The objective of this project is to achieve maximum air quality benefits through the use of the 2015 Targeted Air Shed Grant for the replacement of uncertified stoves with new, cleaner burning devices. The geographic area of the project is limited to the Portola PM2.5 nonattainment area.

a. Installation and Disposal

The District will issue vouchers to qualified homeowners. To qualify for a voucher, the homeowner will have to complete an application to replace an uncertified (pre-1992) stove with a new wood stove, pellet, kerosene, or propane gas stove. Applications will be available at participating retailers, at the District office and web site, as well as other

locations including City Hall, library, Portola Family Resource Center, Plumas Rural Services, and Veteran's Hall/Senior Center. Homeowners will have to agree to a number of requirements for participation. Applications for vouchers will be accepted on a first come, first served basis. The District will review the application to determine if the requirements have been met. Qualified applicants will receive a voucher. Eligible replacement options along with the maximum incentive amount are listed in Table 2. The installation must be coordinated and certified by the participating retailer. No do-it-yourself installations will be allowed under this program

Older stoves that are replaced through the program must be permanently removed from service and surrendered to the participating retailer. Participating retailers will be required to submit the Voucher Tracking Form to redeem each voucher. Each retailer will be responsible for submitting the form to the District along with before- and-after photos and validation that the old stove was removed from the residence.

The retailer will deliver the old stove to the City of Portola Public Works yard where a secured space for temporary storage will be designated. The City of Portola will be responsible for receiving the old stove from the retailer and rendering it inoperable within 90 days of the replacement by torching and/or drilling at least a two inch hole in the unit. The hole will be made in the corner or the side of the unit to ensure that the unit could not be replaced or repaired at a later date. The City will arrange with the recycling facility to have the old units transferred to the recycling facility. The City will be responsible for maintaining the records. Each unit delivered to the Public Works yard by the installer will be issued two tags bearing a serial number. One tag will be given to the installer upon delivery of the unit and the other one will be attached to the device. Once the device is destroyed the tag will be returned to the District along with the Verification of Destruction Form. The City employee will take a photograph of the old stove after it had been rendered inoperable and include it as part of the record. Upon verification and approval, the District will submit final payment to the retailer.

The participating retailers will also provide education to the new owner on the proper use of the new wood stove. The District will follow up with each owner with a customer satisfaction survey to assure that the wood stove is being used properly.

b. Fireplace as the Primary Source of Heat

Some residents in the area use fireplaces to heat their homes. They either never had a wood stove or their wood stove broke down and they don't have the money to buy a new one. Burning wood in a fireplace is a very inefficient way to heat home. It takes over three times as much wood to heat home using a fireplace compared to a wood stove. The District understands that verifying that a fireplace is used as the primary source of heat requires more extensive investigation and is prepared to take that step. The following aspects of home heating will be evaluated to determine if the fireplace is used as the primary heat source:

- The amount of wood stored for winter or receipts for wood purchase indicating that the amount of wood used is at least twice the average wood usage for the area; or
- Utility bills to verify less than 25 percent increase in fuel usage during winter.

The existing application form will be revised to allow an Applicant to self-certify using fireplace as a primary heat source. The District would be responsible for verifying this information and retaining documentation for justifying this type of change-out. The District will work closely with the Installer to determine the best replacement option. If the existing fireplace is structurally sound, the District may offer an incentive to be used towards purchase and installation of a fireplace insert utilizing wood, natural gas, propane, or electricity. However, if the fireplace is lacking structural integrity, the incentive could be used towards the purchase of a free-standing home heating device. In this case, the fireplace and chimney must be rendered permanently inoperable to prevent use of the fireplace. Verification of inoperability would be the responsibility of the District.

c. Certified Stoves in Need of Repair

Another problem that the District encountered while implementing this Program is that many certified wood stoves are not functioning properly. Some of these wood stoves are over 20 years old and their performance deteriorated over the years leading to increased emissions and reduced efficiency

ARB and the District propose to expand the Program to certified stoves at least 20 years old. Residents of the Nonattainment Area operating a certified stove at least 20 years old would qualify for the Program. If the repairs could be accomplished for less than \$1,000, the stove would be repaired. If the stove can't be repaired or the repairs exceed \$1,000, a new stove would be installed. Residents interested in participating would submit an application to the District. The District would work with the approved Installer to verify the condition of the device and provide estimate and recommend repair or replacement.

d. Promoting Propane, Pellet, and Kerosene Stoves

Lastly, it's very important to promote pellet, propane, and kerosene stoves as home heating options in the community. Unlike wood stoves, these devices are less prone to high emissions due to improper operation and lack of routine maintenance.

Furthermore, the District offers a non-wood replacement for any uncertified or certified stove at least 20 years old. These stoves are approaching their useful life-time and significant reductions could be achieved by replacing them with non-wood home heating devices (pellet, propane, or kerosene).

e. Heat Pumps Project

The best way to ensure permanent reductions in PM2.5 levels is to replace wood heating with other environmentally friendly alternatives. These include renewables such as solar and geothermal energy. A good alternative for home heating in the Portola Nonattainment Area are split ductless heat pumps, also called mini-splits. Split-ductless systems don't require ductwork, so they are practical for single-room additions or for homes without ducts. Mini splits also avoid the energy losses associated with ductwork, which can account for more than 30 percent of a home's energy consumption for space

conditioning.

Due to ongoing concerns about PM_{2.5} emissions from woodburning devices, combined with Portola households' reluctance to remove woodburning devices upon installation of a heat pump due to concerns about power outages and heat pump performance in extreme cold, removal of a certified wood burning device will not be required to qualify for a zero-emission electric heat pump installation. This provision will apply only to City of Portola households because they are subject to the City of Portola mandatory woodburning curtailment and they reside in the most densely populated area with highest woodsmoke emissions.

f. Education and Outreach Coordinator

Generally, emissions from a new appliance are much lower compared to the old wood burning device. However, emission reductions depend considerably on selection of fuel and user behavior. Certified wood stoves are highly sensitive to wet wood due to limited capacity of the air systems³. Households must use properly dried firewood in order to achieve optimal emission reductions. Burning wet wood in a certified stove can increase PM_{2.5} emissions fivefold. Adequate burning conditions, especially with regard to air flow and underload, can significantly reduce PM emissions. One of the most common mistakes, especially for long-term users of uncertified stoves who recently switched to certified stoves, is firing at part load (underloading). This can increase emissions two-fold.⁴ Unnecessary use of excess air also leads to a two- to three-fold increase in PM emissions due to reduced residence time within combustion region.⁵

The Program needs to have a full time education and outreach coordinator (Burnwise Coordinator) to ensure full expected emission reductions from new stoves. Burnwise Coordinator will be responsible for conducting follow-up visits, organizing and attending community outreach events, assisting with a voluntary, wood burning curtailment. This person will be the main point of contact in the community for any wood smoke related issues. The public will benefit by learning about air quality and how individual behaviors contribute to the problem.

Assuming an hourly rate of \$21.74 for 40 hours per week for forty five weeks for two years along with fringe benefits (27%), the District estimate \$99,395.28 for Burnwise Coordinator salary. The education and outreach is critical to ensure that optimal emission reductions are achieved from the Woodstove Change-out Program.

³ Kindbom, K., Mawdsley, I., Nielsen, O.-K., Saarinen, K., Jónsson, K., & Aasestad, K. (2018). Emission factors for SLCP emissions from residential wood combustion in the Nordic countries: Improved emission inventories of Short Lived Climate Pollutants (SLCP). Copenhagen. <https://doi.org/10.6027/TN2017-570>

⁴ Kindbom, K., Mawdsley, I., Nielsen, O.-K., Saarinen, K., Jónsson, K., & Aasestad, K. (2018). Emission factors for SLCP emissions from residential wood combustion in the Nordic countries: Improved emission inventories of Short Lived Climate Pollutants (SLCP). Copenhagen. <https://doi.org/10.6027/TN2017-570>

⁵ Fachinger, F., Drewnick, F., Giere, R., Borrmann, S., How the user can influence particulate emissions from residential wood and pellet stoves: Emission factors for different fuels and burning conditions, Atmospheric Environment 158 (2017)216-226.

g. Registration Database

Effective January 1, 2021, the District set restrictions on wood burning in the City of Portola. Households using certified wood stoves to heat their homes must register their devices with the District to qualify for an exemption from the burn ban. A database to register and track the homes that have installed certified wood-burning devices is needed. The District worked with an outside agency to establish a framework for registering the devices. The cost was \$10,000.

h. Chimney Sweep

Proper maintenance, including chimney sweeping, is necessary to optimal stove performance. Professional Chimney Sweeps are trained in the maintenance of stoves and chimneys, are able to evaluate if a stove is being properly used, and are trained and equipped to provide instruction and education to the stove user. Thus, for each home that receives a new wood stove, a visit from a chimney sweep is a perfect opportunity to evaluate if the stove is being used properly, and to provide follow-up instruction from a trusted expert.

As of February 9, 2022, the District has been offering chimney sweep vouchers to all City of Portola residential units or households operating U.S. EPA Phase II certified or cleaner wood burning stoves. If funds are available in the chimney sweep category under each TAG, each household will be eligible for annual chimney cleaning (one chimney sweep per calendar year) if one of the following categories apply:

- Household received a new wood burning device as part of the Greater Portola Woodstove Change-out Program (automatic eligibility).
- Household registered their existing Phase II or cleaner wood burning device with the District for the mandatory woodburning curtailment.

i. Wood Shed Project

The District will partner with Portola High School to conduct a Wood Shed Project in the community. The District will provide funding to the Portola High School Woodshop Class to build 50 wood sheds according the Burnwise wood shed specification, adapted if needed for the community. The school would auction these wood sheds at a community event with proceeds from the sale benefiting the High School Woodshop Class. Through this process, 50 households in the nonattainment area will receive a wood shed for storing their wood and additionally auction would serve as an opportunity to inform community about the benefits of burning seasoned wood. As of July 1, 2020, due to an increase in the price of wood and other materials, the allowance for building and delivering woodsheds to households was increased up to \$850 per woodshed. The amount assigned to the woodshed category under both TAGs will remain the same, but fewer woodsheds may be completed because of this increase. Table 2 provides more details on the cost and estimated number of woodsheds. To allow for greater firewood storage options, homeowner flexibility and ease of implementation the District will continue to pursue and encourage the use of less expensive wood storage options and materials, which may include cinderblocks, landscape timbers and wood pallets, among others..

j. Timeline

CARB would like to extend the project performance period for the 2015 Portola Targeted Airshed Fund, grant number 99T37501, until February 28, 2024, one year beyond the current end date. The summary below outlines reasons for the delay in implementing the Program and provides justification for seeking the no-cost time extension.

Shortage of Licensed Installers

The District had a difficult time finding licensed installers in the Portola area to go inside home and install the new cleaner burning devices. Portola is a remotely located, small town in Nevada County. The closest large city is Reno, Nevada, but Reno's installers will typically possess only a State of Nevada license. The District subsequently entered into agreements with two California-licensed wood stove installers. Unfortunately, during the pandemic, one installer had to implement very strict social distancing restrictions due to underlying health conditions which rendered him at high risk, leaving only one installer able to implement the woodstove change-outs. Finding a heat pump installer proved even more challenging. It was not until late 2020 when the District finally signed agreements with two heat pump installers and by the end of 2021 four heat pumps were installed as part of the Program.

Permitting

Portola is in a unique area where three separate agencies are responsible for permitting the installations of cleaner burning devices. Installations within the City limits are permitted by the City of Portola. Installations outside the City, but in traditional homes, are permitted by Plumas County. Installations in mobile homes are permitted by the State of California Department of Housing and Community Development. Due to the complex permitting landscape, it takes time to coordinate final inspections and submit paperwork for processing.

Installations in Mobile Homes

Many people in Portola live in mobile homes. Installing home heating devices in mobile homes proves to be challenging and time consuming. Stoves installed in mobile homes must be specifically approved for mobile homes. Residents often do not have paperwork necessary to process appropriate permits. For example, many homeowners could not locate their Mobile Home Decal numbers, which are necessary for obtaining a permit.

Residents Are Opposed to Government Intervention

Portola residents pride themselves on being self-sufficient and many are opposed to incentives, which they view as government handouts. Outreach and education efforts had to be restructured several times to promote the Program in the community and inform residents about health risks of air pollution.

High Staff Turnover at the District

Since the beginning of the Program, the lead staff at the District level has changed three times. Each new staff needed time for training and developing a relationship with the community.

Large Number of Rental Properties

A large fraction of homes in Portola are rentals with owners residing outside of the area. Installation in rental properties requires agreements and coordination among both parties, landlord and tenant. Since owners often do not reside in the area, it was difficult to inform them about the Program, particularly during the pandemic. It also takes longer to coordinate home visits and installation with tenants not as invested in improvements to the property.

Pandemic

In most recent years, 2020, 2021, and 2022, COVID-19 pandemic restrictions and supply chain disruptions resulted in significant delays to getting cleaner burning devices installed in Portola. The staff member in charge of the TAG at the time of pandemic was in a high-risk category and due to social distancing restrictions could not interact directly with the public. One of the installers was also in a high-risk category and elected not to work until he could get vaccinated. Permitting was also delayed because at the early stages of pandemic most agencies did not send inspectors into peoples' homes. Finally, unprecedented supply chain disruptions extended the wait times for stove delivery from weeks to months. Most of the disruptions have taken the form of skyrocketing prices, delays in shipments, and long or uncertain backorders. Installers reported that orders they expected from suppliers were outright cancelled or just not delivered. In some cases, the specific cleaner burning device the resident ordered was not available and they had to find an alternative device.

Table 3 shows the approximate project timeline for the remainder of the grant time.

Table 3. Approximate project timeline, 2022 to 2024

Task	2022	2023	2024
Establish and maintain partnership with retailers			
Educate and work with retailers throughout the project	X	X	
Education and outreach			
Promote and advertise the project in the community	X	X	
Maintain website with program information	X	X	
Maintain a network of key stake holders to promote project	X	X	
Host annual media "kick-off" event	X	X	
Facilitate wood stove changeout project			
Identify and target low income residents most affected by particulate matter pollution, including children and seniors	X	X	
Develop applications and procedures to collect and review applications	X		
Assist residents with applications	X	X	
Verify completed applications, issue vouchers	X	X	
Inspect and verify non-certified wood stoves are destroyed	X	X	
Verify tracking forms and vouchers, issue checks, record in database	X	X	X
Follow-up with each resident on proper wood stove use	X	X	X
Heat Pump Installations	X	X	X
Education and Outreach	X	X	X

Registration Database	X		
Wood Shed Project	X	X	
Chimney Sweep	X	X	
Enforcement			
Wood burning curtailment	X	X	X
Grant reporting and oversight	X	X	X
Compile reports on number of stoves changed out and associated cost	X	X	X
Verify projected reductions in ambient PM2.5 concentrations and emissions	X	X	X

k. Work Products and Benefits to the Public

The main benefit of this project will be upgrading uncertified stoves to cleaner burning and more energy efficient home heating devices and educating residents about the proper way to store and burn wood to minimize health and environmental impacts. To accomplish this goal, the District will develop the following:

- Educational materials, including advertising flyers, press releases, media conferences, presentations, and brochures;
- Written agreements with wood stove retailers outlining rules and responsibilities;
- Application process including eligibility criteria, participant evaluation, and notification forms;
- Voucher program and tracking log; and
- Quarterly and final reports to ARB and the U.S. EPA

The District will utilize spreadsheets developed by the U.S. EPA to keep track of the number of stoves changed out and associated emission reductions. These include U.S. EPA Burn Wise Calculator and another spreadsheet developed by CARB to allow calculating device specific emission estimates CARB spreadsheet was used to calculate emission reductions reported to the U.S. EPA as part of annual Enforceable Commitment Reports and Quantitative Milestone Reports.

The target population to receive the U.S. EPA grant funds would be 1,239 households with uncertified wood stoves within the Portola PM2.5 nonattainment area. The District will make a concentrated effort to enlist participation from low income residents in the nonattainment area. Not only will the owners of the older stoves benefit by upgrading to the newer stoves, all of the residents of the PM2.5 nonattainment area will benefit from significant improvements in air quality. Based on the U.S. Census Block Group data, the District estimates that there are 5,825 people living in the nonattainment area. Replacing old wood stoves in the community with the new EPA-certified wood stoves would reduce annual PM2.5 design values. The ultimate goal is to attain annual and 24-hour PM2.5 NAAQS. Furthermore, replacing uncertified wood stoves with cleaner burning EPA-certified stoves would significantly reduce public exposure to hazardous air pollutants (HAPs).

Changes to the workplan in 2018 were necessary to achieve optimal emission reductions from the wood stove change out program. If heat pumps prove to be a viable solution for the community, for every wood stove that would be replaced with a heat pump would reduce PM2.5 emissions 0.07 tons annually. Table 4 lists additional components.

Table 4. Additional Elements Added in 2018

Activity	Outputs	Outcomes	Performance Measure
Heat Pump Pilot Project	Install heat pumps in five homes.	Promote heat pumps in the community. Reduce PM2.5 Emissions 0.35 tons annually.	Track reductions using existing database and spreadsheet.
Education and Outreach Coordinator	Full time staff responsible for educating households and promoting clean home heating	Ensuring optimal emission reductions.	In addition to emissions, track air quality to ensure that emission reductions lead to commensurate air quality improvements.
Chimney Sweep	Sweep 200 chimneys, inspect stoves, and educate residents		
Wood Shed Project	Build 50 wood sheds.		
Woodstove Registration	Register every certified stove	Provide a way for a District Inspector to verify that households without certified stove are not burning wood on non-burn days.	Track concentrations on mandatory Woodburning Curtailment to verify Program effectiveness.

Since June 2022, more staff members have been assigned to oversee Targeted Air Shed grant functions. Due to this increase in staffing levels, several Program elements have been reestablished and new marketing campaigns have been incorporated. Some of the newly implemented elements include electric mini split heat pump installations, video advertisement marketing campaigns, in-person events, and in-home assessments. The Program has responded to inflation concerns with an increase in the amount allocated to individual change outs and vouchers paid out by the District. In addition to the implemented program elements, the District has contracted with an outside agency to issue daily forecasts for wood stove curtailment days. Curtailment days are sent to the public via email and on the District website. The District strongly believes with time and U.S. EPA grant funds that PM2.5 emissions will continue to reduce in the greater Portola area providing improved PM2.5 air quality. Shifting funds from woodstoves to other budget categories would not negatively impact the estimated reductions in emissions and air quality improvements. Just the opposite would occur, without changing the original structure of the Program optimal reductions per stove may not be achieved. Furthermore, the

original budget allowed for up to \$3,500 per stove for 442 stoves. Since the District secured another source of funding in 2018 that was not originally anticipated in the original 2015 Targeted Airshed Grant application and Project workplan, less than \$2,500 of EPA funding was spent per stove to date, August 2018. By supplementing EPA funding with another source of new funding, to date the District saved over \$100,000 in Targeted Air Shed Grant funding. This extra money will be allocated to other categories or other type of equipment. Additionally, the average stove installed had about 50 percent lower emissions than original numbers factor in the calculations, so the air quality improvements should be greater than original grant application estimate.

I. Role of the District

The District will assume sole responsibility for the operation and management of the project. This includes the following:

- Promote wood stove changeout project in the community and educate public about proper way to store and burn wood
 - Prepare and conduct wood stove kick-off media conference
 - Develop and deliver presentations to partners
 - Prepare and distribute media outreach and educational materials
- Prepare, distribute, and process applications
 - Assist in filling out application
 - Respond to applicant's questions and concerns
 - Review applications
- Administer the financial incentive program
 - Enter into a partnership with local retailers
 - Issue vouchers to qualified applicants
 - Process and track vouchers submitted by retailer
 - Issue payments to retailers
- Track vouchers, funds, and receipts for recycled stoves
- Develop quarterly and final reports to ARB and U.S. EPA

m. Experience and Qualifications

The District was formed in 1986 by the merging of the Air Pollution Control Districts of Nevada, Plumas, and Sierra Counties. The District is required by state law to achieve and maintain the federal and state Ambient Air Quality Standards, which are air quality standards set at levels that will protect the public health. The District is composed of three primary entities, each with a specific purpose: District staff, Governing Board of Directors, and Hearing Board. Currently, the District staff is limited to four full-time employees in the main office in Grass Valley and one full-time employee located in the District's only field office in the City of Portola.

The District has a mission to conduct outreach and administer programs that will help bring the Portola nonattainment area back into attainment. The District is working

closely with Portola city officials, Plumas County agencies, local community organizations, and state and federal government organizations to outline a plan to reach attainment by 2025.

The District has been implementing a woodstove changeout program with the Targeted Airshed Grant funding since 2015. The District developed the program, including development of procedures, applications, documents tracking and record keeping. Over the past 20 years, the District has successfully distributed \$2.4M to residents through different residential wood stove changeout programs throughout all three counties, changing out about 800 wood stoves to cleaner burning appliances. Additionally, the District has distributed \$23,632 for wood sheds and \$25,489 in chimney sweep vouchers for residents as part of the TAGs.

The District's project for the purposes of this application will use many of the procedures, documents, and tracking techniques used in prior wood stove changeout programs, with an increased level of record-keeping and tracking.

The principal and responsible parties of the District currently assigned to the project are:

- Executive Director, Gretchen Bennitt
- Targeted Airshed Grant Specialist, Mikki Brown
- Air Pollution Specialist III, Julie Hunter
- Contracted Assistant, Cynthia Mejia
- Business Manager, Dawn Lundsford
- Contracted Accountant, Rose Asquith

All six of the staff members have extensive experience in implementing the Targeted Airshed Grant program. Gretchen Bennitt developed the criteria for the implementation of wood stove changeouts throughout the District. Mikki Brown is the lead for the Targeted Airshed Grant program in Portola. She worked with a contractor to develop an education/outreach program, hosted Burnwise events, developed pre-assessment visits with residents and is in collaboration with a local Fire Safe Council to develop a seasoned wood stove program. Cynthia Mejia works directly with wood stove retailers and individual residents to process payments for changeouts, and chimney sweep vouchers. She tracks all changeouts and maintains all paper and electronic filing. Julie Hunter worked with a contractor to establish a wood stove curtailment forecast for the Greater Portola area and assists in contracts, agreements, and invoicing. Rose Asquith and Dawn Lundsford issue and track payments and conduct financial audits.

ARB staff will assist with annual verification of progress including estimating reductions in emissions and PM2.5 concentrations. Kasia Turkiewicz, Air Resources Engineer, will

oversee the project on behalf of ARB to ensure that funds are passed to the District in a timely manner.

n. Programmatic Capability and Past Performance

Over the past 20 years, the District has successfully distributed almost \$2.4M to residents through different residential wood stove changeout programs throughout all three counties within the District boundaries, changing out about 800 wood stoves to cleaner burning appliances. The District has demonstrated the technical ability to successfully implement a wood stove changeout program by establishing a plan, tracking progress, and adjusting accordingly to maximize short- and long-term program goals. In addition, the District has successfully administered \$2,224,000 of incentive funds from the ARB Lower Emission School Bus Program and \$2,281,808 from the Carl Moyer program. The success of these programs substantiates the District's experience in public outreach, marketing, administrative coordination, and fund management.

With respect to grant management, ARB has accepted several U.S. EPA grants in the past three years, including: Section 105 Air Pollution Control Financial Assistance Grant (Grant Number A-00901315), PM 2.5 Monitoring Network Grant (Grant Number PM-98960901), and the State Clean Diesel Grant (Grant Number DS-00T87901). Each of these recent grants represents a continuation of a multi-year, multi-million dollar grant from U.S. EPA. For each grant, ARB has completed all grant agreement terms and completed (or expects to complete) the approved work plans to expeditiously apply funds to shared U.S. EPA and ARB air quality goals. ARB has documented progress on these grants through submittal of required reports and inputting collected data into state and national databases, as appropriate per the grant terms.

Additionally, ARB has extensive experience implementing multi-million dollar incentives programs, such as the Lower-Emission School Bus Program, the Carl Moyer Memorial Air Quality Standards Attainment (Moyer) Program, Goods Movement Emission Reduction (Goods Movement) Program, the Air Quality Improvement Program (AQIP), and the Providing Loan Assistance for California Equipment (PLACE) Program. ARB's experience in these programs has established solid working relationships with air districts as well as engine/equipment and retrofit manufacturers and vendors necessary for successfully implementing the proposed project.

o. Partnerships

The District has established partnerships with the USDA, DOE, and LIHEAP to assist very low income residents with residential wood stove replacements. The District will encourage agencies assisting low income residents to promote non-wood heating appliances and consider subsidizing clean fuels.

The most essential partnership is with the local wood stove retailers. The retailers will assist in the outreach and marketing of the project, as well as the installation of certified appliances and the proper removal and demolition of uncertified appliances.

The City of Portola will be an active partner throughout the project. The City will continue to enforce a City ordinance as a change-of-ownership requirement that when a home is sold, all wood burning appliances must be EPA Phase II Certified, as well as any newly installed wood burning appliance. The City or Plumas County will inspect new installations of wood stoves as required. They will actively promote the changeout project during City Council Meetings and participate in community events.

Finally, the District will partner with additional groups to enhance the outreach of the project. These groups include chimney sweeps, local businesses, social services groups, health and medical care organizations, fire departments, home builders and remodelers, local opinion leaders, media representatives, social service groups, and others who can reach large numbers of people and may share its goal of improved air quality and public health.

The ARB will provide oversight of the project; provide assistance and review reports and documents. The ARB will forward project related documents to the U.S. EPA and ensure prompt transfer of funding to the District.

4. BUDGET

a. 2015 Targeted Air Shed Grant

The U.S. EPA allocated \$2,483,607.00 towards the Residential Wood Stove Changeout Project in the Plumas County PM2.5 Nonattainment Area, with \$175,000 allocated to CARB for administering the grant and \$2,308,607 sub-granted to the District captured as “Other” in the budget.

b. 2018 Revisions

The impact of the 2018 revisions on the budget is summarized in Tables 12, 13, and 14. In the original grant CARB requested \$175,000 in total indirect charges to cover administrative expenses associated with overseeing the grant implementation and processing paperwork. This amount did not change. Since all of the EPA funds except the indirect funding are sub-granted from ARB to the Northern Sierra Air Quality Management District, all funding to the District is captured in the “Other” Object Class Category in the budget, as reflected in Table 5. The breakdown of this category is provided in Tables 6 and 7. Table 7, the Equipment Budget, includes not only the cost of purchase and installation of replacement devices, but also the proper destruction of the old stoves.

Table 5. Budget Revised in 2018

Category	Subcategory	Amount
2015 EPA Targeted Air Shed Grant Funds		\$2,483,607.00
Total Indirect Charges- ARB Grant Administrative Cost		\$175,000.00
Other: Total Pass-Through to the District Subcategories:		\$2,308,607.00
	District – Personnel	\$343,445.20
	District- Fringe Benefits	\$92,730.20
	District – Travel	\$6,000.00
	District - Equipment	\$1,828,604.72
	District - Contractual ⁶	\$10,000.00
	District – Supplies ⁷	\$10,000.00
	District - Other ⁸	\$17,826.88
Total for 2015 EPA Targeted Air Shed Grant		\$2,483,607.00
Matching Funds	District - Equipment	\$20,000.00
Matching Funds	District - Miscellaneous	\$20,000.00
Total Project Cost		\$2,523,607.00

Table 6. Personnel budget revised in 2018

Other: District Personnel Subcategory	Rate (\$)	Hours per Week	Number of Weeks per Year	Number of Years	Cost
(1) District Project Manager	48.74	8	43	5	\$83,832.80
(2) Project Coordinator	21.74	18	45	5	\$88,047.00
(3) Business Manager	24.44	8	43	5	\$42,036.80
(4) Project Staff #1	36.96	3	43	5	\$23,839.20
(5) Project Staff #2	42.52	3	43	5	\$27,425.40
(6) Education and Outreach Coordinator	21.74	40	45	2	\$78,264.00
Fringe Benefits (27%)					\$92,730.20
Total					\$436,175.40

⁶ “Contractual” category includes the cost of hiring a contractor to set-up and manage a database of registered certified stoves.

⁷ “Supplies” category includes office supplies (paper, folders, and markers) as well as supplies used for follow-up visits (stove thermometers, starters, etc.).

⁸ “Other” category includes legal fees, revising website, developing promotional materials, printing and photocopying, facility rental for community events, cost of setting up and maintaining a separate phone line, etc.

Table 7. Equipment budget revised in 2018

Other: Equipment Subcategory	Grant Funds (\$)	District Funds (\$)	Equipment Total (\$)
Stoves (Purchase, Installation, and Destruction)	\$1,742,904.72	\$20,000.00	\$1,762,904.72
Heat Pump Pilot Project-5@\$10K per unit plus \$700 for heat sensors	\$50,700.00		\$50,700.00
Chimney Sweep - 200 @100 per unit	\$20,000.00		\$20,000.00
Wood Sheds - 50 @\$300 per unit	\$15,000.00		\$15,000.00
Equipment Total	\$1,828,604.72	\$20,000.00	\$1,848,604.72

c. 2023 Revisions

The impact of the 2023 revisions on the budget is summarized in Table 8. In the original grant CARB requested \$175,000 in total indirect charges to cover administrative expenses associated with overseeing the grant implementation and processing paperwork. This amount remains the same. Since all of the U.S. EPA funds except the indirect funding are sub-granted from ARB to the Northern Sierra Air Quality Management District, all funding to the District is captured in the “Other” Object Class Category in the budget, as reflected in Table 5. The proposed breakdown of this category based on the current program needs is provided in Table 8.

We propose to reallocate funds from the Equipment category to other activities as follows:

- \$96,000 to cover the cost of District staff. The grant will be extended by four additional quarters. With the average cost per quarter of \$24,000 we recommend moving \$96,000 from the Equipment category to District Staff Time.
- \$8,000 to cover the cost of travel, with \$5,000 to cover maintenance of the grant-dedicated vehicle and fuel and \$3,000 to cover the cost of travel to attend a conference.
- \$10,000 to cover the demand for chimney sweeps.
- \$22,500 to cover the cost of wood sheds.
- \$1,000 to replenish the supplies.
- \$15,000 for contractual, which will include a cost of contract with Sonoma Technology STI for making woodburning curtailment determinations for 10 months (March through April, 2023 and September, 2023 through February, 2024) at the lower curtailment threshold of 20 ug/m3.

This reallocation would reduce funding for equipment from about \$280,000 to \$130,000.

Table 8. Proposed Funds Reallocation in 2023

Category	Current Grant Allocation	Spent to Date	Remaining Grant Balance	Proposed Re-Allocation	Grant Allocation After	Remaining After Re-Alloc.
District Staff Time	\$436,175.40	\$447,717.32	-\$11,541.92	\$96,000.00	\$532,175.40	\$84,458.08
Travel	\$6,000.00	\$7,692.87	-\$1,692.87	\$8,000.00	\$14,000.00	\$6,307.13
Equipment	\$1,742,904.72	\$1,462,101.48	\$280,803.24	-\$152,500.00	\$1,590,404.72	\$128,303.24
Chimney Sweep	\$20,000.00	\$25,489.00	-\$5,489.00	\$10,000.00	\$30,000.00	\$4,511.00
Heat Pump	\$50,700.00	\$37,943.00	\$12,757.00		\$50,700.00	\$12,757.00
Wood Sheds	\$15,000.00	\$28,460.56	-\$13,460.56	\$22,500.00	\$37,500.00	\$9,039.44
Supplies	\$10,000.00	\$9,844.71	\$155.29	\$1,000.00	\$11,000.00	\$1,155.29
Contractual	\$10,000.00	\$10,000.00	\$0.00	\$15,000.00	\$25,000.00	\$15,000.00
Other	\$17,826.88	\$16,892.54	\$934.34		\$17,826.88	\$934.34
TOTALS	\$2,308,607.00	\$2,046,141.48	\$262,465.52	\$0.00	\$2,308,607.00	\$262,465.52

d. Voluntary Cost Share/Match and Leveraged Funds

With the assistance of the Environmental Finance Center (EFC), the District has concluded that approximately 163 households in the nonattainment area will participate in programs for wood stove changeouts from the following agencies; USDA, DOE, LIHEAP, and ECIP. The District is planning a financial assistance workshop in the summer of 2015 with these agencies. The income-qualified programs are contingent upon availability of funds and the community’s ability to target eligible households that meet both the income and age requirements of the funding programs. As education and outreach continues, these programs should be considered first for wood stove changeout assistance. The estimated amount for cost/share for income-qualifying programs is \$570,500 (Table 9).

Table 9. Participation in income-qualifying wood stove changeout programs

Program Name	Estimated Households Eligible*	Participation Rate	Number of Changeouts	Total Cost
Very Low Income Repair and Rehabilitation Grants (USDA)	204	75%	153	\$535,500
Low Income Energy Crisis Intervention Program (LIHEAP ECIP)	7	100%	7	\$24,500
Low Income Weatherization Program (DOE)	3	100%	3	\$10,500
TOTALS	214	76%	163	\$570,500

*Eligibility for program based on income and age restrictions (USDA) and funding amounts (LIHEAP and DOE).

Additionally, the District has allocated \$40,000 of local fees specifically to be used for the wood stove changeout program, which brings the total amount of leveraged funding to \$610,500. Part of the \$40,000 provided by the District will be used for providing additional incentive of up to \$1,000 to encourage residents to change out to a pellet or a propane stove.

Addendum to the 2015, 2018, and 2020 Portola Targeted Airshed Grants

The following changes apply to the 2015, 2018, and 2020 Portola Targeted Airshed Grants (TAGs)

1. As of November 1, 2021, incentive levels for space heating devices were modified to reflect current pricing. Table 1 lists original and revised incentive levels. Zone 2 is now subject to uniform incentive levels, regardless of income level. Based on the implementation of the Greater Portola Woodstove Change-out Program (Program) so far, few households in Zone 2 qualified for higher incentives based on their income. Offering uniform incentives across Zone 2 will simplify the review and approval process.
2. The Northern Sierra Air Quality Management District (District) will work with the approved chimney sweepers to include education to the residents during their sweeps. Education activities may include but are not limited to how to properly operate and clean their woodstove, along with properly burning seasoned wood. For example, the chimney sweeps may: inspect chimney/flue and clean as appropriate; inspect the wood burning appliance and recommend repairs as needed; speak with the resident and share EPA Burnwise or other educational materials; and conduct other educational efforts to be determined.

As of February 9, 2022, the District will offer chimney sweep vouchers to all City of Portola residential units or households operating U.S. EPA Phase II certified or cleaner wood burning stoves. If funds are available in the chimney sweep category under each TAG, each household will be eligible for annual chimney cleaning (one chimney sweep per calendar year) if one of the following categories apply:

- a. Household received a new wood burning device as part of the Greater Portola Woodstove Change-out Program (automatic eligibility).
 - b. Household registered their existing Phase II or cleaner wood burning device with the District for the mandatory woodburning curtailment.
3. As of July 1, 2020, due to an increase in the price of wood and other materials, the allowance for building and delivering woodsheds to households was increased up to \$850 per woodshed. The amount assigned to the woodshed category under both TAGs will remain the same, but fewer woodsheds may be completed because of this increase. Table 2 provides more details on the cost and estimated number of woodsheds. To allow for greater firewood storage options, homeowner flexibility and ease of implementation the District will continue to pursue and encourage the use of

less expensive wood storage options and materials, which may include cinderblocks, landscape timbers and wood pallets, among others.

4. Due to ongoing concerns about PM2.5 emissions from woodburning devices, combined with Portola households’ reluctance to remove woodburning devices upon installation of a heat pump due to concerns about power outages and heat pump performance in extreme cold, removal of a certified wood burning device will not be required to qualify for a zero-emission electric heat pump installation. This provision will apply only to City of Portola households because they are subject to the City of Portola mandatory woodburning curtailment and they reside in the most densely populated area with highest woodsmoke emissions. Further details of this heat pump pilot program will be determined, including allowed of co-using the certified woodstove during specific circumstances.

5. Zone boundaries for the purpose of the Woodstove Change-out Program will be redrawn as follows:
 - a. Zone 1 will encompass the Portola Sphere of Influence as well as communities of Delleker, Iron Horse, and the southern edge of Lake Davis. These communities will be included in Zone 1 due to their proximity to Portola and their population densities.
 - i. City of Portola will be considered a subset of Zone 1 and labeled as Zone 1.A. Zone 1.A will be subject to the same incentive levels as Zone 1, but households will be eligible for a heat pump and a certified wood stove combo providing their woodburning device is registered with the District for mandatory woodburning curtailment.
 - b. The remaining portion of Portola PM2.5 Nonattainment Area will be considered Zone 2.

Table 1. Greater Portola Woodstove Change-out Program incentive levels

Replacement Device	Incentive Level (Prior to November 2021)			Incentive Level (Starting November 2021)	
	Zone 1	Zone 2		Zone 1	Zone 2
		Standard Incentive	Low Income		
Wood stove	\$3,500	\$1,500	\$3,500	\$5,000	\$3,500
Pellet Stove, Propane, or Kerosene	\$4,500	\$3,000	\$4,500	\$6,500	\$4,500
Heat Pump	\$10,700	\$10,700	\$13,500	\$13,500	\$13,500

Table 2. Impact of the cost of woodsheds on the estimated number of units completed.

TAG	Amount Allocated to Woodsheds (\$)	Price per Unit		Number of Units	
		Estimate	Revised	Estimate	Revised
2015	\$15,000	\$500	\$850	30	18
2018	\$50,000	\$500	\$850	100	59

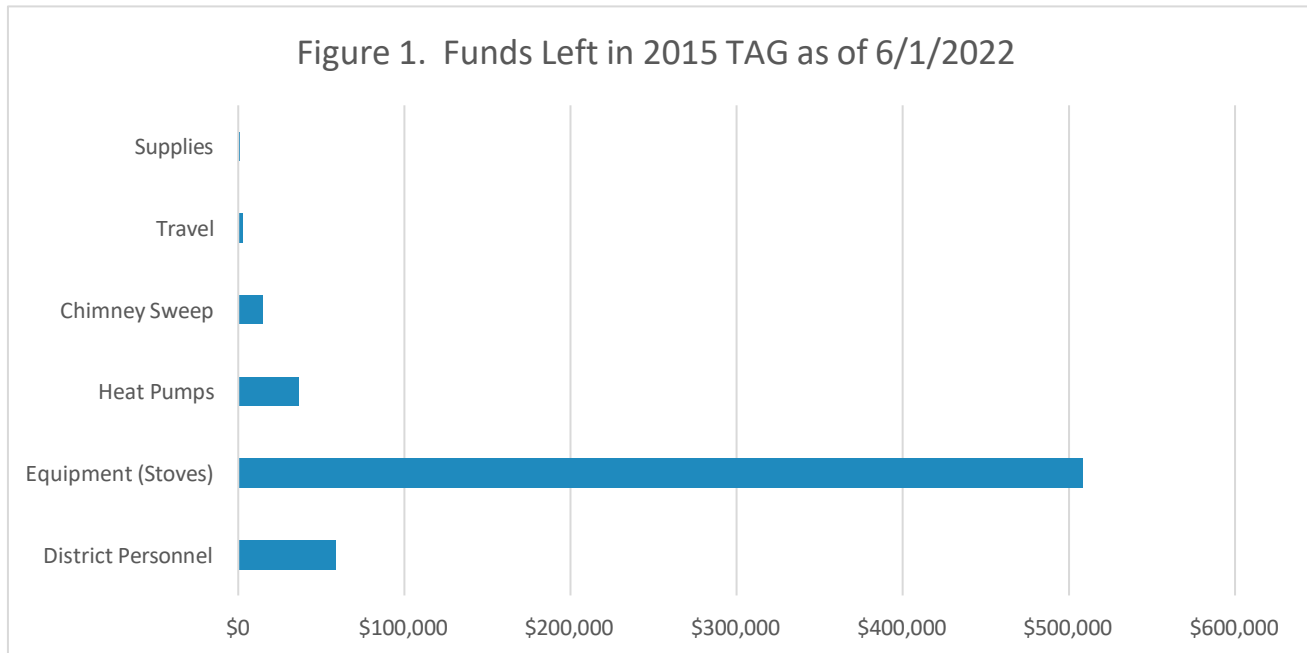
The following provisions will apply to 2015 TAG

The primary focus of the 2015 TAG was to replace uncertified wood burning devices in the Nonattainment Area with cleaner home heating alternatives. Pandemic restrictions contributed to supply chain disruptions which resulted in significant delays in woodstove delivery and installations. We propose to make the following categories eligible for funding under the 2015 TAG ‘Equipment’ category:

1. Under the 2015 TAG, heat pumps were eligible for incentives only if installed as part of the Heat Pump Pilot Program. We propose to make heat pumps, as outlined in paragraph 4 above, eligible for funding.
2. There are no more funds in the 2015 TAG ‘Woodshed’ category. We propose to use a portion of ‘Equipment’ funds to cover the cost of building and delivering woodsheds.
3. Since current marketing does not resonate with the members of community still using uncertified wood stove as the primary source of heat, we propose to use part of the 2015 “Other-Equipment” funding to pay for a more focused outreach and education campaign. District is exploring working with U.C. Davis and Progressive Source Communications. They submitted a proposal to conduct an outreach and education campaign in Portola PM2.5 Nonattainment Area for \$48,000. Education efforts also may include the proper operation and use of the heating device and benefits associated with such.
4. We propose to use 2015 “Other-Equipment” funds to pay for a contract with STI for issuing wood burning curtailments in the City of Portola. The goal of consistent and reliable curtailment calls is to communicate the need to reduce woodburning to protect public health during periods of atmospheric stagnation.
5. We propose to use 2015 “Other Equipment” funds to pay for emergency power backup generators for residents switching to a pellet stove. The generators must meet the best available control technologies (BACT). Due to Portola’s cold climate it’s necessary to ensure households could operate their pellet stoves during a power outage. These residents would sign a contract agreeing to only use this emergency power backup generator during power outages. Only a small portion of equipment funding would be used for this. Over the life of the Program, 62 households changed

to pellet stoves. Each generator costs about \$600, so if additional 30 households change out to pellet stove, the total cost would be about \$18,000.

Figure 1 illustrates funds remaining in each 2015 TAG category.



The following provisions will apply to 2018 TAG (added 12/5/23)

CARB proposes to reallocate \$500,000 within the Equipment Category of the subgrant agreement budget from Wood Stoves to Heat Pumps. As part of an effort to meet the moderate attainment date, the District focused on replacing uncertified wood stoves and fireplaces used as primary sources of heat with certified wood or pellet stoves. Despite exceeding the emission reduction target, the air quality did not improve enough to meet the moderate attainment deadline. Many factors may be contributing to this. There is a lot of uncertainty associated with the wood stove certification program suggesting that certification tests could be adjusted to ensure the stove meets NSPS. This elasticity in stove certification fails to ensure stoves exhibit a similar performance in the field. Two other factors impacting emissions are quality of firewood and device operation. The District has established a program to educate households on the importance of both using seasoned wood and following proper stove operational instructions, but these factors are difficult to correct and account for when estimating emission reductions. After reclassification to a serious nonattainment area, the District decided to prioritize heat pump installations, hoping the emission reductions and associated air quality improvements will be more reliable. Heat pumps are more expensive to install and operate than wood stoves, requiring a significantly higher incentive to entice households into installing them and agreeing to use them as primary sources of heat. The original budgets include funding for 20 heat pumps

and 235 wood stoves over a five-year period. By redirecting \$500,000 from the wood stove budget and factoring increased incentive, as concurred in August 2022, we estimate being able to fund 77 wood stoves and 53 heat pumps.

Appendix G

Memorandum of Understanding between the District and the City of Portola

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MEMORANDUM OF UNDERSTANDING

**BETWEEN THE CITY OF PORTOLA
AND
THE NORTHERN SIERRA AIR QUALITY MANAGEMENT DISTRICT**

THIS MEMORANDUM OF UNDERSTANDING ("MOU") is made and entered into this 9th day of March, 2016, by the CITY OF PORTOLA ("City") and the NORTHERN SIERRA AIR QUALITY MANAGEMENT DISTRICT ("NSAQMD") to allow the District to jointly implement a Wood Burner Stove Changeout Program ("Program") in the Greater Portola Federal Non-Attainment Area to help achieve air quality attainment status.

WHEREAS, the United States Environmental Protection Agency (USEPA) has found that the Greater Portola Federal Non-Attainment Area of the NSAQMD has remained an air quality non-attainment area for years; and

WHEREAS, NSAQMD applied to USEPA and received grant funding to implement a wood burner stove change-out program in the area; and

WHEREAS, CITY has the authority, capability and workforce to process applicable permits for the woodstove change-out and receive the non-compliant stove in accordance with state and federal law; and

WHEREAS, CITY further has the capacity to cause the non-compliant stove to be made useless and destroyed, and collected for final disposition; and

WHEREAS, NSAQMD has identified CITY as capable of the tasks presented; and

WHEREAS, NSAQMD Board of Directors and Portola City Council respectively and separately authorized the establishment of an MOU between the two entities, and for CITY to provide services to NSAQMD, and for NSAQMD to pay CITY for services provided.

NOW THEREFORE, in consideration of the promises and covenants set forth herein, the parties agree as follows:

1. Scope of Services

1.1 CITY agrees to provide services related to NSAQMD's project as requested by NSAQMD. Those services may include, but are not limited to, the following:

- a) Issuing woodstove permits for the installation of new, compliant heating devices within the City limits of the City of Portola.

- b) Accepting and storing removed, non-compliant heating device into the City's designated repository.
- c) Destroying non-compliant heating device.
- d) Maintaining an accurate record of the permitting and destruction of non-compliant heating device processes.
- e) Providing copies of all permitting and destruction documentation to NSAQMD.

1.2 CITY will log the activities performed at the request of NSAQMD or as is required for the completion of work on the PROJECT in an administrative logbook. The administrative logbook will include a description of the activity, from request of permit to final disposition of the non-compliant heating device, and time spent in process. Copies of the log book pages will be submitted to NASQMD as support documentation for the NSAQMD's billing statements.

1.3 CITY will perform work with the thoroughness and competence that would be expected of an experienced and knowledgeable air pollution control district staff member. CITY staff shall conduct themselves in a professional manner and behave in a manner that is courteous and respectful of the public.

2. Geographic Area of Service for the Collection and Destruction of Woodstoves

CITY will provide for the collection and destruction of woodstoves throughout the Greater Portola Federal Non-Attainment Area. A map of the project area is attached as Exhibit A.

3. Payment

3.1 **NSAQMD** agrees to reimburse **CITY** for the services covered by this Agreement at the City's hourly reimbursement rate:

- Building Inspector \$25/hour
- Maintenance Worker \$24/hour
- Office Clerk (\$16/hour)

Any potential increases in the hourly rate must be authorized by NSAQMD in writing, thirty (30) days in advance of said increase. NSAQMD will also provide for equipment necessary, or provide reimbursement to CITY, to complete the project, as authorized by NSAQMD. The maximum sum payable under this MOU for each fiscal year of July 1 through June 30 of the following calendar year is Five Thousand Six Hundred Dollars (\$5,600.00). The amount paid to CITY shall constitute full payment for all services set forth herein. CITY shall not be reimbursed for any additional expenses incurred beyond this maximum amount without prior written agreement by the NSAQMD. The City will not be required to provide services when those services will not be reimbursed.

3.2 CITY shall bill NSAQMD not more often than quarterly based upon the time spent on services rendered for that quarterly billing period. CITY agrees to provide a detailed invoice, including copies of timecards, separating charges as assigned to various tasks of field work and administration to NSAQMD by the fifteenth day following the end of the quarter. NSAQMD agrees to pay CITY within thirty (30) days of receipt of invoice.

3.3 NSAQMD retains the right to require proof of services performed or costs incurred prior to any payment under this Agreement.

4. Agreement Period

4.1 The conditions of this agreement shall remain in effect on a year round basis with an effective date upon the final signatures by both parties.

4.2 This agreement may be canceled by either party upon serving thirty (30) days notice in writing to the other party.

4.3 This agreement shall be in effect until cancelled and may be amended by the further agreement of both parties.

5. CITY Employees

5.1 CITY employees shall perform the duties outlined in this MOU as City Employees, and not as employees of NSAQMD. CITY acknowledges that CITY is not entitled to any of NSAQMD's fringe benefits, including without limitation, paid holidays, life insurance, sick leave, or travel or any other expenses in connection with services performed hereunder.

5.2 Hiring and Supervision. The responsibility for hiring and supervision of all CITY employees, including establishing standards of performance, assignment of personnel, maintaining discipline, determining training required, maintaining personnel files, and other matters relating to the performance of services and control of personnel shall remain with the CITY.

5.3 The City and District agree that neither Party is an agent or employee of the other Party for any purpose and is not entitled to any of the benefits provided by any Party to its employees. This MOU shall not be construed as forming a partnership or any other association or agency among the City and Department.

6. Ownership of Documents

CITY agrees to provide copies to NSAQMD, upon termination of this Agreement, all documents, drawings, photographs, and other written or graphic material, however produced, received from NSAQMD and used by CITY in the performance of its services hereunder. All work papers, drawings, internal memoranda, graphics, photographs, and any written or graphic

material, however produced, prepared by CITY in connection with its performance of services hereunder shall be, and shall remain after termination of this Agreement, the property of NSAQMD and may be used by the NSAQMD for any purpose whatsoever. NSAQMD agrees that any future use of documents produced by CITY under the terms of this Agreement shall be at the sole discretion of the NSAQMD and CITY shall bear no liability for the decisions on whether and how to use such documents.

7. Jurisdiction

This Agreement shall be governed by and construed in accordance with the laws of the State of California. Any suit, action, or proceeding brought under the scope of this Agreement shall be brought and maintained to the extent allowed by law in the County of Plumas, California.

8. Hold Harmless

- 8.1 NSAQMD agrees to defend, indemnify and hold harmless CITY, its directors, officers, servants and agents for any and all reasonable expenses, claims, liabilities, lawsuits and judgments which may occur as a result of any negligent willful acts or omissions on the part of CITY, or its directors, officers, employees, and agents, in any way connected with the performance of its duties and obligations pursuant to the Agreement. This provision shall survive any termination of the Agreement.
- 8.2 CITY agrees to defend, indemnify and hold harmless the NSAQMD, its directors, officers, servants and agents for any and all reasonable expenses, claims, liabilities, lawsuits and judgments which may occur as a result of any negligent willful acts or omissions on the part of NSAQMD, or its directors, officers, employees, and agents, in any way connected with the performance of its duties and obligations pursuant to this Agreement. This provision shall survive any termination of this Agreement.
- 8.3 Each party shall be financially responsible for all damages and losses caused by the negligent or willful misconduct of that Party, its officers, and employees.
- 8.4 Neither Party shall be liable to the other Party for any loss, damage, liability, claim or cause of action for damage to or destruction of property or for the injury to or death of persons arising solely from any act or omission of the other Party's officers, agents, or employees.
- 8.5 A Party against whom any claim arising from any subject matter of this MOU is filed shall give prompt written notice of the filing of the claim to the all other Party.

9. Notices


- 9.1 All notices relative to this MOU shall be given in writing and shall be personally served or sent by certified mail and become effective upon receipt. The Parties shall be addressed as follows, or at any other address designated by notice:

CITY: City Manager
PO Box 1225
Portola, CA 96122

NSAQMD: Air Pollution Control Officer
P.O. Box 2509
Grass Valley, CA 95945


IN WITNESS WHEREOF, the Parties hereto have caused this Memorandum of Understanding to be executed, the day and year first-above written.

Northern Sierra Air Quality Management District


Gretchen Bennitt
Air Pollution Control Officer

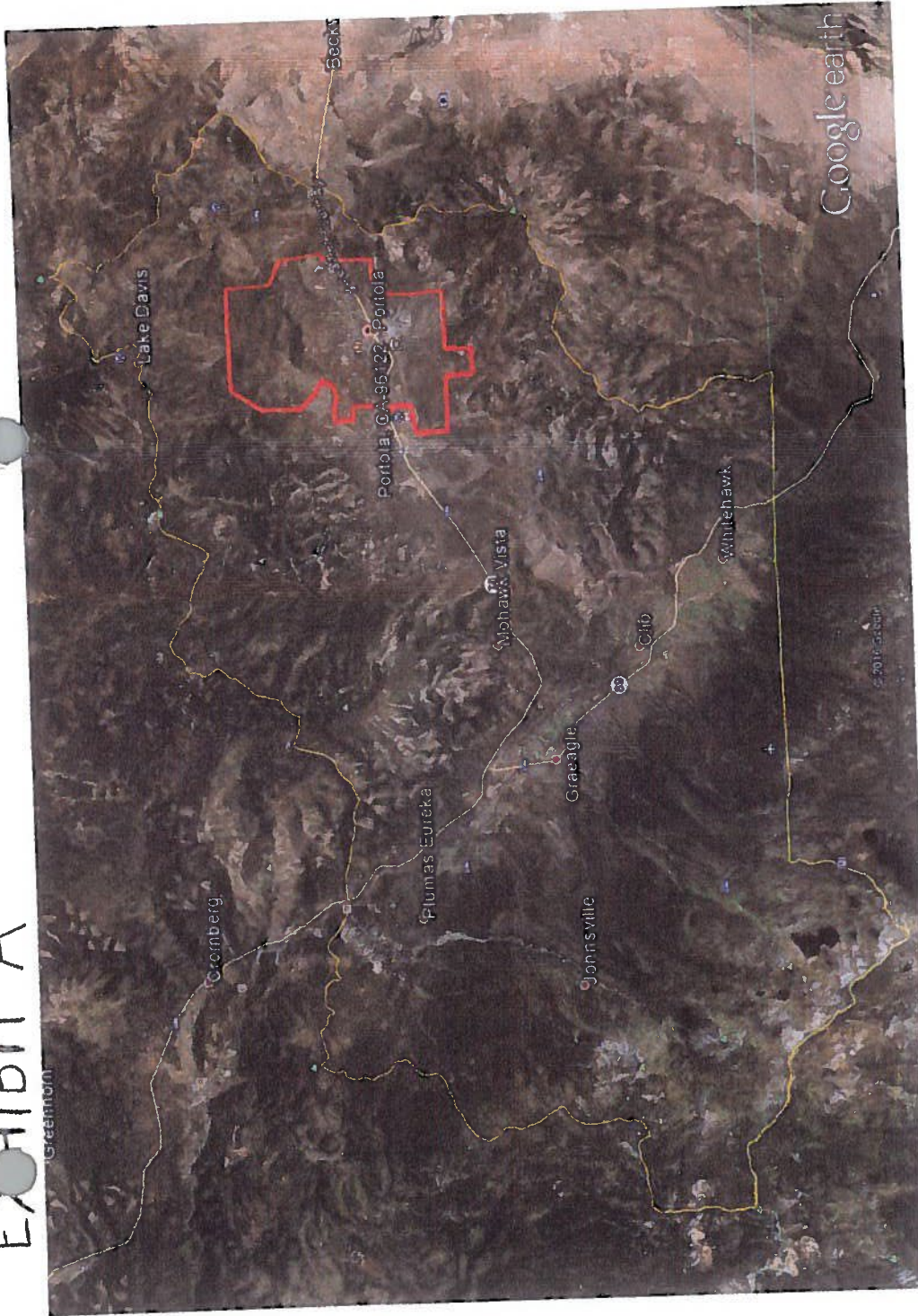
3-28-16
Date

City of Portola


Robert Meacher
City Manager

4-5-2016
Date

EXHIBIT A



Appendix H

Portola City Ordinance 359

ORDINANCE NO. 359

AN ORDINANCE OF THE CITY OF PORTOLA, COUNTY OF PLUMAS
AMENDING CHAPTER 15.10 OF THE CITY OF PORTOLA MUNICIPAL CODE
PROVIDING FOR REGULATION OF WOOD STOVES AND FIREPLACES AND THE
PROHIBITION OF THE OPEN BURNING OF YARD WASTE

The Council of the City of Portola, California, does ordain as follows:

Section 1. Chapter 15.10 of the Portola Municipal Code is hereby amended to read as follows:

Title 15- BUILDINGS AND CONSTRUCTION

Chapter 15.10- WOOD STOVE AND FIREPLACE ORDINANCE AND THE PROHIBITION OF
THE OPEN BURNING OF YARD WASTE

Sections:

- 15.10.010 Purpose.**
- 15.10.020 Definitions.**
- 15.10.025 Prohibition of the Open Burning of Yard Waste.**
- 15.10.026 Exceptions for Prohibition of Open Burning**
- 15.10.030 Requirements for New Wood Burning Devices.**
- 15.10.040 Requirements for Existing Wood Burning Devices.**
- 15.10.050 Permitted Fuels in Wood Burning Devices, Wood Burning Fireplaces, Wood-Fired Cookstoves, Wood-Fired Fire Pits.**
- 15.10.060 Mandatory Curtailment of Wood Burning Heaters, Wood Burning Fireplaces, Wood-Fired Fire Pits and Wood-Fired Cookstoves During Stagnant Conditions.**
- 15.10.070 Curtailment Levels and Period.**
- 15.10.080 Outdoor Wood-Fired Boiler Installation Prohibited.**
- 15.10.090 Wood Stove Retailers/Contractors Required to Provide Educational Materials.**
- 15.10.100 Violations.**
- 15.10.110 Continuing Violations- Each day being a separate violation.**

15.10.010 Purpose.

- A. This chapter shall be cited as the “Wood Burning Device and Open Burning Ordinance”
- B. This chapter is enacted for the purpose of improving the air quality within the City limits and protecting the general welfare of the citizens and residents of Portola. The EPA officially designated the Greater Portola area as federal nonattainment for the federal annual standard for PM 2.5 (Particulate Matter with an aerodynamic diameter of 2.5 microns or less), on April 15, 2015. High PM2.5 levels are mostly due to impacts from residential wood burning. The City Council finds there is a need to regulate and reduce harmful emissions of exhaust gases from wood-burning heaters and fireplaces, and that an appropriate method of regulation is a wood burning device ordinance.

15.10.020 Definitions.

As used in this chapter:

- 1. “Air District” means the Northern Sierra Air Quality Management District.

2. "Building" means any residence, mobile home, commercial property, or other structure.
3. "Certificate of Compliance" means a document issued by the Control Officer certifying that a building has no more than two wood burning heaters which are EPA-certified and no uncertified wood burning heaters.
4. "City" means the City of Portola.
5. "Control officer" means the official designated by the City Manager.
6. "Debris" means wastes resulting from land clearing operations. Debris include but are not limited to stumps, wood, brush, leaves, soil, and road spoils.
7. "EPA" shall mean the United States Environmental Protection Agency.
8. "EPA - Certified" means any wood burning heater with a Phase II certification or a more stringent certification as currently enforced in the NSPS.
9. "EPA-Qualified Fireplace" means any fireplace model or retrofit device that has been qualified by EPA under EPA's Voluntary Fireplace Program as emitting no more than 5.1. g/kg.
10. "Fireplace" means any permanently installed indoor or outdoor masonry or factory-built device used for aesthetic or space-heating purposed and designed to operate with an air to fuel ratio greater than or equal to 35 to 1.
11. "New Construction" means any single or multi-family housing unit, for which construction began on or after the effective date of this ordinance. Construction is deemed to occur when the foundation for the structure is installed.
12. "Notice of Exemption" means a document issued by the Control Officer certifying that a building has no wood burning heaters.
13. "NSPS" means New Source Performance Standard. For purposes of this rule the NSPS is the Code of Federal Regulations, Title 40, Part 60, Subpart AAA.
14. "Open Burning" The burning of combustible material of any types outdoors in the open, not in any enclosure, where the products of combustion are not directed through the flue.
15. "Outdoor Wood-fired Boiler" or "Hydronic Heater" means a fuel burning device designed: (1) to burn primarily wood or wood pellet fuel; (2) not to be located inside structures ordinarily occupied by humans; and (3) to heat spaces or water by the distribution through pipes of a fluid, typically water or water and antifreeze mixture, heated in the device.
16. "Pellet Fueled Wood Heater" means a pellet-fueled heater, comprising a forced draft heater with an automatic feed which supplies appropriately sized feed material or compressed pellets of wood, corn, or other biomass material to the firebox.
17. "Permanently Inoperable" means modified in such a way that the wood burning heater can no longer function as a wood burning heater or easily be remodified to function as a wood burning heater. Conversion to other fuels, such as propane, is permitted.
18. "Recreational Fire" means an outdoor fire burning dry, seasoned wood, manufactured logs, or charcoal briquettes where the fuel being burned is not contained in an incinerator, outdoor fireplace, portable outdoor fireplace, barbeque grill or barbeque pit and has a total fuel area of 3 feet (914mm) or less in diameter and 2 feet (610 mm) or less in height for pleasure, religious, ceremonial, cooking, warmth or similar purposes. These fires must be at least 25 feet from any structure or other combustible fuel source. Burning of yard waste (branches, shrubbery, or wet wood) is not allowed.
19. "Wood Burning Device" means any wood burning heater or fireplace. Wood burning devices do not include wood-fired residential or commercial barbecue devices, wood-fired fire pits, or wood-fired cookstoves.
20. "Uncertified Wood Burning Device" means any wood burning device that does not meet the performance and emissions standards of a Phase II certification or a more stringent

certification as currently enforced in the NSPS. Uncertified wood burning devices do not include wood-fired residential or commercial barbecue devices, wood-fired fire pits, or wood-fired cookstoves.

21. "Wood-Fired Cookstove" means a wood-fired appliance that is designed primarily for cooking food and that has the following characteristics:
 - a. An oven, with a volume of 0.028 cubic meters (1 cubic foot) or greater,
 - b. A device for measuring temperatures,
 - c. A flame path that is routed around the oven,
 - d. A shaker grate,
 - e. An ash pan,
 - f. An ash clean-out door below the oven, and
 - g. The absence of a fan or heat channels to dissipate heat from the appliance.
22. "Wood Burning Heater" means an enclosed wood-burning device capable of and intended for space heating such as a wood stove, pellet-fueled wood heater, or wood-burning fireplace insert.
23. "Yard waste" means grass, grass clippings, bushes, shrubs, and clippings from bushes and shrubs that come from residential, commercial/retail, institutional, or industrial sources as part of maintaining yards or other private or public lands.

15.10.25 Prohibition of the Open Burning of Yard Waste.

A. All open burning of yard waste and debris, except as otherwise authorized in Section 15.10.026 shall be banned within the city limits of the City of Portola.

15.10.26 Exceptions for Prohibition of Open Burning

- A. Nothing in this rule shall be construed as prohibiting open outdoor fires used only for cooking food for human consumption or for recreational fires.
- B. Training Burns: Fire Department training burns may be permitted with the prior written approval of the Fire Chief and the Northern Sierra Air Quality Management District.
- C. Special Permits: The Fire Chief and the Northern Sierra Air Quality Management District may issue special burn permits to authorize the burning of combustibles for the health and safety of the public.

15.10.030 Requirements for New Wood Burning Devices.

- A. Installation of Wood Burning Devices.
 1. Wood Burning Heaters: No person shall advertise, sell, offer for sale, supply, transfer or install in any residence or other structure any wood burning heater within the City limits unless it is an EPA certified wood burning heater at the time of sale or transfer.
 - a. No local government authority within the City limits may issue a building permit to any person to install an uncertified wood burning heater; and
 - b. Certified devices shall have a label permanently affixed to them from the United States Environmental Protection Agency (USEPA) which states that the stove is certified to comply with the NSPS standards.
 2. Wood Burning Fireplaces: No local government authority within the City limits may issue a building permit to any person to install a wood burning fireplace unless it is an EPA-qualified fireplace or EPA-certified fireplace.
- B. Limitation on Number of Wood Burning Devices in New Construction and Remodels.

1. The number of EPA certified wood burning heaters installed on any residential or non-residential property for which a building permit is required shall not exceed one per individual dwelling unit; and
2. The number of EPA-qualified fireplaces installed on any residential or non-residential property for a which a building permit is required shall not exceed one per individual dwelling unit; and
3. No local government authority within the City limits may issue a building permit to any person to install a wood burning device in new construction or remodel, unless it is an EPA-qualified fireplace or EPA certified fireplace or wood heater certified to the level of the current NSPS; and
4. Wood burning devices shall not be considered the sole source of heat in any new construction within the City limits; and
5. The above limitations do not apply to devices that are defined as low emitting:
 - a. EPA-certified pellet fueled wood heater;
 - b. Devices that are exclusively gaseous- or liquid-fueled; and
 - c. EPA-certified wood burning devices that meet a certified emission rate of 1 gram/hour or less of particulate matter.

15.10.040 Requirements for Existing Wood Burning Devices.

A. Existing Wood Burning Heaters and Change of Ownership.

1. In order to complete any escrow transaction, on any residential or commercial property, the current property within the City limits owner must obtain either a 1) Certificate of Compliance or a 2) Notice of Exemption.
2. It is prohibited for any person to complete, or allow the completion of any Escrow transaction upon any residence or mobile home, or other parcel containing a building within the City limits unless each building on the parcel has been issued a Certificate of Compliance by the Control Officer as having no more than two wood burning heaters which are EPA-Certified and no uncertified wood burning heaters.
3. A Certificates of Compliance or Notice of Exemption shall be issued by the Control Officer only upon physical inspection or documentary evidence that reliably establishes compliance with this section.
4. A Certificate of Compliance shall identify all of the following:
 - a. Owner's name.
 - b. Model number and manufacturer for each wood burning heater in the building.
 - c. The street address, Assessor's parcel number, or legal description of the parcel of real property where the building is located.
 - d. The location of the building and the specific location in the building where the wood burning heater is located.
5. A Notice of Exemption shall identify all of the following:
 - a. Owner's name.
 - b. The street address, Assessor's Parcel number, or legal description of the parcel of real property where the building is located.
 - c. The location of the building and whether a space heat source is exclusively utilized, and if so, what heat source is exclusively utilized.
6. The buyer and seller of any real property within the City limits shall observe this section and any disclosure statements supplied by the real estate agents relating to the

requirement under this regulation for the inspection of any wood burning heater installed in a building on the property.

7. If the disclosure report indicates that a wood burning heater on the property within the City limits is uncertified, the wood burning heater must be removed from the property and destroyed/recycled at an approved facility or agency. Re-inspection and a copy of documentation from the destroying/recycling facility or agency is required by the Control Officer prior to issuance of a Certificate of Compliance.
 8. The Control Officer may issue a Certificate of Compliance for a residence within the City limits without conducting a physical inspection if a person provides evidence that the EPA-certified wood burning heater has been installed in compliance with all applicable building, fire and other codes. This documentation shall include a receipt or invoice from the installation or purchase that includes the manufacturer and model name of the wood burning device.
 9. A Certificate of Compliance issued pursuant to this section:
 - a. Remains valid until the residential or commercial property is transferred or conveyed to a new owner or for nine months, whichever comes sooner.
 - b. Does not constitute a warranty or guarantee by the Control Officer that the wood burning heater within the residence or commercial property meets any other standards of operation, efficiency, or safety, except the certification standards contained in these regulations.
 10. If a residential or commercial property within the City limits is to be sold and does not contain any wood burning heaters, a form approved by the Control Officer, containing the signatures of both the buyer and seller, attesting to that fact, may be accepted in lieu of an inspection, and the Control Officer may issue a Notice of Exemption. The completed form shall be submitted to the Control Officer within ten days of close of escrow. If the residential or commercial property contains an uncertified wood burning heater which must be removed, the form must not be executed by either the buyer or seller until the removal has been completed. On any subsequent sale, a new Notice of Exemption is required.
 11. Upon a change of ownership, no more than two EPA Certified wood burning heaters per building may remain in any property within the City limits, except for the low emitting devices outlined in 15.10.030(B)(5).
 12. Upon a change of ownership, no uncertified wood-burning heater may remain in any property within the City limits.
 13. The Control Officer may conduct audits after properties have closed escrow and have been recorded under the new owner's name in order to determine compliance with this ordinance. If the Control Officer finds that there is an uncertified wood burning heater in the building, the Control Officer shall require that the uncertified wood burning heater be destroyed/recycled at an approved scrappage/recycling facility or agency within 30 days of notifying the current property owner. A financial penalty may be assessed if noncompliance has been identified or if the current property owner fails to destroy/recycle the heater within the time prescribed in the notice.
- B. Existing individual dwelling units with two or more existing EPA Certified Wood Burning Heaters.
Existing individual dwelling units with two or more existing EPA Certified Wood Burning Heaters may not install additional Wood Burning Heaters (certified or uncertified). The above

limitation does not apply to heaters that are defined as low emitting, including without limitation the following:

1. EPA certified pellet fueled wood heaters;
2. Devices that are exclusively gaseous- or liquid fueled; and
3. EPA certified wood burning heaters that meet a certified emission rate of 1 gram/hour or less of particulate matter.

15.10.050 Permitted Fuels in Wood Burning Devices, Wood Burning Fireplaces, Wood-Fired Cookstoves, Wood-Fired Fire Pits.

Burning of any fuels or materials in a Wood Burning Device other than the following fuels within City limits shall be in violation of this ordinance:

- A. Seasoned wood (less than 20% moisture content).
- B. Uncolored paper.
- C. Manufactured logs, pellets, and similar manufactured products (i.e., processed fire starters).

15.10.060 Mandatory Curtailment of Wood Burning Heaters, Wood Burning Fireplaces, Wood-Fired Fire Pits and Wood-Fired Cookstoves During Stagnant Conditions.

A. Episodic Wood Burning Curtailment Requirements.

1. Effective January 1, 2021, the requirements of this section shall be in effect during the months of January, February, November, and December. The Air District shall determine when a mandatory curtailment of solid fuel combustion in the City is necessary, notify the community that mandatory curtailment is required, and make such other determinations as are necessary to carry out the objectives of this chapter.
2. No person shall operate a wood burning heater, wood burning fireplace, wood-fired fire pit or wood-fired cookstove within the City limits when a mandatory curtailment is in effect unless the device is an approved and currently registered EPA-Certified Wood Burning Heater.
3. The approved and currently registered EPA-Certified Wood Burning Heater will be maintained and operated according to manufacturer instructions.
4. The Air District will declare a mandatory curtailment whenever it determines that the 24-hour average PM_{2.5} concentration may exceed 30 ug/m³ AND when adverse meteorological conditions are expected to persist.
5. The criteria for issuing a mandatory curtailment is as follows:
 - a. The Air District will analyze the available air monitoring data and determine whether a trend is continuing; and
 - b. The Air District will contact the National Weather Service located in either Reno or Sacramento to request a specific meteorological forecast specific for the Portola area; and
 - c. If the National Weather Service forecasts adverse meteorological conditions to persist and the Air District ascertains that there is a marked trend of continuing high concentrations of PM_{2.5} possible, then the Air District will declare a mandatory curtailment.
6. Upon determination that mandatory curtailment is required, the Air District shall notify the public through one or more of the following methods:
 - a. A recorded telephone message.
 - b. Messages posted on the Air District website.
 - c. Electronic mail messages to persons or entities that have requested such notice.

- d. Notifying broadcast, print or social media operating within the boundaries of the City of Portola.
- e. Any additional method that the Air District determines is appropriate.

Registration of EPA-Certified Devices.

- 1. Eligibility Requirements – Any EPA-Certified Wood Burning Heater is eligible to be registered with the Air District.
- 2. Registration Process – Effective July 1, 2020, persons applying to register a Wood Burning Heater shall submit a completed application and supplemental documentation demonstrating compliance with the eligibility requirements to the District. Supplemental documentation shall include the following:
 - a. Receipt or invoice from the installation or purchase that includes the manufacturer and model name of the Wood Burning Heater, or
 - b. A certification from the Air District verifying that the Wood Burning Heater meets the eligibility requirements.
- 3. Administrative Requirements – The person who registers the Wood Burning Heater shall retain a copy of the Air District issued registration and make it available upon request.
- B. Penalties – Any person that violates the provisions of 15.10.060 is subject to the following
 - 1. First time violators: a Notice to Comply or Warning will be issued. The Notice to Comply will require that any EPA-Certified Wood Burning Heater be registered within 30 days.
 - 2. Second time violators: Completion of a wood smoke awareness course that has been approved by the Air District, or payment of a penalty of \$50, or submission of proof of replacement of non-certified device with an EPA-Certified Wood Burning Heater or exclusively gaseous- or liquid-fueled heater.
 - 3. Third time violators: payment of a penalty of \$150 or submission of proof of replacement of non-certified device with an EPA-Certified Wood Burning Heater or exclusively gaseous- or liquid-fueled heater.
 - 4. Fourth time violators: payment of a penalty of \$500 or submission of proof of replacement of non-certified device with an EPA-Certified Wood Burning Heater or exclusively gaseous- or liquid-fueled heater.

15.10.070 Curtailment Levels and Period.

Within 60 days of a finding by the U.S. Environmental Protection Agency (U.S. EPA) that (1) the Plumas County PM_{2.5} Nonattainment Area (as defined in 80 Fed. Reg. 2206, January 15, 2015) has failed to attain the 2012 annual National Ambient Air Quality Standard (NAAQS) for fine particulate matter (PM_{2.5}) of 12 micrograms per cubic meter (ug/m³), 78 Fed. Reg. 3086, January 15, 2013 (the 2012 PM_{2.5} annual NAAQS) by the attainment date, (2) the area has failed to meet any reasonable further progress (RFP) requirement or quantitative milestone requirement in the Portola Fine Particulate Matter (PM_{2.5}) Attainment Plan (as approved at 84 Fed. Reg. 11208, March 25, 2019), or (3) California has failed to submit a quantitative milestone report required under the federal Clean Air Act for the 2012 PM_{2.5} annual NAAQS, all provisions of section 15.10.060 will continue to be in effect, except for the duration of curtailment season (Section 15.10.60 A.1) and curtailment level (Section 15.10.60 A.4), which are revised as follows:

List of curtailment months in Section 15.10.60 A.1 expands to include months of January, February, March, April, September, October, November, and December.

- A. Curtailment level described in Section 15.10.60 A.4 is lowered from 30 ug/m³ to 20 ug/m³.

- B. During the months of January, February, March, April, September, October, November, and December, the Air District will declare a mandatory curtailment whenever it determines that the 24-hour average PM2.5 concentration may exceed 20 ug/m³ AND when adverse meteorological conditions are expected to persist.
- C. Section 15.10.070 will remain in effect until the U.S. EPA either approves an attainment plan for the area that satisfies the Serious area requirements for the 2012 PM2.5 annual NAAQS or determines in writing that the RFP and/or quantitative milestone failure that triggered the implementation of this section has been corrected.

15.10.080 Outdoor Wood-Fired Boiler Installation Prohibited.

All outdoor wood-fired boilers are prohibited from installation within the City of Portola.

15.10.090 Wood Stove Retailers/Contractors Required to Provide Educational Materials.

Retailers or Contractors selling or offering for sale new Wood Burning Devices within the City limits shall supply public awareness information with each sale of a Wood Burning Device in the form of pamphlets, brochures, or fact sheets on the following topics:

- A. Proper installation, operation, and maintenance of the Wood Burning Device.
- B. Proper fuel selection and use.
- C. Health effects from wood smoke
- D. Weatherization methods for the home,
- E. Proper sizing of Wood Burning Devices.
- F. Episodic Wood Burning Curtailment levels as defined in Section 15.10.060.

15.10.100 Violations.

Any person who violates any of the requirements of this chapter, or who falsely attests as to information as part of compliance with this chapter, is subject to penalties and punishments as set forth in Chapter 1.10 of this Municipal Code, may be subjected to the applicable penalties and punishments prescribed by law for perjury, and may have any license or permit issued by the City be revoked, including but not limited to a building permit or certificate of occupancy.

15.10.110 - Continuing violations—Each day being a separate violation.

After any person who is responsible for a violation of any provision in this chapter has been given notice of the violation, and such person does not comply or otherwise correct the violation within the time prescribed in the notice, then from that day forward, the continuing violation shall be deemed to be a separate offense on each and every day that the violation persists. A person who knowingly commits or suffers the continuing violation shall be guilty of a separate offense each and every day that the violation persists.

Section 2. Approval. The City of Portola Wood Stove and Fireplace Ordinance concerns revisions to wood stove regulations and the Prohibition of Open Burning of Yard Waste. The text changes reflecting the Amendment are incorporated by reference as if fully set forth herein into Title 15 of the Portola Municipal Code and are hereby approved.

Section 3. CEQA. The City Council finds the approval of this ordinance is not subject to the California Environmental Quality Act ("CEQA") pursuant to CEQA Guidelines Sections 15060(c)(2) (the activity will not result in a direct or reasonably foreseeable indirect physical change in the environment) and 15060(c)(3) (the activity is not a project as defined in Section 15378) of the CEQA Guidelines, California Code of Regulations, Title 14, Chapter 3, because it has no potential for

Ordinance No. 359 August 9, 2020

resulting in physical change to the environment, directly or indirectly. Alternatively, the City Council finds the approval of this ordinance is not a project under CEQA Regulation Section 15061(b)(3) because it has no potential for causing a significant effect on the environment.

Section 4. Enactment. The City of Portola Wood Stove and Fireplace Ordinance Amendment and the Prohibition of Open Burning of Yard Waste shall be effective 30 days from the date of its approval by the City Council.

Section 5. Summary Publication and Posting. Within thirty (30) days after final adoption of this Ordinance, the City Clerk shall have a summary of this ordinance prepared by the City Attorney and published as required by the California Government Code. Within fifteen (15) days after final adoption of this ordinance, the City Clerk shall have it posted in three (3) public places.

This ordinance was introduced, read and the second reading was waived at a Regular Meeting of the City Council of the City of Portola duly held on August 12, 2020. The ordinance was finally passed and adopted at the Regular Meeting of the City Council of the City of Portola duly held on September 9, 2020, by the following vote:

AYES: Councilmember Tom Cooley
Councilmember Par Morton
Councilmember Stan Peiler
Mayor Pro Tem Bill Powers
Mayor Phil Oels

NOES: None
ABSTAIN: None
ABSENT: None

//S// Phil Oels
Phil Oels, Mayor

ATTEST:

//S// Tara Kindall
Tara Kindall, Deputy City Clerk

I, City Clerk of the City of Portola, do hereby certify that the foregoing Ordinance was duly and regularly passed by the City Council of the City of Portola at a Regular Meeting held on September 9, 2020.

//S// Tara Kindall
Tara Kindall, Deputy City Clerk

Appendix I

Woodstove Events for the Greater Portola Wood Stove Change-out Program

Wood Stove Workshop

hosted by the Northern Sierra
Air Quality Management District

WHEN: Thursday, March 19, 2015 6:00PM
WHERE: Portola Veterans Hall
(children welcome; snacks provided)

WHY: **Burning seasoned wood and using best practices in a certified wood stove saves money, time and effort!**

Join the professionals in the industry and view demonstrations on smart burning practices:

**Keynote presentation by John Crouch
(Hearth, Patio and Barbecue Assn.)**

Wood stove retailers – WOOD STOVE DEMONSTRATIONS

Chimney sweeps

Fire agencies

Public health officials

**DRAWING for a \$1,000
gift certificate at Quincy Hot Spot!**
Must fill out the survey on the back;
MUST be present to win!

**DRAWING for a \$1,000 gift certificate
at Wolf Creek Wood Stoves!**
Must fill out the survey on the back;
MUST be present to win!

And more giveaways



Wood Stove Change-Out Fair

hosted by the Northern Sierra Air Quality Management District (NSAQMD)

www.myairdistrict.com

Wood Stove Change-Out Information Line: 530-832-4067

WHEN: Saturday, April 9, 2016 11:00AM-2:00PM

**WHERE: Portola Veterans Hall
(children welcome; snacks provided)**

- **LEARN ABOUT THE GREATER PORTOLA WOOD STOVE CHANGE-OUT PROGRAM**
- **LEARN HOW TO HEAT YOUR HOME MORE EFFICIENTLY AND COST EFFECTIVELY**

PARTICIPATING PARTNERS INCLUDE:

- WOOD STOVE RETAILERS/MANUFACTURERS – WOOD STOVE DEMONSTRATIONS
- HEARTH, PATIO & BARBEQUE ASSN. REPRESENTATIVES
- STATE AND FEDERAL AGENCY REPRESENTATIVES
- PUBLIC HEALTH OFFICIALS... AND MORE!

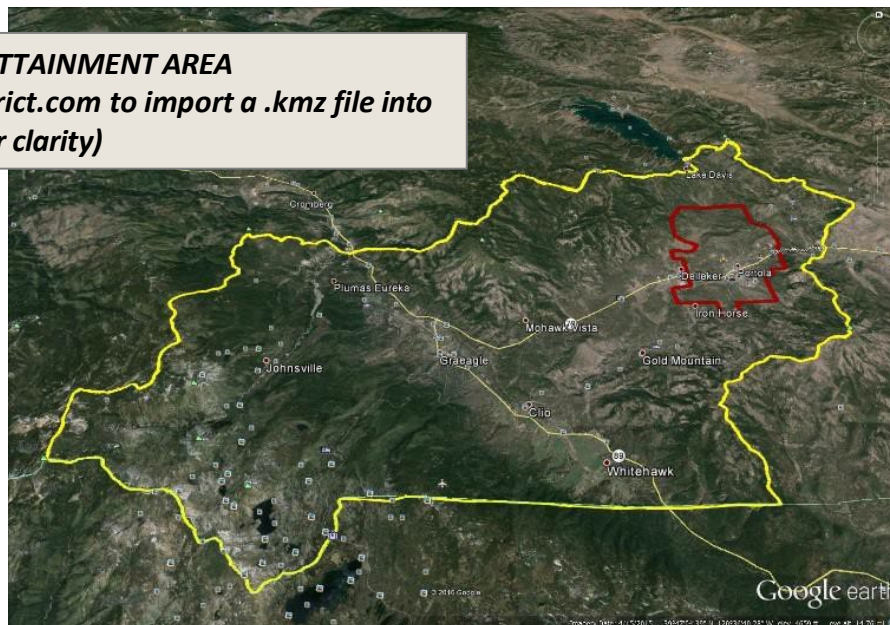
Admission is FREE and the first 20 people to sign in will receive a complimentary gift.



All attendees will be entered in a drawing to win a \$25 gift certificate for Leonard's Market

MAP OF PM2.5 NON-ATTAINMENT AREA

(Go to www.myairdistrict.com to import a .kmz file into Google Earth for better clarity)



ELIGIBILITY CRITERIA FOR ALL PARTICIPANTS:

- Must currently have an installed, operating non-EPA certified wood stove.
- Must submit a completed application to be considered for the program. Applications will be disqualified:
 - IF the old device is removed from the home prior to application approval
 - IF the new certified, device is purchased before application approval
 - IF any information on the application is false or incomplete
- Installation must be completed by a District-Approved Retailer

ZONE 1 CRITERIA:

- Must reside within the City of Portola Sphere of Influence.

MAXIMUM FUNDING:

- Up to \$3,500 to replace a non-certified wood burning device with an EPA certified wood burning device.
- Up to \$4,500 to replace a non-certified wood burning device with a pellet, propane or kerosene heating device.

ZONE 2 CRITERIA:

- Must reside within the Greater Portola PM2.5 Non-Attainment Area (and outside the City of Portola Sphere of Influence).
- Low-Income residents will qualify for greater funding.

MAXIMUM FUNDING:

- Up to \$1,500 to replace a non-certified wood burning device with an EPA certified wood burning device.
- Up to \$3,000 to replace a non-certified wood burning device with a pellet, propane or kerosene heating device.
- Up to \$3,500 for low income residents to replace a non-certified wood burning device with an EPA certified wood burning device.
- Up to \$4,500 for low income residents to replace a non-certified wood burning device with a pellet, propane or kerosene heating device.

ZONE 2 INCLUDES COMMUNITIES OF IRON HORSE, DELLEKER, C-ROAD, MOHAWK VISTA, PLUMAS-EUREKA, BLAIRSDEN-GRAEAGLE, GOLD MOUNTAIN, WHITEHAWK, CLIO, JOHNSTVILLE, AND PORTIONS OF LAKE DAVIS.



Feria para intercambio de Estufas de Leña

Organizada por Northern Sierra Air Quality Management District (NSAQMD)

www.myairdistrict.com

Wood Stove Change-Out Information Line: 530-832-4067

CUANDO: Sabado, Abril 9, 2016 11:00AM-2:00PM

DONDE: Edificio de Veteranos en Portola

(Niños bienvenidos; aperitivos disponibles)

- **APRENDE MAS SOBRE EL PROGRAMA “UN MEJOR PORTOLA-INTERCAMBIO DE ESTUFAS DE LEÑA.”**
- **APRENDE COMO CALENTAR TU HOGAR MAS EFICIENTEMENTE A UN COSTO EFECTIVO.**

SOCIOS PARTICIPANTES INCLUYEN:

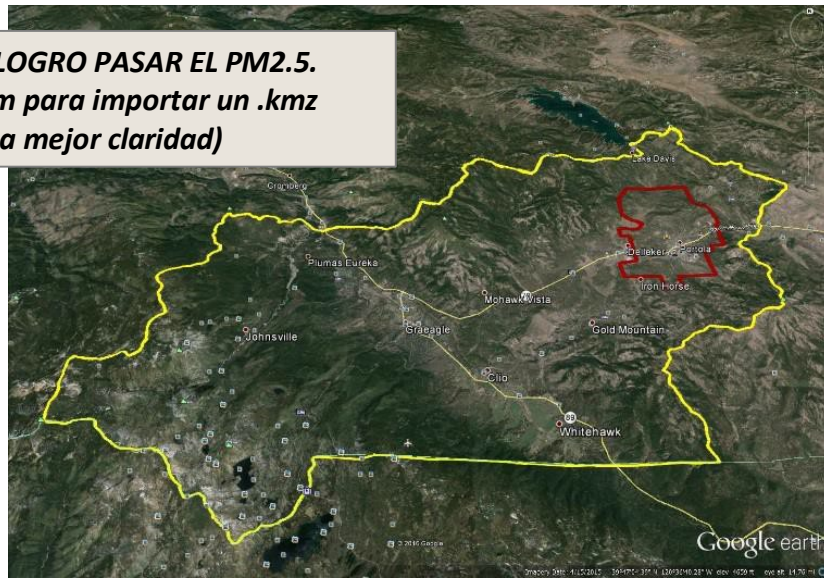
- COMERCIANENTES Y FABRICANTES DE ESTUFAS DE LEÑA. - DEMONSTRACIONES DE ESTUFAS DE LEÑA.
- REPRESENTANTES DE CHIMENEAS, PATIO & BARBEQUE.
- REPRESENTANTES DEL ESTADO Y AGENCIAS FEDERALES.
- OFICIALES DE SALUD PUBLICA ... Y MAS!

Admision es GRATIS y a las primeras 20 personas que se registren recibiran un regalo complimentary.



Todas las personas que asistan a la feria seran parte de una rifa para ganar una tarjeta de \$25.00 para la tienda LEONARD'S.

MAPA DE LA AREA QUE NO LOGRO PASAR EL PM2.5.
(Ve a www.myairdistrict.com para importar un .kmz archivo en Google Earth para mejor claridad)



CRITERIA DE ELIGIBILIDAD PARA TODOS LOS PARTICIPANTES:

- Debe actualmente tener una estufa de leña ya instalada, que funcione y que sea no-EPA certificada.
- Debe entregar una aplicacion completa para ser considerado para el programa. Aplicaciones que seran descalificadas son:
 - Si la estufa vieja es removida del hogar antes de la aprobacion de la aplicacion.
 - Si la nueva estufa certificada es comprada antes de la aprobacion de la aplicacion.
 - Si cualquier informacion en la aplicacion es falsa o incompleta.
- La instalacion debe ser hecha por un vendedor –aprobado por el distrito.

CRITERIA DE LA ZONA 1:

- Debe recidir dentro de la Ciudad de Portola.

MAXIMA FINANCIACION:

- Maximo de \$3,500 para reemplazar una estufa de leña no-certificada a una estufa de leña EPA-certificada.
- Maximo de \$4,500 para reemplazar una estufa de leña no-certificada a una estufa de calentamiento para el Propane, o Kerosene(Queroseno).

CRITERIA DE LA ZONE 2:

- Debe recidir dentro de la area de Portola que no logro pasar el PM2.5 (y fuera de la ciudad de Portola y alrededores).
- Residentes de bajos ingresos pueden calificar para mas financiacion.

MAXIMA FINANCIACION:

- Maximo de \$1,500 para reemplazar una estufa de leña no-certificada a una estufa de leña EPA-certificada.
- Maximo de \$3,000 para reemplazar una estufa de leña no-certificada a una estufa de calentamiento para el Propane, o Kerosene(Queroseno).
- Maximo de \$3,500 para residentes de bajos ingresos para reemplazar una estufa de leña no-certificada a una estufa de leña EPA-certificada.
- Maximo de \$4,500 para residentes de bajos ingresos para reemplazar una estufa de leña no-certificada a una estufa de calentamiento para el Propane, o Kerosene(Queroseno).

LA ZONA 2 INCLUYE COMUNIDADES DE :IRON HORSE, DELLEKER, C-ROAD, MOHAWK VISTA, PLUMAS-EUREKA, BLAIRSDEN-GRAEAGLE, GOLD MOUNTAIN, WHITEHAWK, CLIO, JOHNNSVILLE, Y PARTES DE LAKE DAVIS.



Wood Stove Fair

WHEN: Friday, April 21, 2017 2:00-6:00PM

WHERE: Portola Veterans Hall Parking Lot
(children welcome; snacks provided)

- Learn about the Greater Portola Wood Stove Change-Out program
- Learn how to **SAVE MONEY AND WOOD** by heating your home more efficiently

ASK THE EXPERTS:

- How can I use less wood and heat my home better?
- Why is it important to burn wood that is dry & seasoned?
- I am stuck with wet wood... what should I do?
- Why does creosote build up in my chimney?
- Why does smoke come out of my chimney (and sometimes back into my house)?
- What is the best way to heat my home overnight?
- What new technology is in EPA certified stoves?

GRILLED
HOT
DOGS!

**ALL
ATTENDEES
WILL BE
ENTERED IN A
DRAWING TO
WIN A WOOD
SHED!!**

(Must sign in and print name
and phone number legibly)

Admission is **FREE** and the first 20 people to sign in will receive a bag full of goodies.

**+ MORE
GIVE-
AWAYS!**

Color and turn in the activity on the back of this flier to be entered in a drawing for two \$50 Leonard's gift cards.



GREATER PORTOLA WOOD STOVE CHANGE-OUT PROGRAM

HOSTED BY THE NORTHERN SIERRA AIR QUALITY MANAGEMENT DISTRICT (NSAQMD)

Feria de Estufas de Lena

CUANDO: Viernes, Abril 21, 2017 2:00-6:00PM

DONDE: En el Salon de los Veteranos en Portola en el Parqueadero
(ninos bienvenidos; se proveeran bocadillos)

- **Aprenda acerca de el gran programa de cambio de estufas de lena en Portola**
- **Aprenda como ahorrar dinero y lena calentando su casa eficientemente**

Pregunte a los expertos:

- Como puedo usar menos lena y calentar mi casa mejor?
- Porque es importante quemar lena seca de un ano o mas?
- Tengo problemas con la lena mojada... que puedo hacer?
- Porque el creosote se forma en mi chimenea?
- Porque sale humo de mi chimenea (y algunas veces dentro de mi casa)?
- Cual es la mayor forma de calentar mi casa toda la noche?
- Que nueva tecnologia tienen las estufas certificadas de EPA?

HOT
DOGS A
LA
PARRILLA!

Todos los asistentes entraran en una rifa para ganar un covertizo para guardar lena!!

(Tienen que firmar su nombre y numero de telefono elegible)

Admision es gratis y las primeras 20 personas que firmen al llegar recibiran una bolsa llena de regalos.

Y mucho mucho mas!

Coloren y sometan la actividad por atras de este flayer para entrar a una rifa para dos tarjetas de regalo de \$50 de la tienda Leonard's.



Gran Programa de Cambio de Estufas de Lena en Portola

FREE HOT DOGS!
AND ACTIVITIES FOR KIDS

Northern Sierra
Air Quality
Management District



COMMUNITY FIREWISE DAY

May 19, 2018 11:00-1:00

Portola City Park

YOUR COMMUNITY NEEDS YOU! Every hour you spend reducing fuels around your home and property counts toward becoming a FIREWISE COMMUNITY!



FIREWISE USA[®]
RESIDENTS REDUCING WILDFIRE RISKS



- ✓ Smokey Bear
- ✓ Learn how to protect your community by making your home and property fire resistant
- ✓ Learn about resources for creating defensible space
- ✓ Learn about the Community Wildfire Protection Plan
- ✓ Learn how to protect your home from fire within
- ✓ Learn about the Wood Stove Change-Out Program and meet participating retailers:

**WOLF CREEK
WOOD STOVES**

Phone: (530) 283-2929
Fax: (530) 283-2338
2019 E. Main St.
Quincy, CA 95971



Hours of Operations
Tuesday - Friday
9:30 a.m. - 5:30 p.m.
Saturday
10 a.m. - 4 p.m.

GREATER PORTOLA WOOD STOVE CHANGE-OUT PROGRAM



Stove Workshop & Fair

WHEN: Saturday, April 6, 2019 11:00AM

WHERE: Portola Veterans Hall Parking Lot
(children welcome; lunch provided)

PRESENTATIONS BEGIN PROMPTLY AT 11:00.

Followed by lunch, stove demos and fire building demos (until 2:00PM).

**WOLF CREEK
WOOD STOVES**

530-832-9859 (store)
530-616-0135 (cell)

All attendees will be
entered in a drawing to
win a **CORD OF WOOD!**

(Must sign in and print legibly)



530-283-2929

SAVE MONEY AND WOOD by heating your home more efficiently!

ASK THE EXPERTS!

- Heating device manufacturers
- Local stove retailers and installers
- Chimney sweeps
- Plumas County Public Health
- Hearth, Patio and Barbeque Association representatives
- Greater Portola Wood Stove Change Out Program (Northern Sierra Air District)



Admission is FREE and the
first 20 people to sign in will
receive a bag full of goodies.

Fill out the survey on the back of this flier and
bring it on April 6 to be entered in a drawing for
a \$100 ACE HARDWARE GIFT CARD.



GREATER PORTOLA WOOD STOVE CHANGE-OUT PROGRAM

HOSTED BY THE NORTHERN SIERRA AIR QUALITY MANAGEMENT DISTRICT (NSAQMD)



GREATER PORTOLA WOOD STOVE CHANGE-OUT PROGRAM

YOU MAY QUALIFY FOR A NEW, EPA CERTIFIED HEATING DEVICE AT LITTLE TO NO COST TO YOU!!

- ✓ Do you heat your home with a wood stove that is at least 20 years old (or fireplace)?
- ✓ Do you live within the Portola, Clio, Blairsden, Graeagle, Johnsville area?

CALL THE NORTHERN SIERRA AIR DISTRICT AT 530-832-0102 TODAY TO SEE IF YOU QUALIFY!

Federal funds for this program are available through 2020, or until funds run out.

Please circle or fill in answers below.

1. Are you aware of the Greater Portola Wood Stove Change-Out Program? YES NO
2. Have you participated in the program? YES NO
3. Are you familiar with the CLEAR THE AIR; CHECK BEFORE YOU LIGHT program? YES NO
4. Are you aware that beginning January 1, 2021 there will be times during the winter that burning will be allowed ONLY in EPA certified heating devices? YES NO
5. Is your residence heated with a wood burning device? YES NO (skip to #11)
6. If yes, circle the type of device it is (if more than one, the one you use most):
 FIREPLACE WOOD STOVE PELLET STOVE FIREPLACE INSERT OUTDOOR WOOD BOILER
7. Is your wood burning device EPA certified (generally manufactured after 1990)?
 N/A YES NO NOT SURE
8. If burning wood, where is it obtained? CUT BUY
9. If purchasing wood, what is the cost per cord? \$ _____
10. How many cords do you use annually? _____
11. If you are not burning wood, how is your home heated? _____

In order to qualify for the **\$100 Ace Hardware gift card**, please fill out your contact information legibly:

NAME _____

ADDRESS _____ CITY _____ ZIP _____

PHONE _____ EMAIL _____

SECURE AN EPA CERTIFIED HEATING DEVICE TODAY... before funds run out!

- ✓ EPA Certified wood stove (freestanding or insert)
- ✓ EPA Certified pellet stove
- ✓ Propane or kerosene heating device

FERIA Y TALLER DE ESTUFA

Cuando: Sábado, Abril 6, 2019 11:00AM

Donde: Portola Veterans Hall Parking Lot (niños bienvenidos; se proveerá almuerzo)

Las presentaciones comienzan puntualmente a las 11:00 AM.

Seguido por el almuerzo, demostraciones de estufas y de la construcción de fuego (hasta las 2:00PM).

**WOLF CREEK
WOOD STOVES**

530-832-9859 (store)
530-616-0135 (cell)

Todos los asistentes serán ingresados en un sorteo para ganar **UNA CUERDA DE LEÑA!**
(Debe registrarse e imprimir de forma legible)



530-283-2929

AHORRE DINERO Y LEÑA CALENTANDO SU HOGAR DE MANERA MAS EFICIENTE!

PREGUNTA A LOS EXPERTOS!

- Fabricantes de dispositivos de calentamiento
- Proveedores locales de estufas e instaladores
- Limpieza de chimenea
- Plumas County Public Health
- Representantes de asociaciones de piso, patios y barbacoa
- Greater Portola Programa De Estufa de Leña (Northern Sierra Distrito De Aire)



La entrada es GRATIS y las primeras 20 personas que se registren recibirán una bolsa llena de premios.

Complete la encuesta en la parte posterior del folleto y llévela para que se ingrese en el sorteo para ganar una tarjeta de \$100 de ACE HARDWARE.



GREATER PORTOLA WOOD STOVE CHANGE-OUT PROGRAM

PUEDEN CALIFICAR PARA UN NUEVO DISPOSITIVO, DE CALEFACCIÓN CON CERTIFICACIÓN EPA A UN COSTO MUY BAJO O SIN COSTO PARA USTED !!

- ✓ ¿Calienta su casa con una estufa de leña que tiene más de 20 años (o chimenea)?
- ✓ ¿Vives dentro la zona de Portola, Clio, Blairsden, Graeagle, Johnsville?

LLAME A NORTHERN SIERRA DISTRITO DE AIRE A 530-832-0102 LLAME HOY AVES SI CALIFICA!

Los fondos federales para este programa están disponibles hasta el 2020, O hasta que se terminen los fondos.

Por favor circule o complete las respuestas abajo.

1. ¿Has escuchado del Programa De Cambio De Estufa De Leña De Portola? SI NO
2. ¿Has participado en el programa? SI NO
3. ¿Estas familiarizado con el programa de CLEAR THE AIR: CHECK BEFORE YOU LIGHT? SI NO
4. ¿Conoces que el principio de Enero 1, 2021 Habra ocasiones durante el invierno en las que se permitira la quema SOLAMENTE en dispositivos de calefaccion certificados por EPA? SI NO
5. ¿Es su residencia calentada con una estufa de leña? SI NO (saltar al #11)
6. Si su respuesta es SI, Circule el tipo de dispositivo (si es mas de una, la que mas utilizas):

CHIMENEA	ESTUFA DE LEÑA	ESTUFA DE PELLETS	INSERTO DE CHIMENEA
CALDERA DE MADERA AL AIRE LIBRE			
7. ¿Esta su dispositivo que quema leña certificado por EPA (generalmente fabricado despues de 1990)?

No disponible	SI	NO	NO ESTA SEGURO
---------------	----	----	----------------
8. ¿Si quema leña, donde se obtiene? CORTA COMPRA
9. Si se compra leña, ¿cual es el costo por cuerda? \$ _____
10. ¿Cuantas cuerdas usa annualmente? _____
11. Si no estas quemando leña, ¿como se calienta su casa? _____

Para calificar para la tarjeta de \$100 de Ace Hardware, complete su información de contacto de manera legible:

Nombre _____

Direccion _____ Ciudad _____ Codigo Postal _____

Telefono _____ Correo Electronico _____

ASEGURE UN DISPOSITIVO DE CALEFACCION CERTIFICADO POR LA EPA HOY... ¡ANTES QUE SE TERMINEN LOS FONDOS!

- ✓ ESTUFA DE LEÑA CERTIFICADA POR LA EPA (de pie o insertada)
- ✓ ESTUFA PELLETS CERTIFICADA POR LA EPA
- ✓ DISPOSITIVO DE CALENTAMIENTO DE PROPANO O KEROSENO

Fall BurnWise Workshop

WHEN: Saturday, November 23rd, 2019 2:00PM to 4:00PM

WHERE: Portola Veterans Hall

Children Welcome

Free Food * Free Gifts * Free Fun

Admission is FREE and the first 20 people to sign in will receive a bag full of goodies.

KEEP YOUR HOME SAFE THIS WINTER

Am I at risk of a flue fire?

How do I know if my wood is dry enough to burn in my wood stove?

What is the best way to store my wood or pellets?

I have an EPA certified wood stove; why do I still see smoke coming out the chimney?

Do I have appropriate clearance around my home to keep it safe from fire?

COME FIND OUT!

- How to prevent a flue fire
- Wood storage options
- How to determine if your wood is optimal to burn
- The importance of regular chimney sweeps
- How to burn safely in a wood or pellet stove
- The Clear the Air; Check Before You Light program and device registration
- Greater Portola Wood Stove Change Out Program
- Talk to the Portola Firewise committee about protecting homes from wildfire



FIREWISE USA[®]
RESIDENTS REDUCING WILDFIRE RISKS

BECOME PART OF THE SOLUTION! Share your ideas and expertise with your community.

The Portola Jr/Sr High construction class has been busy building wood sheds! Check out their handiwork & enter a free drawing for one of four wood sheds completed by the students. Includes delivery!



GREATER PORTOLA WOOD STOVE CHANGE-OUT PROGRAM

Sponsored by the NORTHERN SIERRA AIR QUALITY MANAGEMENT DISTRICT (530) 832-0102 and the Eastern Plumas Rural Fire Department



Taller de Otoño BurnWise

Cuando: Sabado, Noviembre 23 de 2019 2:00PM a 4:00PM

Dónde: Portola Veterans Hall

Niños Bienvenidos

Comida Gratis * Regalos Gratis * Diversión Gratis

Admisión es GRATIS y las primeras 20 personas en registrarse recibirán una bolsa llena de premios.

MANTENGA SU HOGAR SEGURO ESTE INVIERNO

- ¿ Estoy en riesgo de un incendio de chimenea?
- ¿ Cómo sé si mi madera está lo suficientemente seca como para quemar en mi estufa de leña ?
- ¿Cuál es la mejor manera de almacenar mi madera o pellets?
- ¿ Tengo una estufa de leña certificada por EPA; ¿Por qué sigo viendo humo saliendo de la chimenea?
- ¿ Tengo un espacio libre adecuado alrededor de mi casa para mantenerla a salvo del fuego?

VEN A DESCUBRIR!

- Cómo prevenir un fuego de incendio de chimenea
- Opción de almacenamiento de madera
- Cómo determinar si tu madera es óptima para quemar
- La importancia de deshojar la chimenea regularmente
- Cómo quemar de manera segura en una estufa de leña o de pellets
- The Clear the Air; Check Before You Light programa y el registro del dispositivo
- Greater Portola Programa de Cambio de Estufa de Leña
- Hable con el comité de Portola Firewise sobre la protección de los hogares contra incendios forestales



FIREWISE USA
RESIDENTS REDUCING WILDFIRE RISKS

¡CONVIÉRTETE EN PARTE DE LA SOLUCIÓN!

Conparta sus ideas y experiencia con su comunidad.

La clase de construcción Portola Jr / Sr High ha estado ocupada construyendo casitas de madera! ¡Eche un vistazo al trabajo e ingrese al sorteo gratuito para una de las cuatro casitas de madera construido por los estudiantes. Incluye entrega a domicilio!



GREATER PORTOLA PROGRAMA DE CAMBIO DE ESTUFA DE LEÑA

Patrocinado por NORTHERN SIERRA AIR QUALITY MANAGEMENT DISTRICT (530) 832-0102 y Eastern Plumas Rural Fire Department



September 24 | 11 – 3 P.M

Portola Veterans Hall 449 W. Sierra
Ave. Portola, CA

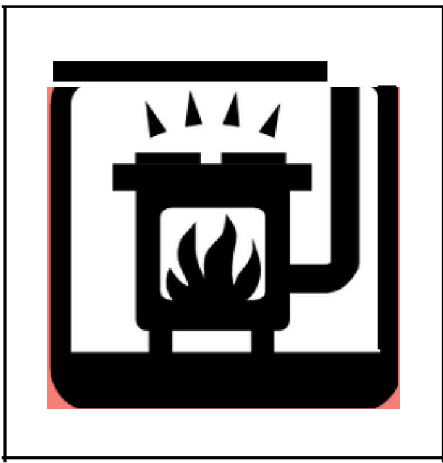
Burn Wise Event

**WOODSTOVE CHANGE-OUT PROGRAM
CHIMNEY SWEEP VOUCHERS**

Join in a wood heating device workshop with installers, representatives & our local Air Quality District.**Food and beverages provided, three 1- cord woodshed raffle.

Free BIOBLOCKS Children welcome!

Sponsored by NSAQMD



WOOD STOVE EVENT

ASK THE EXPERTS

WOOD STOVE RETAILERS & INSTALLERS

HPBA

NORTHERN SIERRA AIR DISTRICT

LOCAL HEAT PUMP INSTALLERS

RANS HALL
FREE LUNCH AND REFRESHMENTS

APRIL 22, 2023
11-3PM

Northern Sierra
Management District



PRESENTATIONS

BEGIN PROMPTLY AT 11AM

RAFFLE PRIZES!

FOR MORE INFORMATION, CONTACT MIKKI BROWN AT (530) 832-0102

Appendix J
Atypical and Unrepresentative
PM2.5 Events Demonstration

Portola

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Introduction

While preparing data for calculating the 2021 base year annual PM_{2.5} design value, CARB staff identified 19 data points that are not typical or not expected to reoccur in the future, or otherwise unrepresentative or irregular in nature. Removing these exceptional, extreme, or unrepresentative data will result in a base year design value that more accurately represents Portola's air quality. Since these events do not influence regulatory determinations, they fall outside of the scope of the Exceptional Events Rule¹ (EER) and should instead be analyzed in accordance with U.S. EPA 2019 guidance, *Additional Methods, Determinations, and Analyses to Modify Air Quality Data*² for handling air quality data that may have been influenced by atypical, extreme, or unrepresentative events outside of the realm of regulatory determination. Under this guidance, modeling analyses used for estimating base and future year design values for PM_{2.5} attainment demonstrations may exclude atypical or unrepresentative monitoring data. Data points listed in Table 1 were demonstrated to be atypical or unrepresentative and were therefore excluded from the attainment demonstration for the Portola Serious State Implementation Plan for the 2012 PM_{2.5} Annual Standard (Portola Serious SIP). This lowered the 2021 base year design value from 16.5 ug/m³ to 12.6 ug/m³. This appendix includes an extensive event write-up demonstrating that the excluded data points were atypical or unrepresentative. Of the 19 data points, 17 were impacted by wildfires and the remaining two were proven to be erroneous measurements.

¹ U.S. EPA, Treatment of Air Quality Data Influenced by Exceptional Events, <https://www.epa.gov/air-quality-analysis/treatment-air-quality-data-influenced-exceptional-events-homepage-exceptional>

² U.S. EPA Memorandum, Additional Methods, Determinations, and Analyses to Modify Air Quality Data Beyond Exceptional Events. April 4, 2019: <https://www.epa.gov/air-quality-analysis/clarification-memo-additional-methods-determinations-and-analyses-modify-air>

Table 1. Days Excluded from the Modeling and Attainment Demonstration

Site	Year	Quarter	Date	PM2.5 (ug/m3)	Event Type
Portola-Gulling Street	2020	3	8/19/20	70.3	Atypical Event
Portola-Gulling Street	2020	3	8/22/20	92.4	Atypical Event
Portola-Gulling Street	2020	3	8/25/20	61.9	Atypical Event
Portola-Gulling Street	2020	3	8/28/20	74.5	Atypical Event
Portola-Gulling Street	2020	3	8/31/20	56.3	Atypical Event
Portola-Gulling Street	2020	3	9/3/20	75.1	Atypical Event
Portola-Gulling Street	2020	3	9/12/20	453.4	Atypical Event
Portola-Gulling Street	2020	3	9/15/20	52	Atypical Event
Portola-Gulling Street	2020	3	9/21/20	60.1	Atypical Event
Portola-Gulling Street	2020	3	9/30/20	76.3	Atypical Event
Portola-Gulling Street	2021	3	7/24/21	77.4	Atypical Event
Portola-Gulling Street	2021	3	8/2/21	34.3	Unrepresentative
Portola-Gulling Street	2021	3	8/5/21	70.1	Unrepresentative
Portola-Gulling Street	2021	3	8/11/21	81.5	Atypical Event
Portola-Gulling Street	2021	3	8/14/21	41.8	Atypical Event
Portola-Gulling Street	2021	3	8/20/21	38.1	Atypical Event
Portola-Gulling Street	2021	3	8/23/21	31.6	Atypical Event
Portola-Gulling Street	2021	3	8/29/21	37.1	Atypical Event
Portola-Gulling Street	2021	3	9/4/21	44	Atypical Event

Atypical Events Impacted by Wildfires

The summers of 2020 and 2021 were extreme fire seasons, with numerous wildfires active during the time of the exceedances discussed in this demonstration (2020 shown in: Figure 1 and Table 2; 2021 shown in: Figure 2 and Table 3),³ although not all the active wildfires impacted the monitor on any given day.

In 2020, there were approximately 9,900 wildfires that burned 4.3 million acres across the state of California⁴ then in 2021, there were approximately 8,800 wildfires that burned 2.5 million acres.⁵ 2020 was the largest wildfire season (based on acres burned) recorded in California's modern history, followed by 2021.⁶

Hot and dry conditions at the surface, combined with mid-level moisture, resulted in elevated instability. Thunderstorms ignited multiple wildfires, resulting in smoke that accumulated throughout northern and central California. The accumulating smoke layers made identification of the impact of just one wildfire difficult. The major wildfires active during the 2020 and 2021 the atypical event periods are shown in Table 2 (2020) and Table 3 (2021) and shown visually in Figure 1 (2020) and Figure 2 (2021).

Table 2: Major wildfires active during the 2020 events (in order of ignition)⁷

Name	Source	Start Date	Containment	Latitude	Longitude	Acres
Red Salmon Complex	Lighting	2020-07-27	2020-11-17	41.168	-123.407	144,679
Loyalton Fire	Lighting	2020-08-14	2020-08-26	39.70244	-120.143473	47,029
August Complex (includes Doe Fire)	Lighting	2020-08-16	2020-11-11	39.776	-122.673	1,032,648
CZU Lightning Complex	Lighting	2020-08-16	2020-09-22	37.17162	-122.22275	86,509

³ CalFire, [2020 Incidents](#) and [2021 Incidents](#), last accessed 2023-11-29

⁴ UC Davis, [2020 California wildfire statistics](#), last accessed 2023-11-29

⁵ Western Fire Chiefs Association, [2021 California wildfire statistics](#), last accessed 2023-11-29

⁶ National Interagency Fire Center, [Fire information and statistics](#), last accessed 2023-11-29

⁷ CalFire, [2020 Incidents](#), last accessed 2023-11-29

Name	Source	Start Date	Containment	Latitude	Longitude	Acres
SCU Lightning Complex	Lighting	2020-08-16	2020-10-01	37.43944	-121.30435	396,624
Butte/Teha ma/Glenn Lightning Complex	Lighting	2020-08-17	2020-10-09	40.09571	-122.4393	19,609
LNU Lightning Complex	Lighting	2020-08-17	2020-10-02	38.48193	-122.14864	363,220
Jones	Lighting	2020-08-17	2020-08-28	39.29241	-121.10035	705
North Complex	Lighting	2020-08-18	2020-12-03	39.69072	-121.22718	318,935
W-5 Cold Springs	Lighting	2020-08-18	2020-09-16	41.02861	-120.281389	84,817
Salt	Lighting	2020-08-18	2020-08-24	38.02792	-120.76326	1,789
Sheep Fire	Lighting	2020-08-22	2020-09-09	40.274	-120.757	29,570
Creek Fire	UI	2020-09-04	2022-10-21	37.19147	-119.261175	379,895
Slater Fire (includes Devil Fire)	UI	2020-09-07	2020-12-10	41.86889	-123.44963	157,229
Glass	UI	2020-09-27	2020-10-20	38.56295	-122.49745	67,484
Zogg Fire	UI	2020-09-27	2020-10-13	40.53927	-122.56656	56,338

UI = Under Investigation

Figure 1: Major wildfires active during August and September 2020

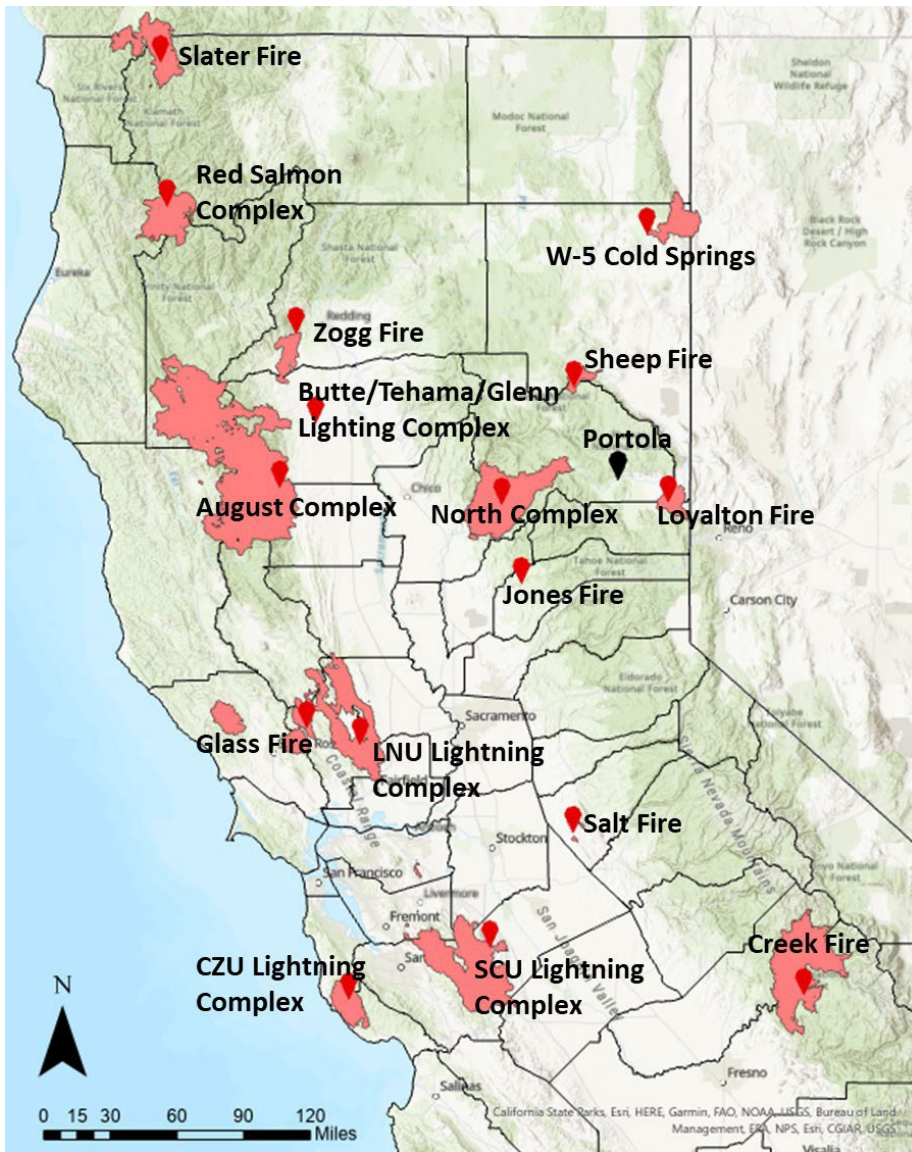
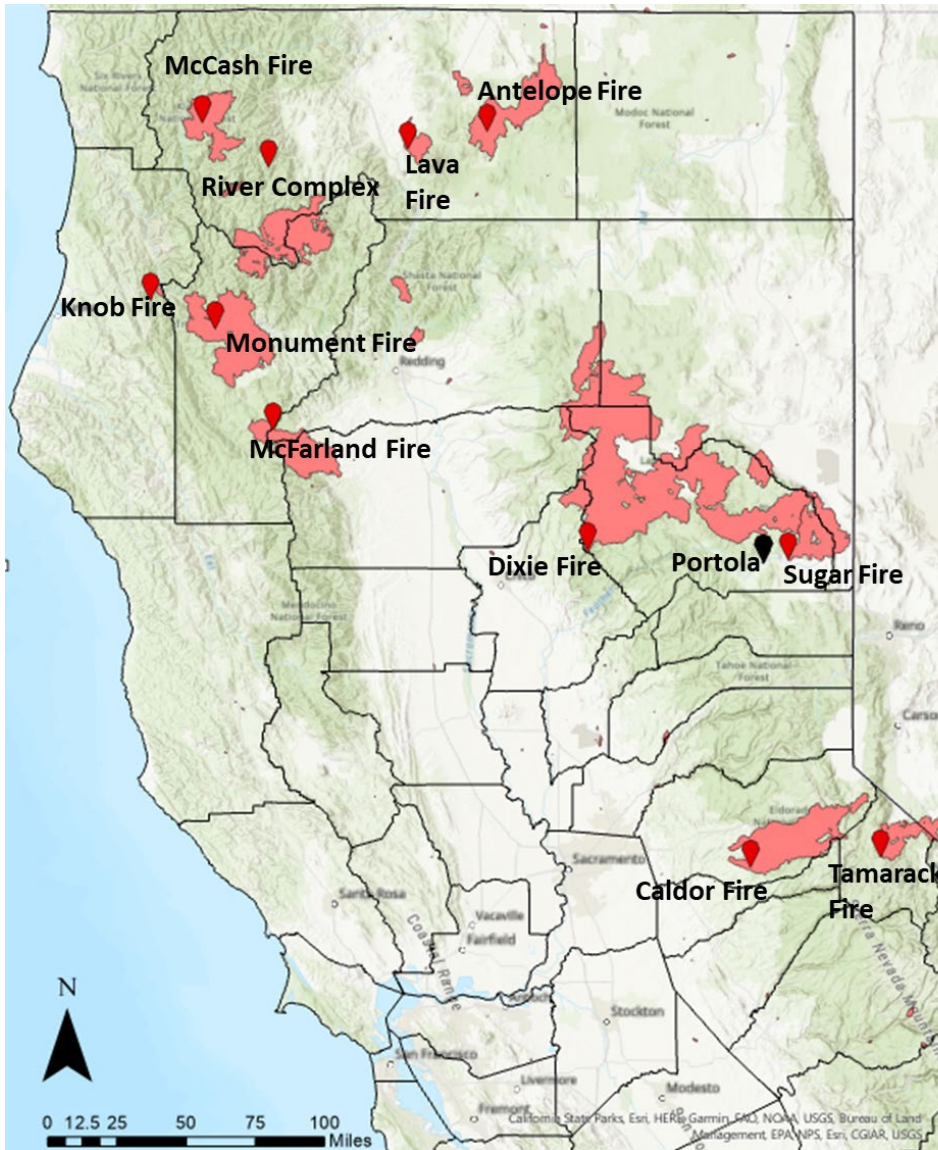


Table 3: Major wildfires active during the 2021 events (in order of ignition)

Name	Source	Start Date	Containment	Latitude	Longitude	Acres
Lava Fire	Lightning	2021-06-24	2021-10-26	41.459	-122.329	26,409
Beckwourth Complex (includes Sugar fire)	Lightning	2021-07-04	2021-09-22	39.83203	-120.3415	105,670
Tamarack Fire	Lightning	2021-07-04	2021-10-25	38.6280042	-119.85919	68,637
Dixie Fire	Equipment	2021-07-13	2021-10-25	39.871306	-121.38944	963,309
McFarland Fire	Lightning	2021-07-30	2021-09-16	40.35	-123.034	122,653
Monument Fire	Lightning	2021-07-30	2021-10-26	40.752	-123.337	223,124
River Complex Fire	Lightning	2021-07-30	2021-10-26	41.389	-123.057	199,359
Antelope Fire	Lightning	2021-08-01	2021-10-15	41.5289901	-121.91549	145,632
Caldor Fire	UI	2021-08-14	2021-10-21	38.586	-120.5378	221,835
McCash Fire	Lightning	2021-08-18	2021-11-02	41.564	-123.404	94,962
Knob Fire	UI	2021-08-29	2021-09-13	40.8652	-123.6744	2,421

UI = Under Investigation

Figure 2: Active major wildfires in Northern California, July to September 2021



I. Summary of Event

A series of large wildfires were ignited across California from mid-August through September in 2020 and late-July to early-September in 2021. The majority of these fires occurred in the northern portion of the State (Figure 1 and Figure 2).

The following section provides evidence of the impact of these atypical event days listed in Table 4. Although the Portola monitor was affected by smoke from wildfires at other times during the 2020 and 2021 wildfire season, only the dates listed in Table 4 being requested for exclusion from the modeling exercise as atypical event days.

This demonstration uses the federal primary annual PM_{2.5} standard⁸ of 12 µg/m³. The PM_{2.5} annual standard is used, throughout this demonstration, to support the exclusion of data from the modeling base year design value calculation for the dates as listed in Table 4.

Table 4: List of Atypical Event Days in 2020 and 2021

Date	PM _{2.5} Daily Average (µg/m ³)	Date	PM _{2.5} Daily Average (µg/m ³)
2020-08-19	70.3	2021-07-24	77.4
2020-08-22	92.4	2021-08-11	81.5
2020-08-25	61.9	2021-08-14	41.8
2020-08-28	74.5	2021-08-20	38.1
2020-08-31	56.3	2021-08-23	31.6
2020-09-03	75.1	2021-08-29	37.1
2020-09-12	453.4	2021-09-04	44.0
2020-09-15	52.0		
2020-09-21	60.1		
2020-09-30	76.3		

II. Tools

A. Satellite Images

Moderate Resolution Imaging Spectroradiometer (MODIS) Terra⁹ satellite was used to visualize the smoke plumes on each atypical event day. MODIS views the entire Earth's surface every 1 to 2 days, in 36 spectral bands. Terra's orbit around the Earth is timed so that it passes from north to south across the equator in the morning.

Due to MODIS Terra satellite viewing the Earth's surface every 1 to 2 days, the satellite image only shows a snapshot of the visible smoke. This may not be an accurate representation of smoke impact during the maximum PM_{2.5} concentrations on a given atypical event day. It is

⁸ U.S. EPA Criteria Air Pollutants, [NAAQS Table](#)

⁹ NASA Moderate Resolution Imaging Spectroradiometer, [MODIS Terra](#)

also important to note that an active wildfire does not necessarily denote visible smoke emissions.

B. Backward Trajectory

National Oceanic and Atmospheric Administration's (NOAA's) Hybrid Single Particle Lagrangian Integrated Trajectory (HYSPLIT)¹⁰ model was used to determine simple back-trajectories showing the estimated path that an air parcel took for a specified period of time (here, 24 hours) before reaching the Portola PM_{2.5} monitor at the hour of maximum concentration in the exceeding PM_{2.5} daily average. The NAM 12km (hybrid sigma-pressure, U.S., 03-2010-present) Meteorology archived data set was used with, three height levels (red: 100 meters (m) above ground level (AGL), blue: 500m AGL; green: 1,000m AGL) to indicate transport near the surface and in the mid to upper levels of the atmosphere. Table 5 indicates the hour of the maximum concentrations within the exceeding PM_{2.5} daily average, in PST (Pacific Standard Time) and UTC (Universal Coordinated Time). The HYSPLIT backward trajectory heights, for all atypical dates, can be found in Appendix I. HYSPLIT Backward Trajectory (from Monitor).

Google Earth was used as a platform to combine the HYSPLIT back-trajectories and the MODIS Terra satellite images to show the transport of smoke to the monitoring site.

¹⁰ NOAA Air Resources Laboratory, [HYSPLIT Trajectory Model](#)

Table 5: Date and Max hour of PM_{2.5} 1-hour concentration in both PST and UTC

Date (PST)	Max Hour (PST)	Date (UTC)	Max Hour (UTC)
2020-08-19*	22:00	2020-08-20	06:00
2020-08-22	13:00	2020-08-22	21:00
2020-08-25	12:00	2020-08-25	20:00
2020-08-28*	02:00	2020-08-28	10:00
2020-08-31*	02:00	2020-08-31	10:00
2020-09-03	07:00	2020-09-03	15:00
2020-09-12	03:00	2020-09-12	11:00
2020-09-15	06:00	2020-09-15	14:00
2020-09-21	05:00	2020-09-21	13:00
2020-09-30	18:00	2020-10-01	02:00
2021-07-24	17:00	2021-07-25	01:00
2021-08-11	18:00	2021-08-12	02:00
2021-08-14	11:00	2021-08-14	19:00
2021-08-20	23:00	2021-08-21	07:00
2021-08-23	12:00	2021-08-23	20:00
2021-08-29	10:00	2021-08-29	18:00
2021-09-04	8:00	2021-09-04	16:00

* PurpleAir maximum hour (PST and UTC) used

C. Hazard Mapping System Smoke Product

NOAA's Hazard Mapping System (HMS) Fire and Smoke Product¹¹ was used to support the transport of smoke to the Portola monitor on some of the dates. HMS is a blended product composed of fire detection data from three different satellites and uses both machine- and analysis-based data screening. The initial HMS product for the current day is created by satellite analysis, between 8:00 and 10:00 Eastern Time (ET), fine-tuned after 10:00 ET, and the product is finalized the following morning. More information about the NOAA HMS Fire and Smoke Product is available at the NOAA HMS website.^{11,12}

Google Earth was used as a platform to combine the HMS Smoke map and the HYSPLIT back-trajectories to show the transport of smoke to the monitoring site.

D. PurpleAir Data

PurpleAir¹³ hourly PM_{2.5} data was used to support that there was elevated PM_{2.5} in the area for three dates in 2020: August 19, August 28, and August 31. The PurpleAir PM_{2.5} U.S. Correction using the 'Current Correction (cf_atm)' piecewise equations,¹⁴ was applied to all the PurpleAir raw data used in this report. PurpleAir data was limited during the summer of 2020 and only one site was active during the time of the 2020 Portola atypical event days, the CARB Smoke NSAQMD Graeagle site. Figure 3, shows a map of both the Portola monitor and the PurpleAir Graeagle site. The two sites are approximately 8.6 miles apart, and Portola is approximately 480 feet higher in elevation. The PurpleAir Graeagle site was the closest PM_{2.5} monitor to Portola during the 2020 atypical events.

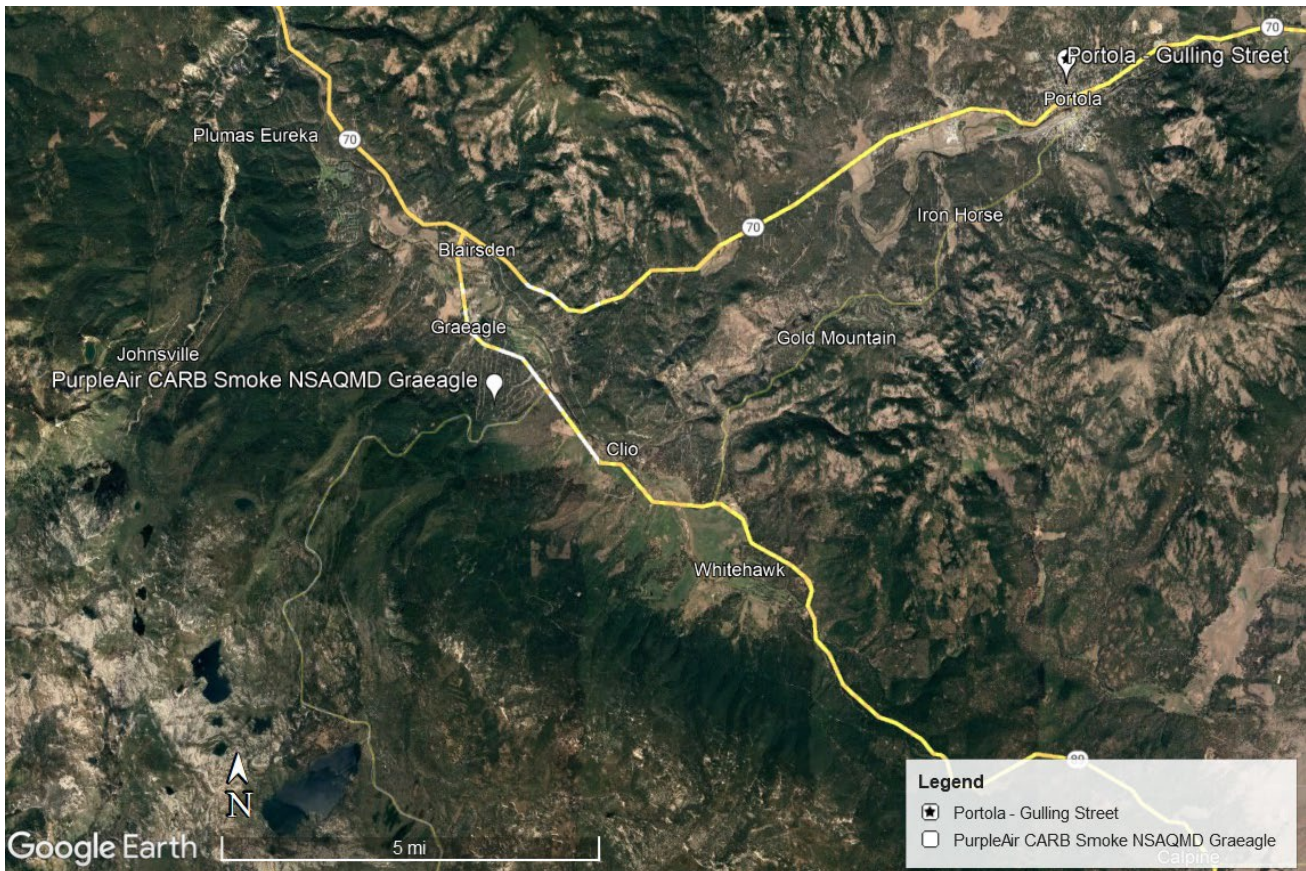
¹¹ NOAA Office of Satellite and Product Operations, [Hazard Mapping System Fire and Smoke Product](#)

¹² [NOAA HMS Fire Detection](#)

¹³ [PurpleAir Map](#)

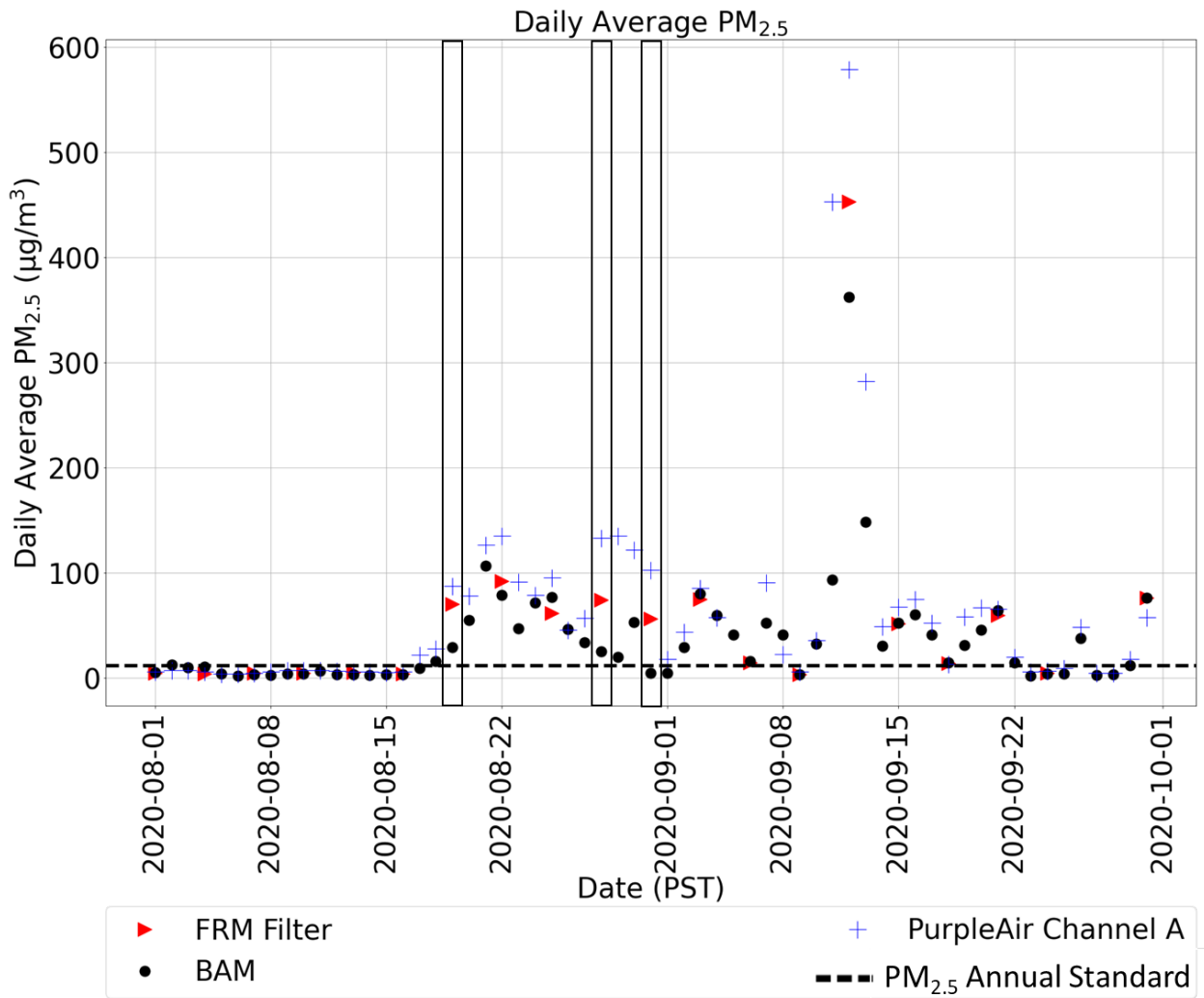
¹⁴ U.S. EPA Science Inventory, [PurpleAir PM_{2.5} U.S. Correction and Performance During Smoke Events](#), from [the URLs/Downloads PDF on page 26](#). Last accessed 1/18/2024.

Figure 3: Map of both the Portola Monitor and the PurpleAir Graeagle site



For the three dates listed above the Portola hourly $PM_{2.5}$ BAM data was extremely low compared to Primary $PM_{2.5}$ FRM Portola data. Due to these extreme differences PurpleAir data was used to support elevated $PM_{2.5}$ concentrations in Portola. Figure 4 shows the comparison between the Portola daily average primary FRM data, the Portola daily average BAM data, and the daily average PurpleAir data. The three dates mentioned above are highlighted. There are some slight deviations, but generally the daily average PurpleAir data and the primary FRM data track well together. More information regarding the Portola BAM data can be found in Sections VIII through XII.

Figure 4: Comparison of the daily PM_{2.5} for the Portola Primary FRM Filter, Portola BAM, and Graeagle PurpleAir



III. Event Descriptions

An average PM_{2.5} diurnal pattern for Portola can be found in Portola Serious SIP, Section II.C.4, showing the highest PM_{2.5} concentrations occurring during winter and during nighttime. Whereas the PM_{2.5} diurnal pattern on the atypical days (Table 4) are elevated throughout the day with many of the atypical days peaking midday. The average PM_{2.5} diurnal pattern shows a stark difference when compared to the diurnal pattern on the atypical days, in the following sections.

A. 2020 Atypical Days

1. August 19, 2020

Due to the drastic difference between the Portola BAM and Primary FRM 24-hour averaged data (Figure 4), PurpleAir data was also reviewed. Figure 5 shows the comparison between the hourly BAM and PurpleAir data on August 19, 2020. The hourly PurpleAir and BAM data

are in agreement until approximately 08:00 PST when the BAM and PurpleAir data start to deviate. The PurpleAir data agrees with the elevated primary FRM daily average PM_{2.5} concentration, indicating the high concentrations are due to the ongoing presence of wildfire smoke.

Figure 5: Hourly PM_{2.5} Portola BAM and Graeagle PurpleAir data on August 19, 2020

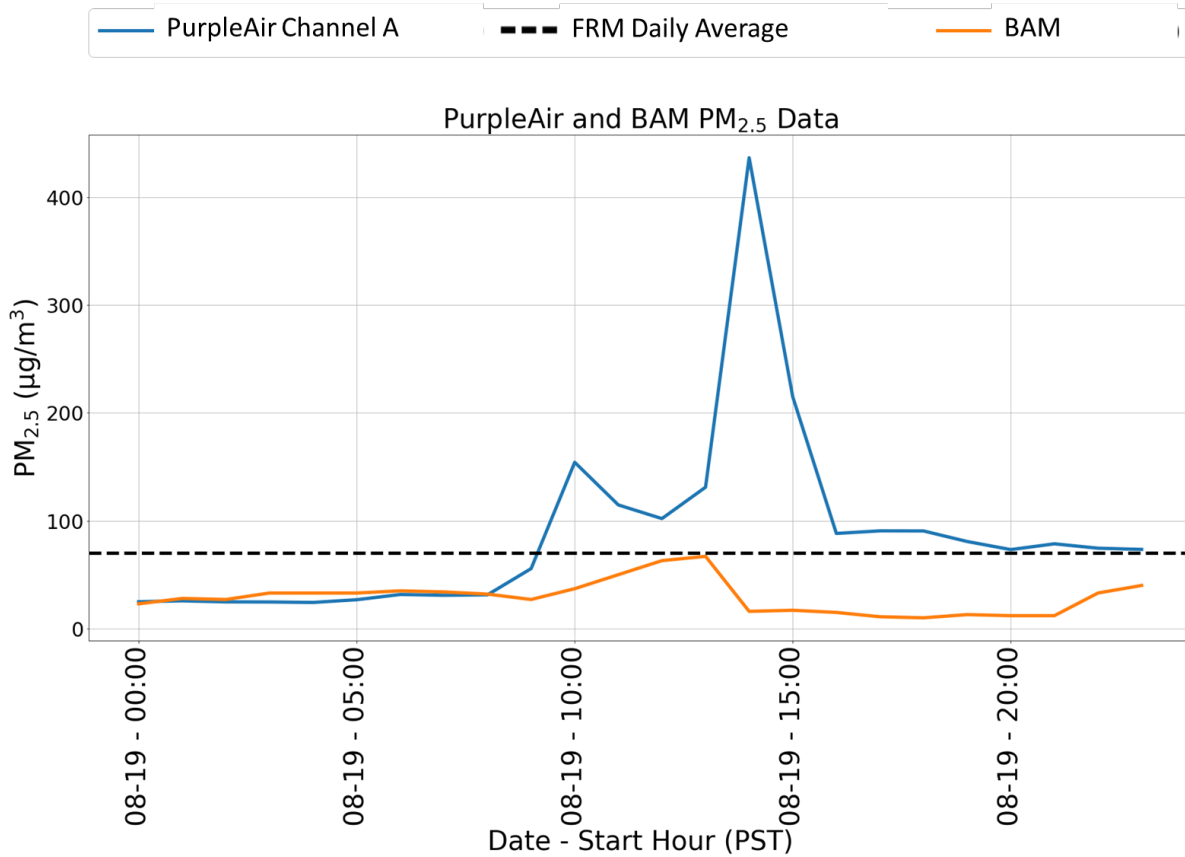
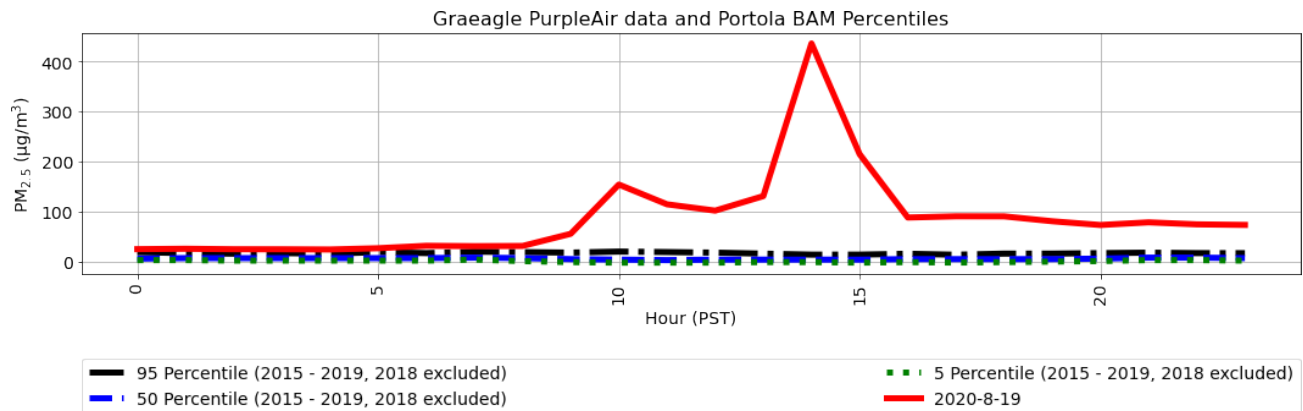


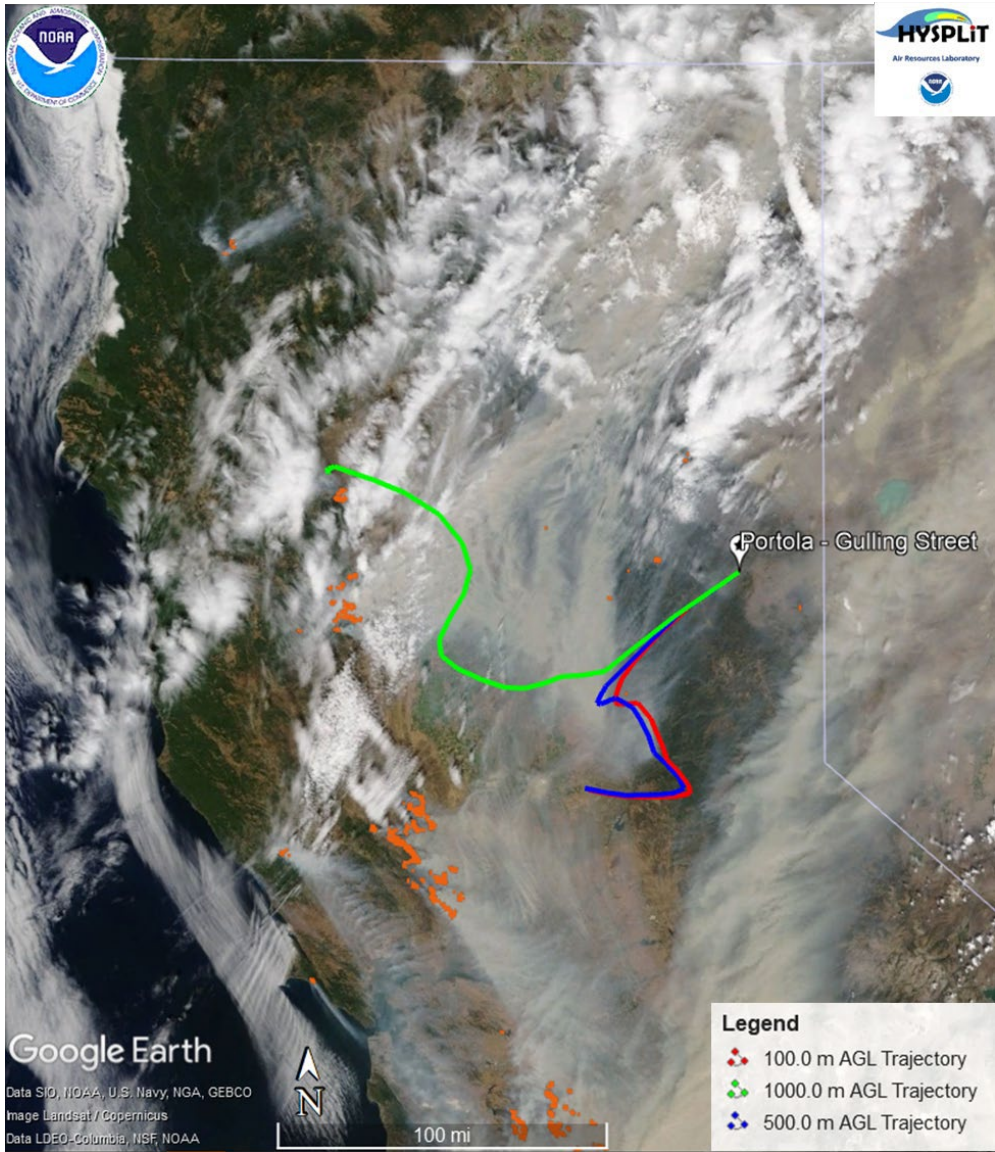
Figure 6 shows the diurnal pattern using the Graeagle PurpleAir data for August 19, 2020, compared to the Portola BAM percentiles for August 2015-2019, with 2018 excluded due to it being an extreme wildfire year and not an accurate representation of a typical August at the Portola monitor. On August 19, the hourly PM_{2.5} concentrations were elevated above the 95th percentile for the entire day. This diurnal pattern was unusual compared to the percentiles of a typical day in August, with high concentrations throughout the day due to the ongoing presence of wildfire smoke.

Figure 6: Percentiles for August PM_{2.5} for 2015-2019 compared with Graeagle PurpleAir data on August 19, 2020



Satellite images show that smoke was visible over Northern California, including the Portola area, on August 19, 2020 (Figure 7). Back-trajectories, beginning at the time of the maximum PM_{2.5} concentrations measured from the PurpleAir monitor on August 19, 2020, are overlaid on the MODIS Terra satellite image for the same day. The surface trajectory (red, 100m) indicates a more local smoke influence, while those higher in the atmosphere are more indicative of transport (blue, 500m; green, 1000m). All trajectories intersected with the widespread smoke. The HYSPLIT backward trajectory heights (Appendix I. HYSPLIT Backward Trajectory (from Monitor)) indicate that this was more of a local smoke impact. Both the lower trajectories (red, 100m and blue, 500m) were near the surface for a majority of the 24-hour period and within the smoke plume for the whole time-period.

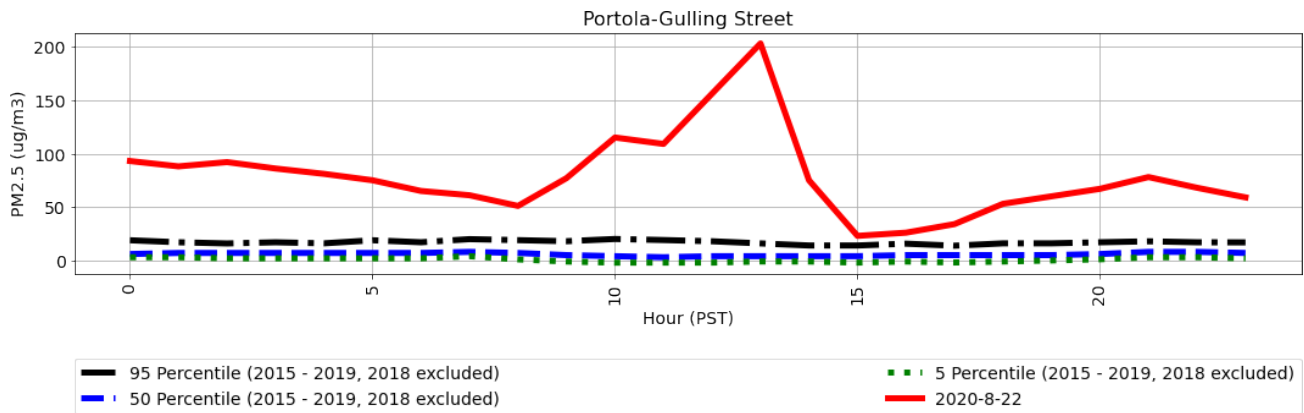
Figure 7: August 19, 2020, PurpleAir maximum hour Backward Trajectory 14PST (August 19, 22UTC) from Portola overlaid with MODIS Terra satellite image



2. August 22, 2020

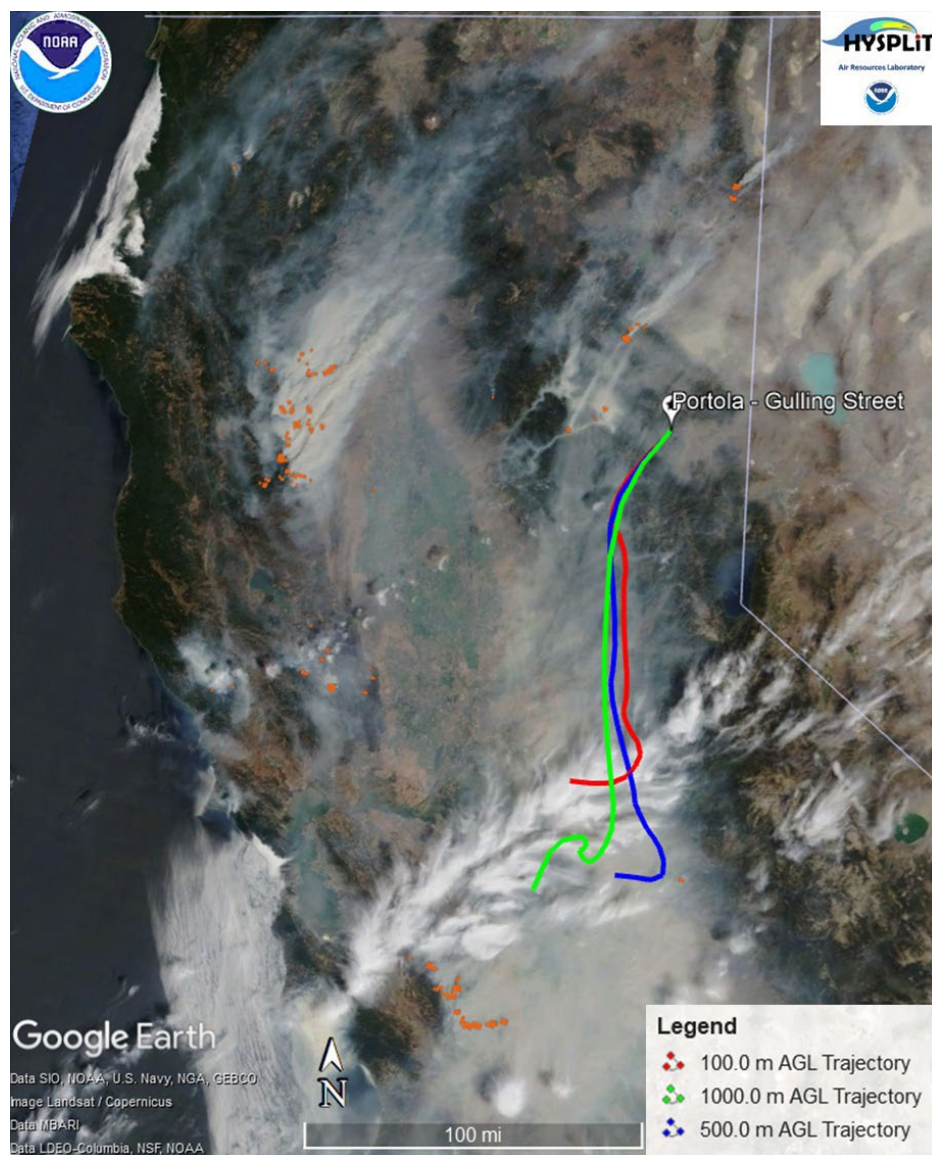
Figure 8 shows the diurnal pattern for August 22, 2020, compared to the percentiles for August 2015-2019, with 2018 excluded due to it being an extreme wildfire year and not an accurate representation of a typical August at the Portola monitor. On August 22, the hourly $PM_{2.5}$ concentrations were elevated above the 95th percentile for the entire day, and the peak hourly concentration occurred at 13:00 PST with a concentration of $203 \mu\text{g}/\text{m}^3$. This diurnal pattern was unusual compared to the percentiles of a typical day in August, with high concentrations throughout the day due to the ongoing presence of wildfire smoke.

Figure 8: Percentiles for August PM_{2.5} for 2015-2019 compared with August 22, 2020



Satellite images show that smoke was visible over Northern and Central California, including the Portola area, on August 22, 2020 (Figure 9). Back-trajectories, beginning at the time of the maximum PM_{2.5} concentrations at Portola on August 22, 2020, are overlaid on the MODIS Terra satellite image for the same day. The surface trajectory indicates a more local smoke influence, while those higher in the atmosphere are more indicative of transport. All trajectories intersected with the widespread smoke.

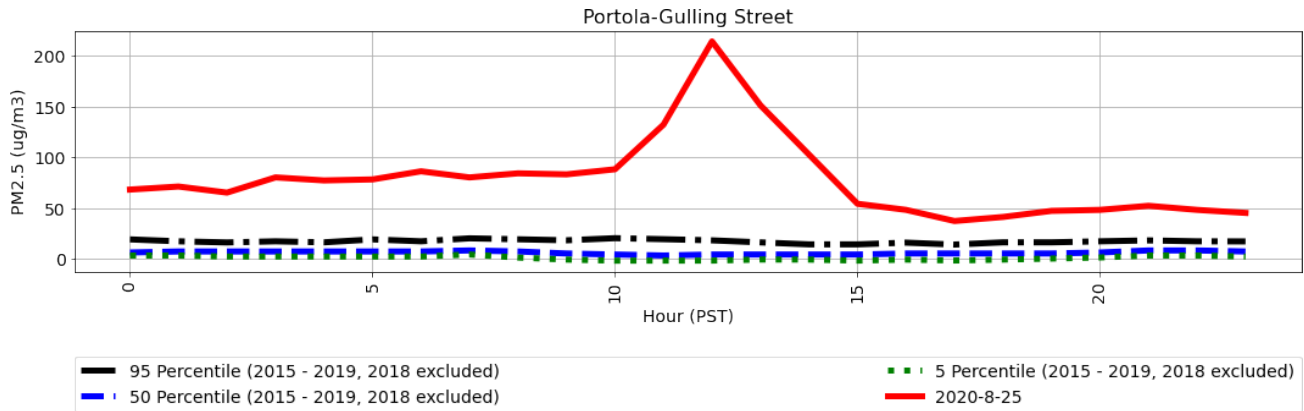
Figure 9: August 22, 2020, Backward Trajectory 13PST (August 22, 21UTC) from Portola overlaid with MODIS Terra satellite image



3. August 25, 2020

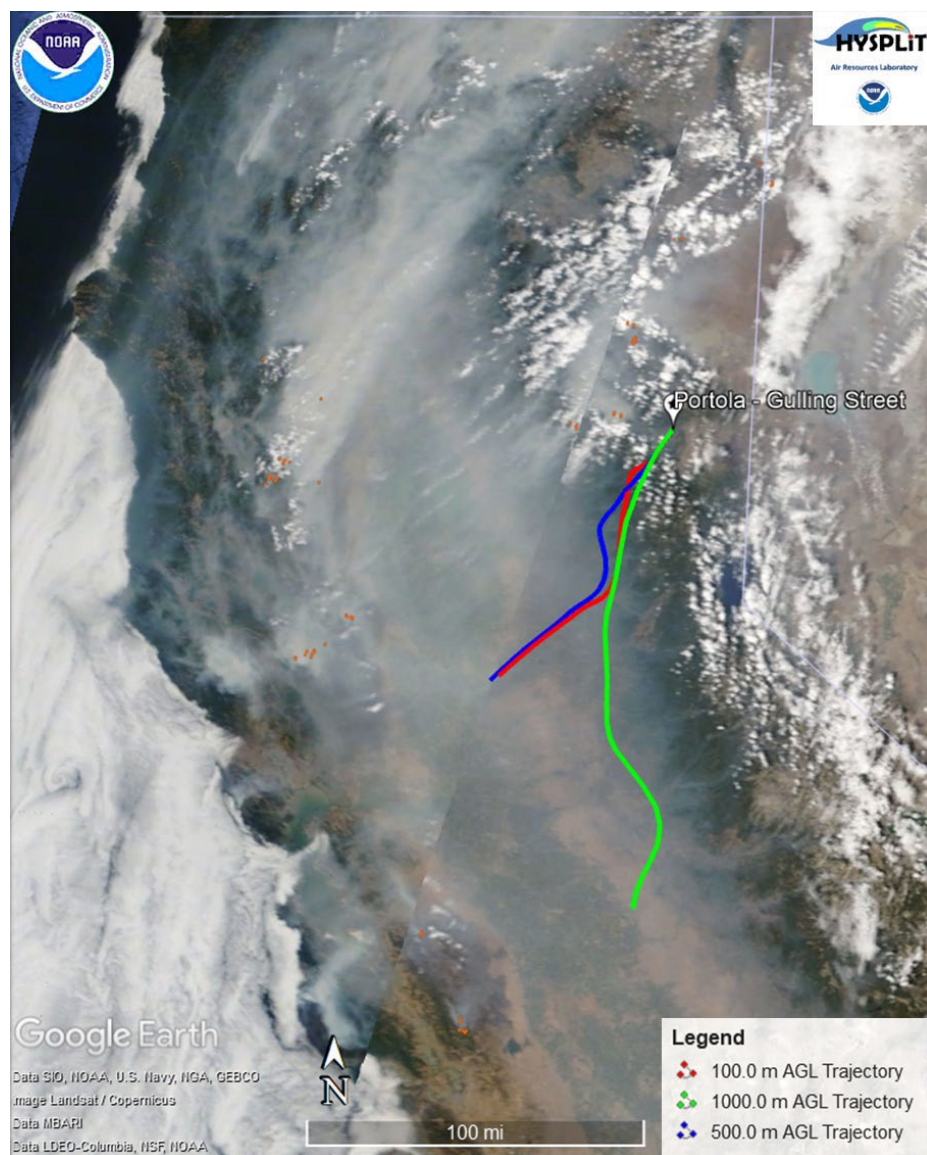
Figure 10 shows the diurnal pattern for August 25, 2020, compared to the percentiles for August 2015-2019, with 2018 excluded due to it being an extreme wildfire year and not an accurate representation of a typical August at the Portola monitor. On August 25, the hourly $PM_{2.5}$ concentrations were elevated above the 95th percentile for the entire day, and the peak hourly concentration occurred at 12:00 PST with a concentration of $214 \mu g/m^3$. This diurnal pattern was unusual compared to the percentiles of a typical day in August, with high concentrations throughout the day due to the ongoing presence of wildfire smoke.

Figure 10: Percentiles for August PM_{2.5} for 2015-2019 compared with August 25, 2020



Satellite images show that smoke was visible over Northern and Central California, including the Portola area, on August 25, 2020 (Figure 11). Back-trajectories, beginning at the time of the maximum PM_{2.5} concentrations at Portola on August 25, 2020, are overlaid on the MODIS Terra satellite image for the same day. The surface trajectory indicates a more local smoke influence, while those higher in the atmosphere are more indicative of transport. All trajectories intersected with the widespread smoke.

Figure 11: August 25, 2020, Backward Trajectory 12PST (August 25, 20UTC) from Portola overlaid with MODIS Terra satellite image



4. August 28, 2020

Due to the drastic difference between the Portola BAM and Primary FRM 24-hour averaged data (Figure 4), PurpleAir data was also reviewed. Figure 12 shows the comparison between the hourly BAM and PurpleAir data on August 28, 2020. The PurpleAir data agrees with the elevated primary FRM daily average $PM_{2.5}$ concentration, indicating the high concentrations throughout the day are due to the ongoing presence of wildfire smoke.

Figure 12: Hourly PM_{2.5} Portola BAM and Graeagle PurpleAir data on August 28, 2020

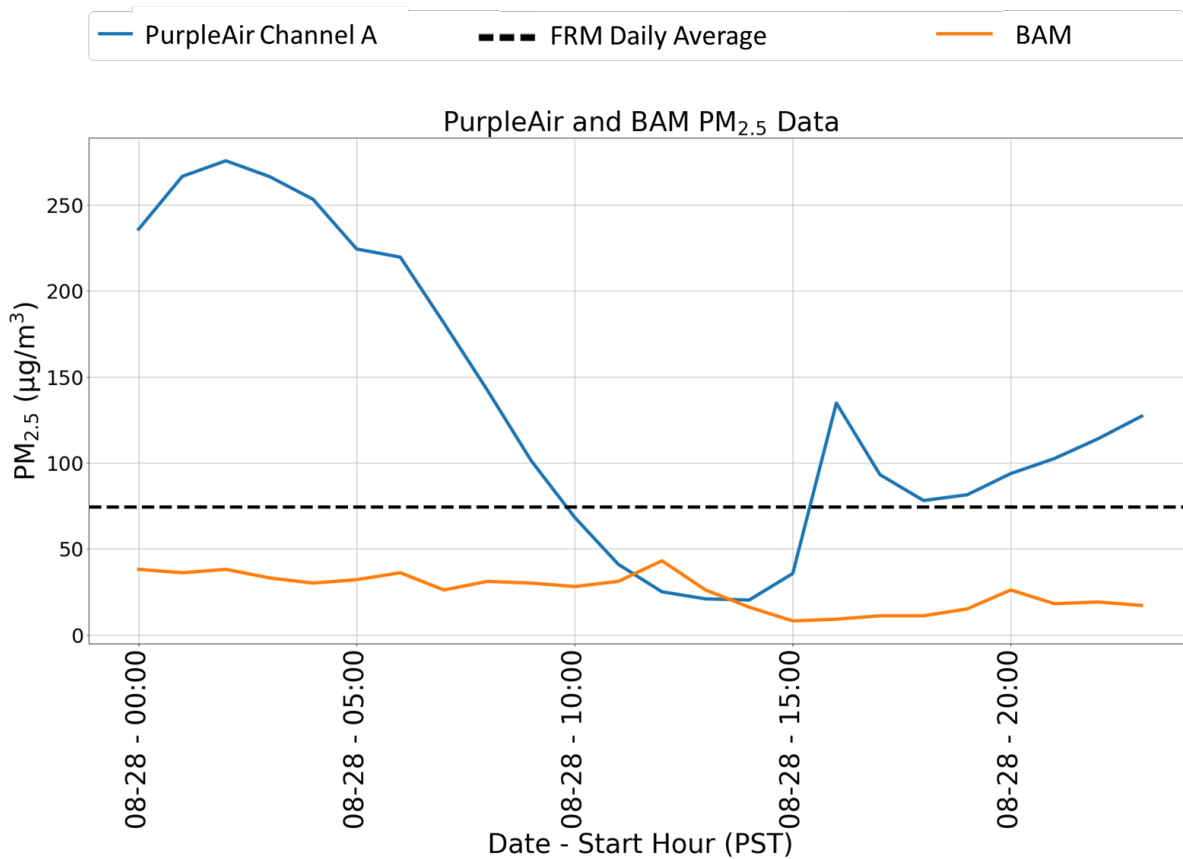
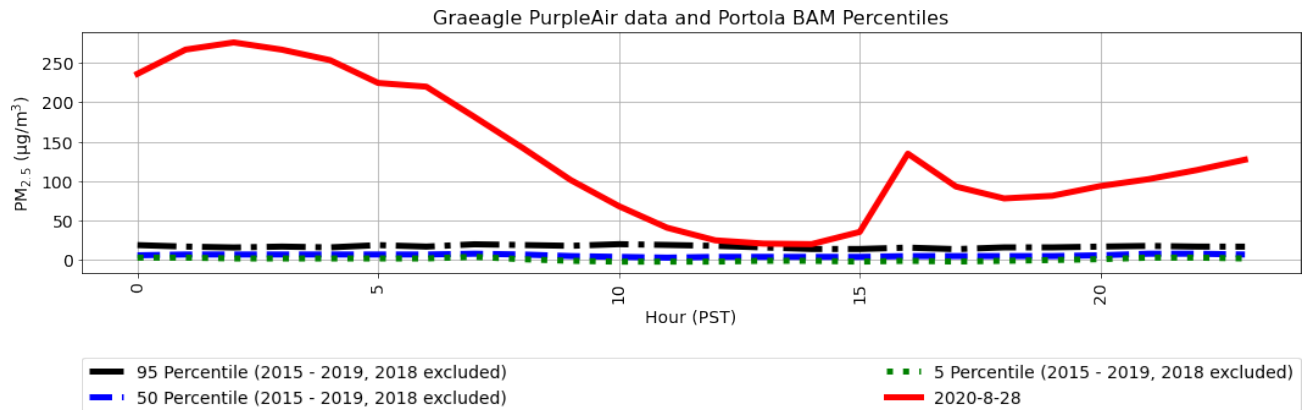


Figure 13 shows the diurnal pattern using the Graeagle PurpleAir data for August 28, 2020, compared to the Portola BAM percentiles for August 2015-2019, with 2018 excluded due to it being an extreme wildfire year and not an accurate representation of a typical August at the Portola monitor. On August 28, the hourly PM_{2.5} concentrations were elevated above the 95th percentile for the entire day. This diurnal pattern was unusual compared to the percentiles of a typical day in August, with high concentrations throughout the day due to the ongoing presence of wildfire smoke.

Figure 13: Percentiles for August PM_{2.5} for 2015-2019 compared with Graeagle PurpleAir data on August 28, 2020



Satellite images show that smoke was visible around the Portola monitor on August 27 (Figure 14 left), and August 28, 2020 (Figure 14 right). On August 28, 2020, the maximum PM_{2.5} concentration, recorded from the PurpleAir monitor, occurred at 02:00 PST. Due to the early maximum PM_{2.5} concentration, back-trajectories beginning at the time of the maximum PM_{2.5} concentrations at the PurpleAir monitor on August 28, 2020, are overlaid on the MODIS Terra satellite image for both August 27 (Figure 14 left) and August 28 (Figure 14 right). High PM_{2.5} concentrations in the early hours on August 28 and the low wind speed (Meteorological Conditions section) indicates lingering smoke, from August 27. Lingering smoke accounts for the high hourly PM_{2.5} concentrations recorded in the early hours of August 28 and helps support that the monitor was impacted by smoke.

Due to the lighter visible smoke over the Portola area on August 28 (Figure 14 right), the HMS smoke product is shown in Figure 15 as additional support for this atypical day. The HMS smoke product indicates that there was heavy smoke over Portola on August 28, 2020. All the backward trajectories intersected with widespread smoke on August 27 before reaching the monitor (Figure 14 left), and medium-heavy to heavy widespread smoke is present on August 28 (Figure 15). Both of these observations support the conclusion that the monitor was impacted by wildfire smoke on August 28, 2020.

Figure 14: PurpleAir maximum hourly Backward Trajectory 02PST (August 28, 10UTC) from Portola overlaid with MODIS Terra satellite image: August 27, 2020 (left) and August 28, 2020 (right)

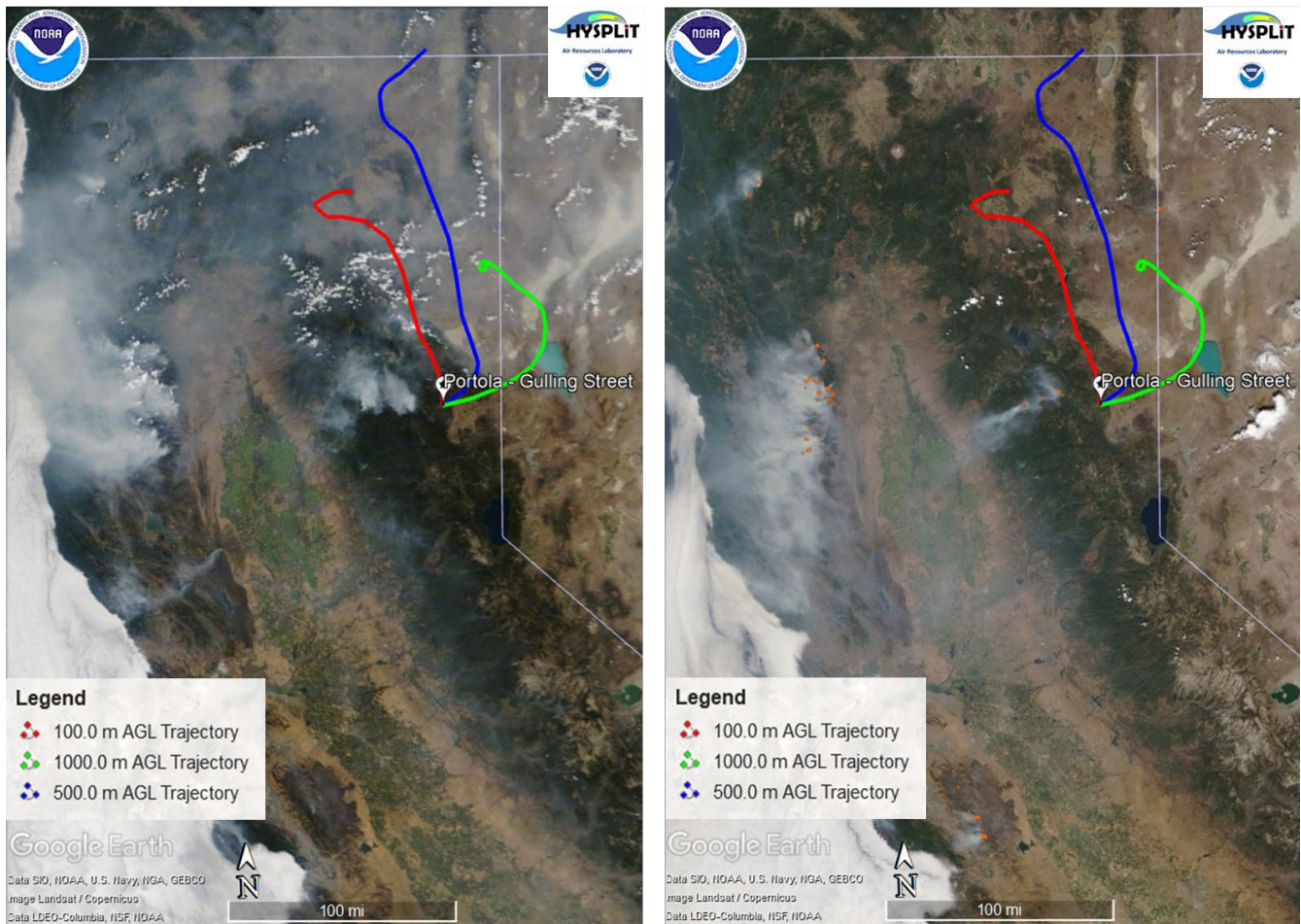
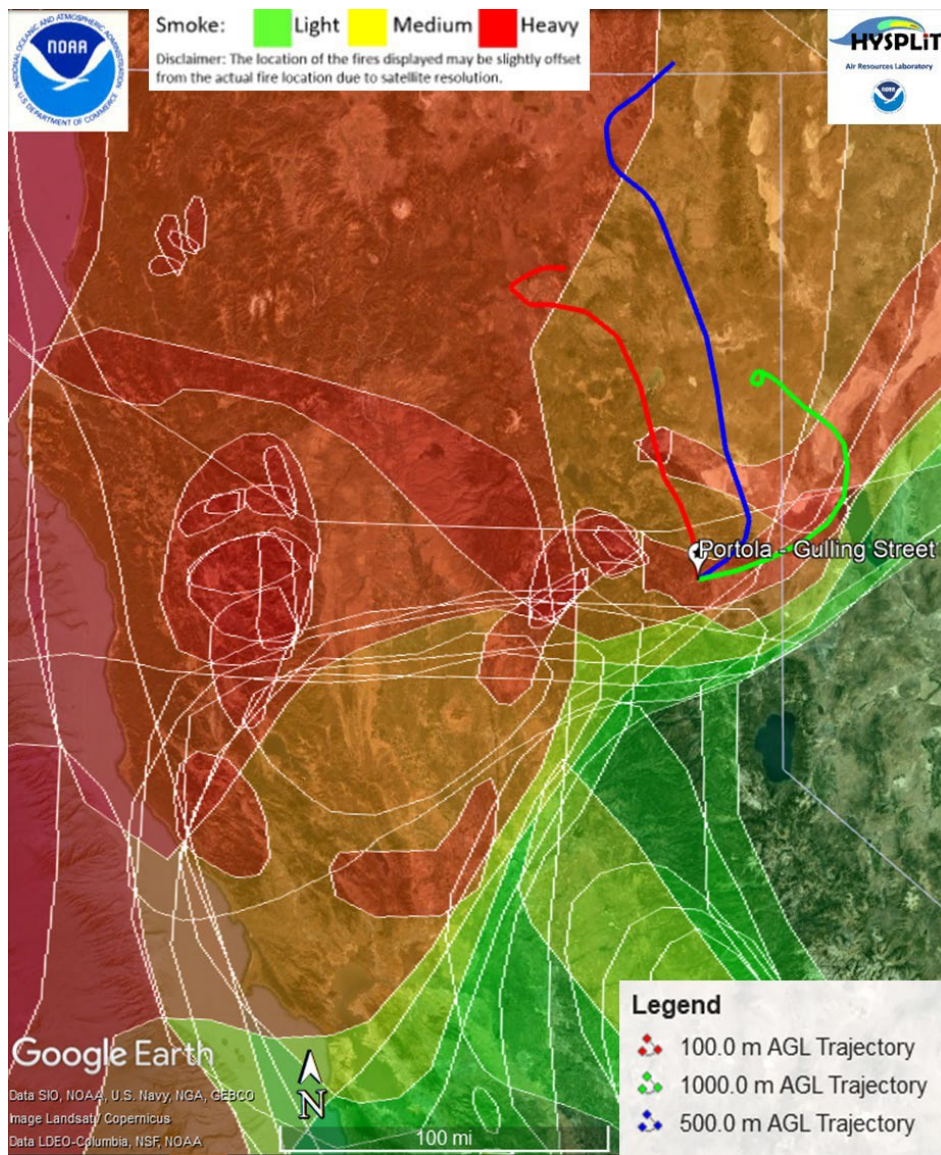


Figure 15: August 28, 2020, PurpleAir maximum hour Backward Trajectory 02PST (August 28, 10UTC) from Portola overlaid with HMS Smoke



5. August 31, 2020

Due to the drastic difference between the Portola BAM and Primary FRM 24-hour averaged data (Figure 4), PurpleAir data was also reviewed. Figure 16 shows the comparison between the hourly BAM and PurpleAir data on August 31, 2020. The PurpleAir data agrees with the elevated primary FRM daily average $PM_{2.5}$ concentration, indicating the presence of smoke impacting the $PM_{2.5}$ concentrations.

Figure 16: Hourly PM_{2.5} Portola BAM and Graeagle PurpleAir data on August 31, 2020

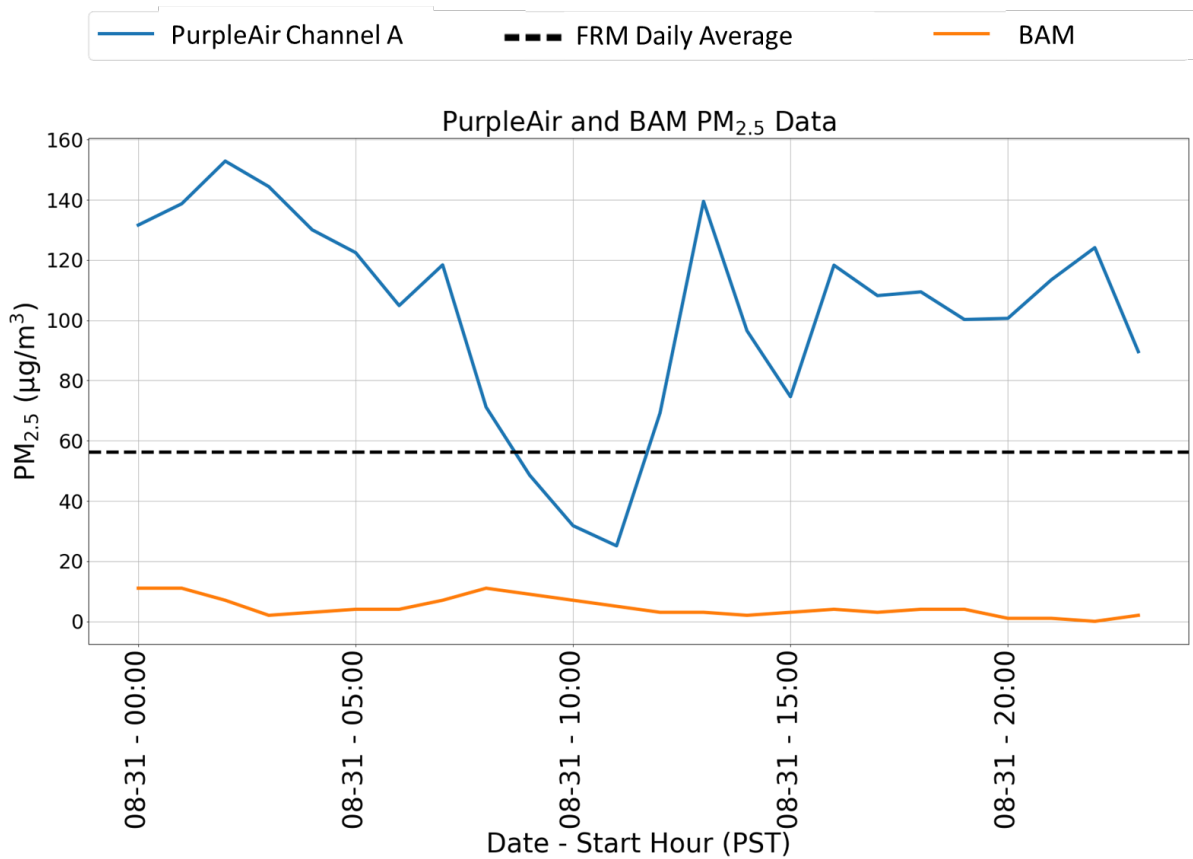
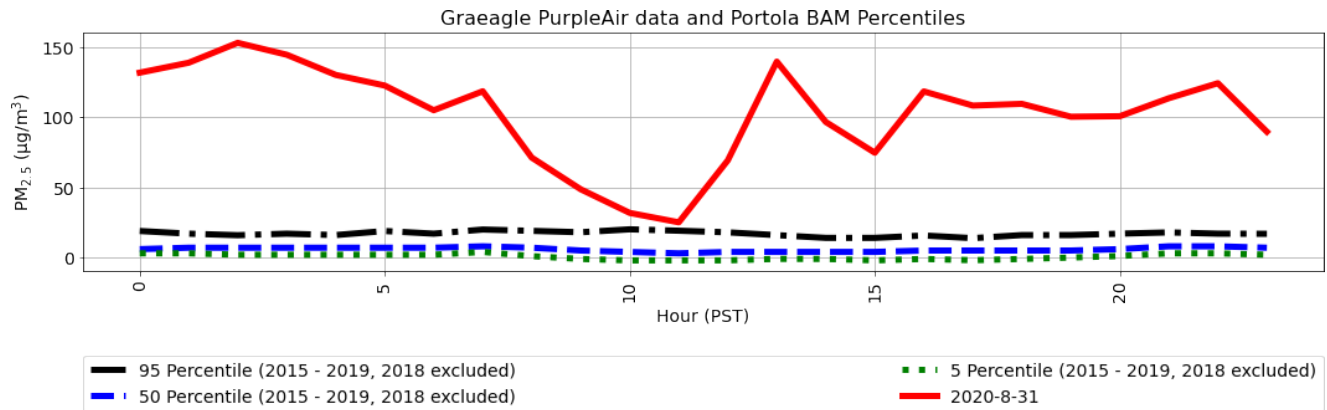


Figure 17 shows the diurnal pattern using the Graeagle PurpleAir data for August 31, 2020, compared to the Portola BAM percentiles for August 2015-2019, with 2018 excluded due to it being an extreme wildfire year and not an accurate representation of a typical August at the Portola monitor. On August 31, the hourly PM_{2.5} concentrations were elevated above the 95th percentile for the entire day. This diurnal pattern was unusual compared to the percentiles of a typical day in August, with high concentrations throughout the day due to the ongoing presence of wildfire smoke.

Figure 17: Percentiles for August PM_{2.5} for 2015-2019 compared with Graeagle PurpleAir data on August 31, 2020



Satellite images show that smoke was visible over the Portola monitor on August 30 (Figure 18 left), and around the Portola area, on August 31, 2020 (Figure 18 right). On August 31, 2020, the maximum PM_{2.5} concentration, recorded from the PurpleAir monitor, occurred at 02:00 PST. Due to the early maximum PM_{2.5} concentration, back-trajectories beginning at the time of the maximum PM_{2.5} concentrations at the PurpleAir monitor on August 31, 2020, are overlaid on the MODIS Terra satellite image for both August 30 (Figure 18 left) and August 31 (Figure 18 right). High PM_{2.5} concentrations in the early hours on August 31 and the low wind speed (Meteorological Conditions section) indicates lingering smoke from August 30. Lingering smoke accounts for the high hourly PM_{2.5} concentrations recorded in the early hours of August 31 and helps support that the monitor was impacted by smoke.

Due to the light visible smoke over the Portola area on August 31 (Figure 18 right), the HMS smoke product is shown in Figure 19 as additional support for this atypical day. The HMS smoke product indicates that there was heavy smoke over Portola on August 31, 2020. All the backward trajectories intersected with widespread smoke on August 30 before reaching the monitor (Figure 18 left), and medium-heavy to heavy widespread smoke is present on August 31 (Figure 19). Both of these observations support the conclusion that the monitor was impacted by wildfire smoke on August 31, 2020.

Figure 18: PurpleAir maximum hourly Backward Trajectory 02PST (August 31, 10UTC) from Portola overlaid with MODIS Terra satellite image: August 30, 2020 (left) and August 31, 2020, (right)

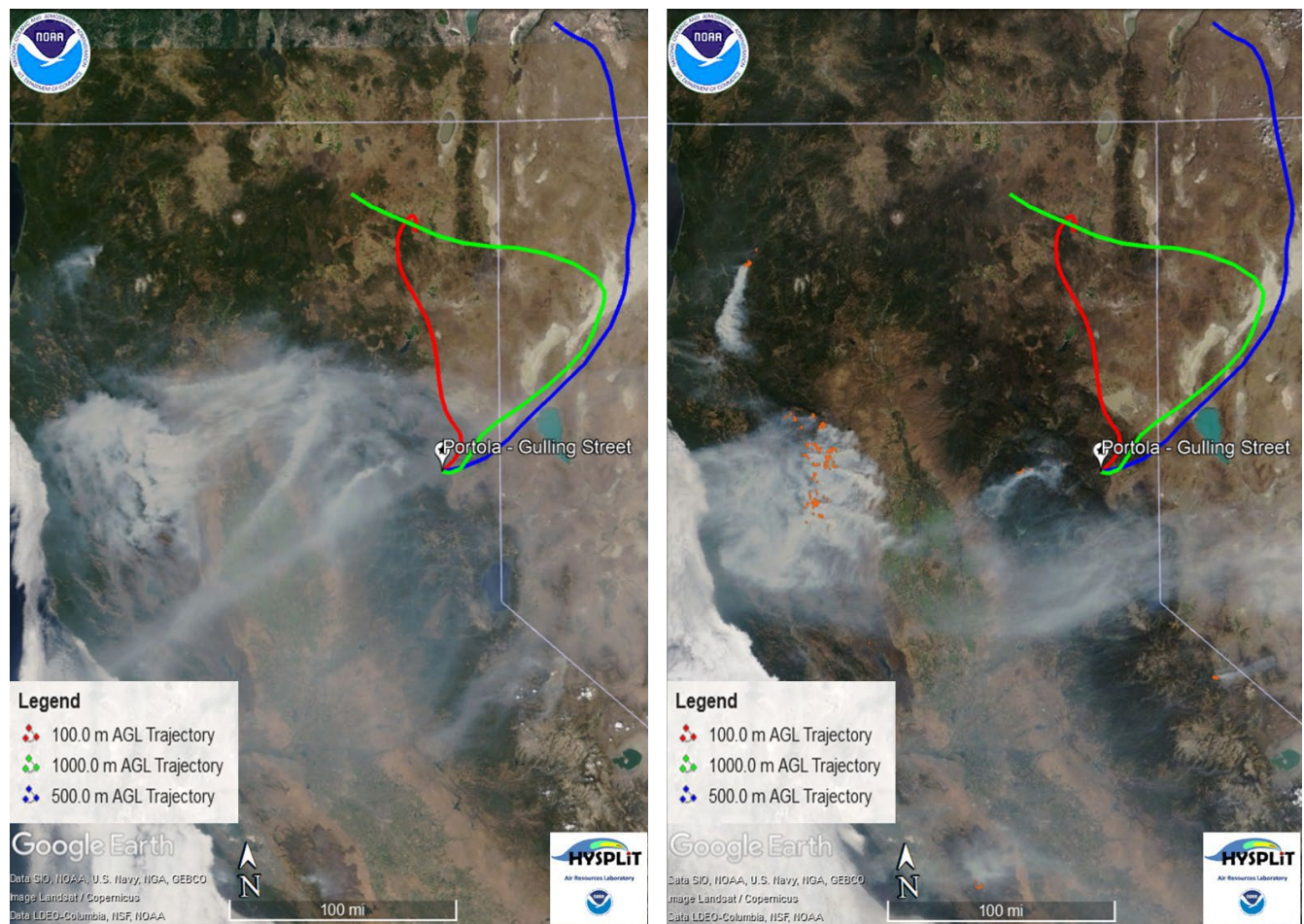
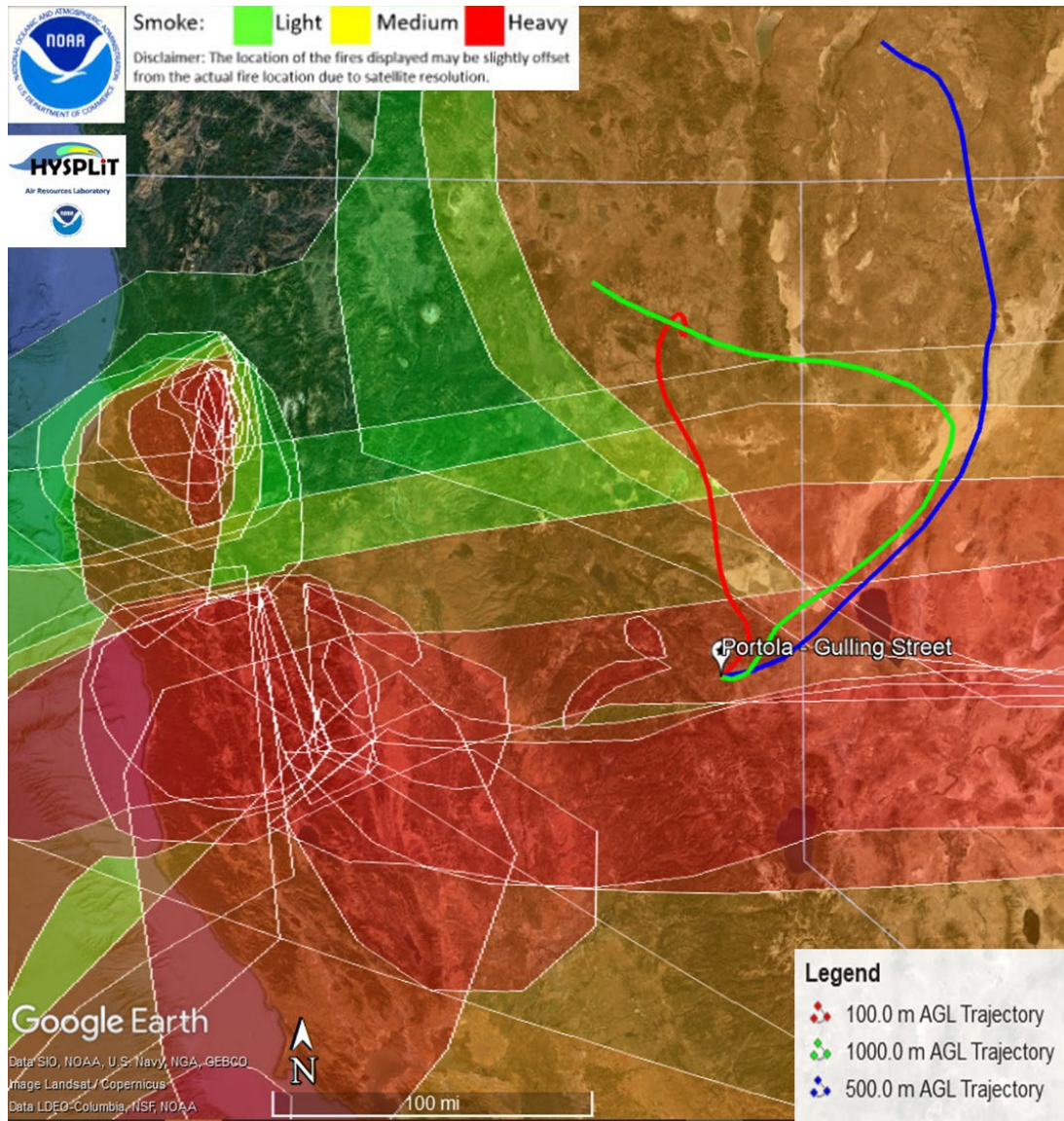


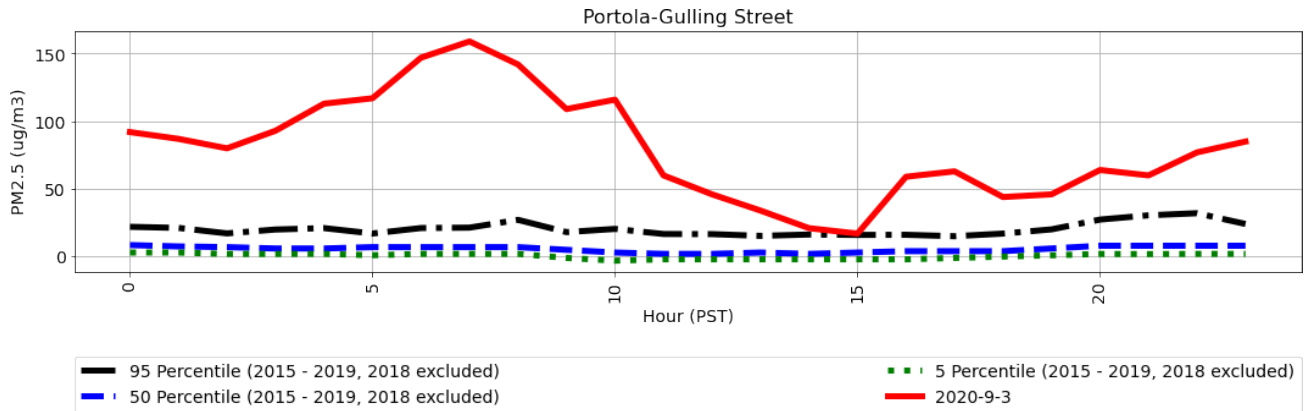
Figure 19: August 31, 2020, PurpleAir maximum hourly Backward Trajectory 02PST (August 31, 10UTC) from Portola overlaid with HMS Smoke



6. September 03, 2020

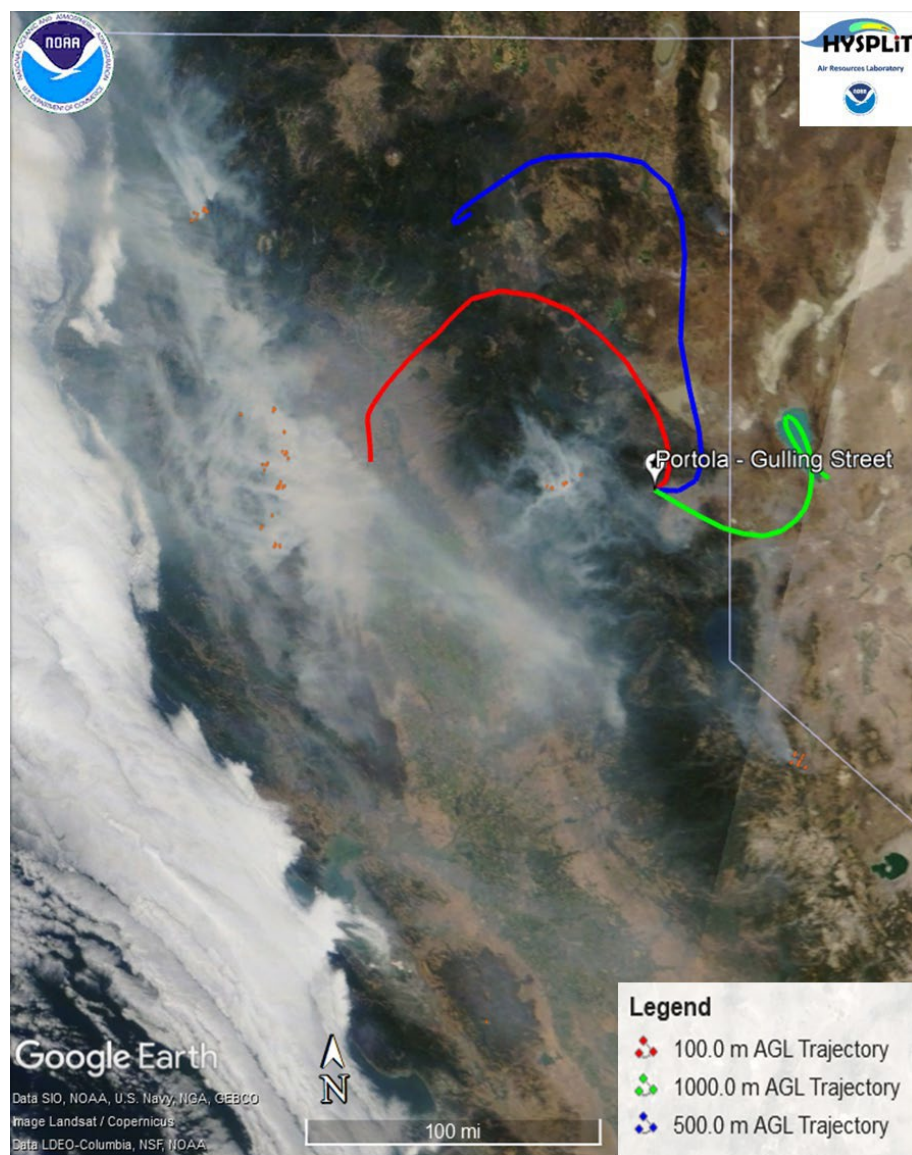
Figure 20 shows the diurnal pattern for September 03, 2020, compared to the percentiles for September 2015-2019, with 2018 excluded due to it being an extreme wildfire year and not an accurate representation of a typical September at the Portola monitor. On September 03, the hourly PM_{2.5} concentrations were elevated above the 95th percentile for the entire day, and the peak hourly concentration occurred at 07:00 PST with a concentration of 159 µg/m³. This diurnal pattern was unusual compared to the percentiles of a typical day in September, with high concentrations throughout the day due to the ongoing presence of wildfire smoke.

Figure 20: Percentiles for September PM_{2.5} for 2015-2019 compared with September 03, 2020



Satellite images show that smoke was visible over Northern California, including the Portola area, on September 03, 2020 (Figure 21). Back-trajectories, beginning at the time of the maximum PM_{2.5} concentrations at Portola on September 03, 2020, are overlaid on the MODIS Terra satellite image for the same day. The surface trajectory indicates a more local smoke influence and intersects with the smoke at the start and end of the 24-hour back trajectory, while those higher in the atmosphere are more indicative of transport. All trajectories intersected with smoke right before reaching the monitor. The surface trajectory (red, 100m) intersects with smoke at the start and end the 24-hour period, indicating that this was more of a local smoke impact resulting in the high 24-hour PM_{2.5} concentration at the Portola monitor.

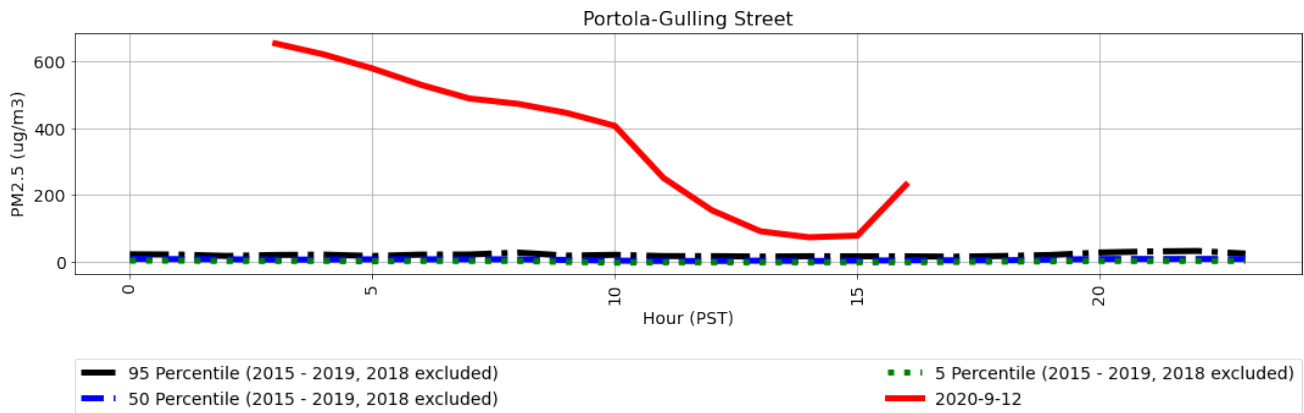
Figure 21: September 03, 2020, Backward Trajectory 07PST (September 03, 15UTC) from Portola overlaid with MODIS Terra satellite image



7. September 12, 2020

Figure 22 shows the diurnal pattern for September 12, 2020, compared to the percentiles for September 2015-2019, with 2018 excluded due to it being an extreme wildfire year and not an accurate representation of a typical September at the Portola monitor. On September 12, the hourly PM_{2.5} concentrations were elevated above the 95th percentile for all available hours, and the peak hourly concentration occurred at 03:00 PST with a concentration of 654 $\mu\text{g}/\text{m}^3$. The BAM data was missing between the hours of 00:00 to 02:00 and 17:00 to 23:00. This diurnal pattern was unusual compared to the percentiles of a typical day in September, with high concentrations throughout the day due to the ongoing presence of wildfire smoke.

Figure 22: Percentiles for September PM_{2.5} for 2015-2019 compared with September 12, 2020



Satellite images show that smoke was visible over Northern and Central California, including the Portola area, on September 12, 2020 (Figure 23). Back-trajectories, beginning at the time of the maximum PM_{2.5} concentrations at Portola on September 12, 2020, are overlaid on the MODIS Terra satellite image for the same day. The surface trajectory indicates a more local smoke influence, while those higher in the atmosphere are more indicative of transport. All trajectories intersected with the widespread smoke.

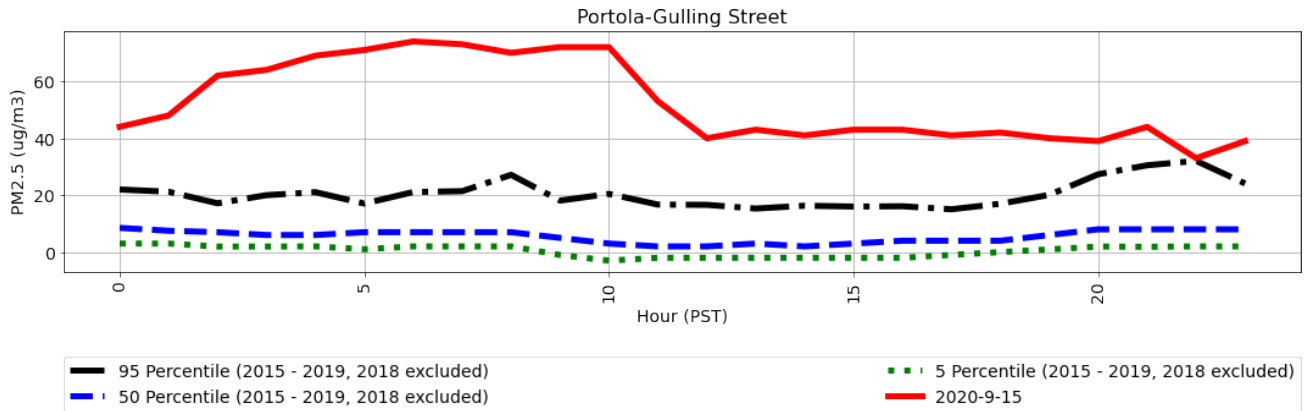
Figure 23: September 12, 2020, Backward Trajectory 03PST (September 12, 11UTC) from Portola overlaid with MODIS Terra satellite image



8. September 15, 2020

Figure 24 shows the diurnal pattern for September 15, 2020, compared to the percentiles for September 2015-2019, with 2018 excluded due to it being an extreme wildfire year and not an accurate representation of a typical September at the Portola monitor. On September 15, the hourly PM_{2.5} concentrations were elevated above the 95th percentile for the entire day, and the peak hourly concentration occurred at 06:00 PST with a concentration of 74 $\mu\text{g}/\text{m}^3$. This diurnal pattern was unusual compared to the percentiles of a typical day in September, with high concentrations throughout the day due to the ongoing presence of wildfire smoke.

Figure 24: Percentiles for September PM_{2.5} for 2015-2019 compared with September 15, 2020



Satellite images show that smoke was visible over California, including the Portola area, on September 15, 2020 (Figure 25). Back-trajectories, beginning at the time of the maximum PM_{2.5} concentrations at Portola on September 15, 2020, are overlaid on the MODIS Terra satellite image for the same day. The surface trajectory indicates a more local smoke influence, while those higher in the atmosphere are more indicative of transport. All trajectories intersected with the widespread smoke.

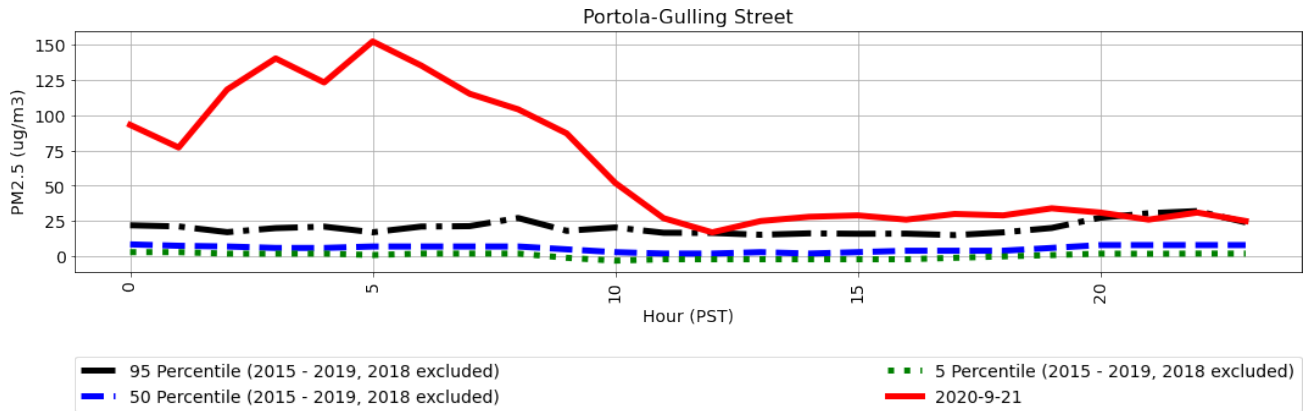
Figure 25: September 15, 2020, Backward Trajectory 06PST (September 15, 14UTC) from Portola overlaid with MODIS Terra satellite image



9. September 21, 2020

Figure 26 shows the diurnal pattern for September 21, 2020, compared to the percentiles for September 2015-2019, with 2018 excluded due to it being an extreme wildfire year and not an accurate representation of a typical September at the Portola monitor. On September 21, the hourly PM_{2.5} concentrations were elevated above the 95th percentile for most of the day, and the peak hourly concentration occurred at 05:00 PST with a concentration of 152 $\mu\text{g}/\text{m}^3$. This diurnal pattern was unusual compared to the percentiles of a typical day in September, with high concentrations throughout the day due to the ongoing presence of wildfire smoke.

Figure 26: Percentiles for September PM_{2.5} for 2015-2019 compared with September 21, 2020



Satellite images show that smoke was visible over California, including the Portola area, on September 21, 2020 (Figure 27). Back-trajectories, beginning at the time of the maximum PM_{2.5} concentrations at Portola on September 21, 2020, are overlaid on the MODIS Terra satellite image for the same day. The surface trajectory indicates a more local smoke influence, while those higher in the atmosphere are more indicative of transport. All trajectories intersected with the widespread smoke.

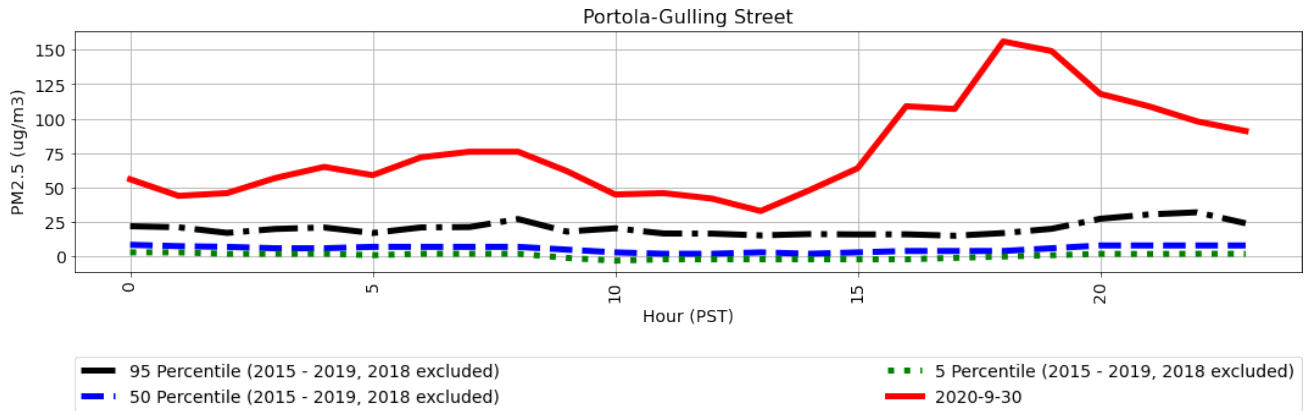
Figure 27: September 21, 2020, Backward Trajectory 05PST (September 21, 13UTC) from Portola overlaid with MODIS Terra satellite image



10. September 30, 2020

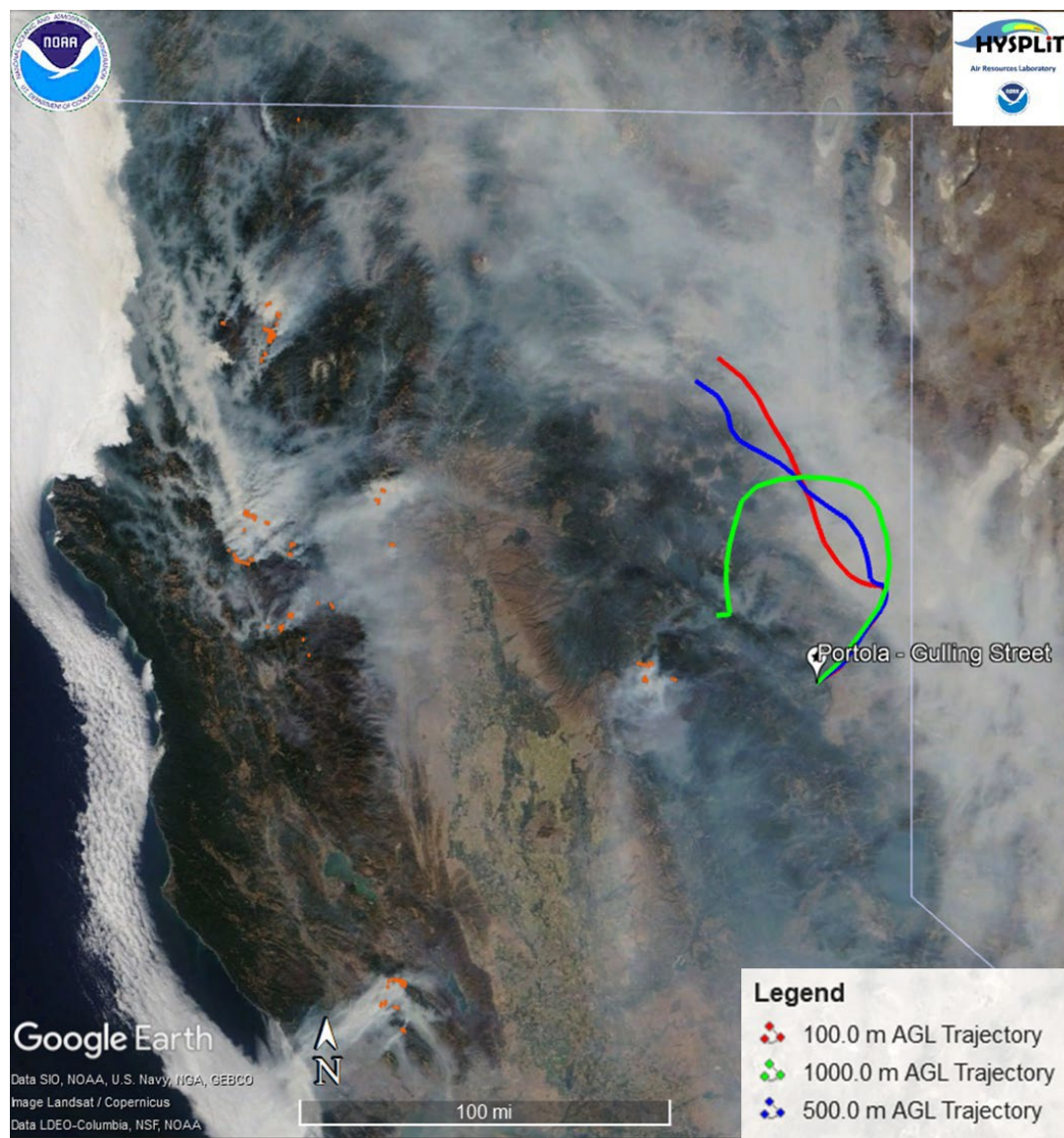
Figure 28 shows the diurnal pattern for September 30, 2020, compared to the percentiles for September 2015-2019, with 2018 excluded due to it being an extreme wildfire year and not an accurate representation of a typical September at the Portola monitor. On September 30, the hourly PM_{2.5} concentrations were elevated above the 95th percentile for the entire day, and the peak hourly concentration occurred at 18:00 PST with a concentration of 156 $\mu\text{g}/\text{m}^3$. This diurnal pattern was unusual compared to the percentiles of a typical day in September, with high concentrations throughout the day due to the ongoing presence of wildfire smoke.

Figure 28: Percentiles for September PM_{2.5} for 2015-2019 compared with September 30, 2020



Satellite images show that smoke was visible over the Portola area and other parts of Northern California, on September 30, 2020 (Figure 29). Back-trajectories, beginning at the time of the maximum PM_{2.5} concentrations at Portola on September 30, 2020, are overlaid on the MODIS Terra satellite image for the same day. The surface trajectory indicates a more local smoke influence, while those higher in the atmosphere are more indicative of transport. All trajectories intersected with the widespread smoke.

Figure 29: September 30, 2020, Backward Trajectory 18PST (October 01, 02UTC) from Portola overlaid with MODIS Terra satellite image

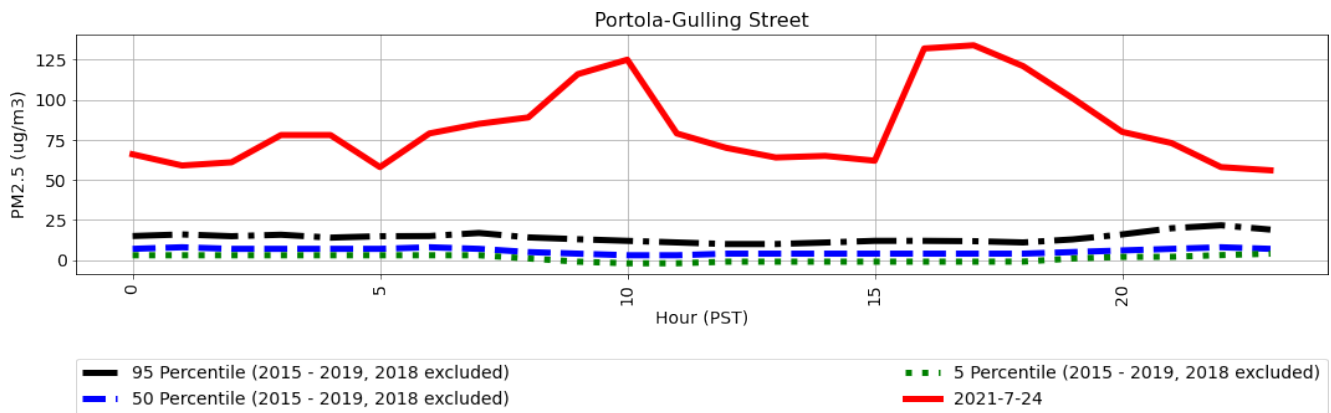


B. 2021 Atypical Days

1. July 24, 2021

Figure 30 shows the diurnal pattern for July 24, 2021, compared to the percentiles for July 2015-2019, with 2018 excluded due to it being an extreme wildfire year and not an accurate representation of a typical July at the Portola monitor. On July 24, the hourly PM_{2.5} concentrations were elevated above the 95th percentile for the entire day, and the peak hourly concentration occurred at 17:00 PST with a concentration of 134 $\mu\text{g}/\text{m}^3$. This diurnal pattern was unusual compared to the percentiles of a typical day in July, with high concentrations throughout the day due to the ongoing presence of wildfire smoke.

Figure 30: Percentiles for July PM_{2.5} for 2015-2019 compared with July 24, 2021



Satellite images show that smoke was visible over the Portola area, on July 24, 2021 (Figure 31). Back-trajectories, beginning at the time of the maximum PM_{2.5} concentrations at Portola on July 24, 2021, are overlaid on the MODIS Terra satellite image for the same day. The surface trajectory indicates a local smoke influence, while those higher in the atmosphere are more indicative of transport. All trajectories intersected with the widespread smoke.

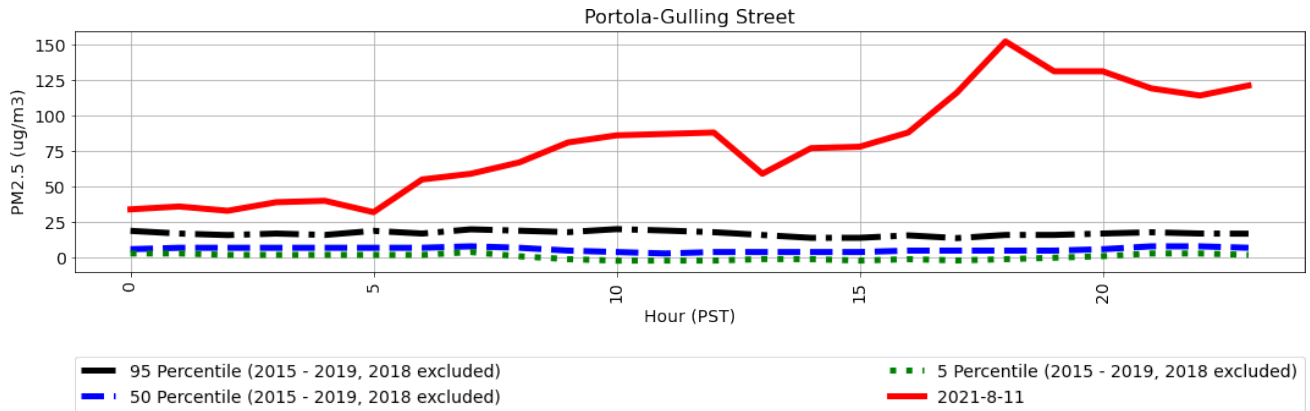
Figure 31: July 24, 2021, Backward Trajectory 17PST (July 25, 01UTC) from Portola overlaid with MODIS Terra satellite image



2. August 11, 2021

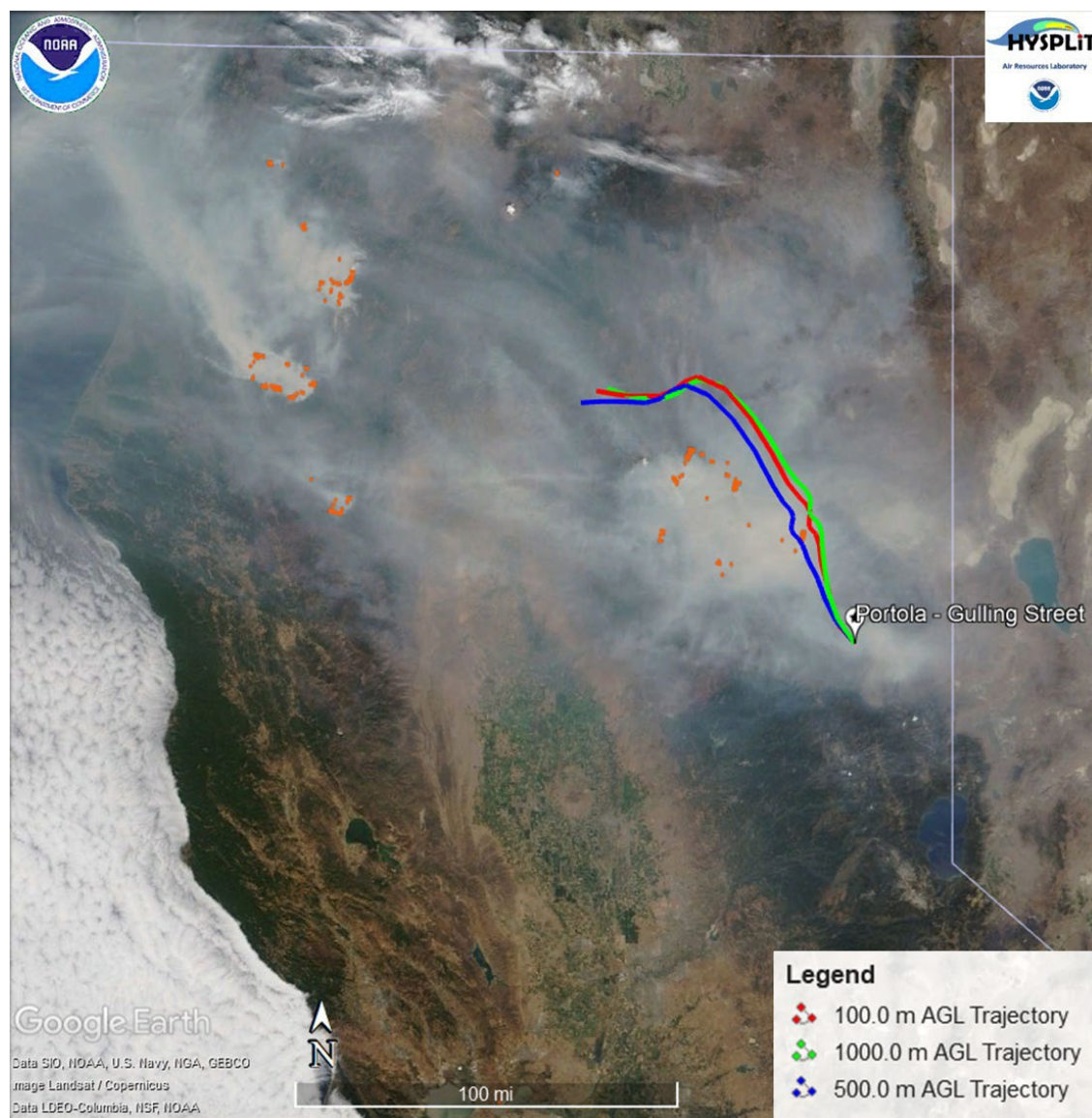
Figure 32 shows the diurnal pattern for August 11, 2021, compared to the percentiles for August 2015-2019, with 2018 excluded due to it being an extreme wildfire year and not an accurate representation of a typical August at the Portola monitor. On August 11, the hourly PM_{2.5} concentrations were elevated above the 95th percentile, between 05:00 to midnight the following day, and the peak hourly concentration occurred at 18:00 PST with a concentration of 152 µg/m³. This diurnal pattern was unusual compared to the percentiles of a typical day in August, with high concentrations throughout the day due to the ongoing presence of wildfire smoke.

Figure 32: Percentiles for August PM_{2.5} for 2015-2019 compared with August 11, 2021



Satellite images show that smoke was visible over Northern California, including the Portola area, on August 11, 2021 (Figure 33). Back-trajectories, beginning at the time of the maximum PM_{2.5} concentrations at Portola on August 11, 2021, are overlaid on the MODIS Terra satellite image for the same day. The surface trajectory (red, 100m) indicates a more local smoke influence, while those higher in the atmosphere are more indicative of transport (blue, 500m; green, 1,000m). All trajectories intersected with the widespread smoke.

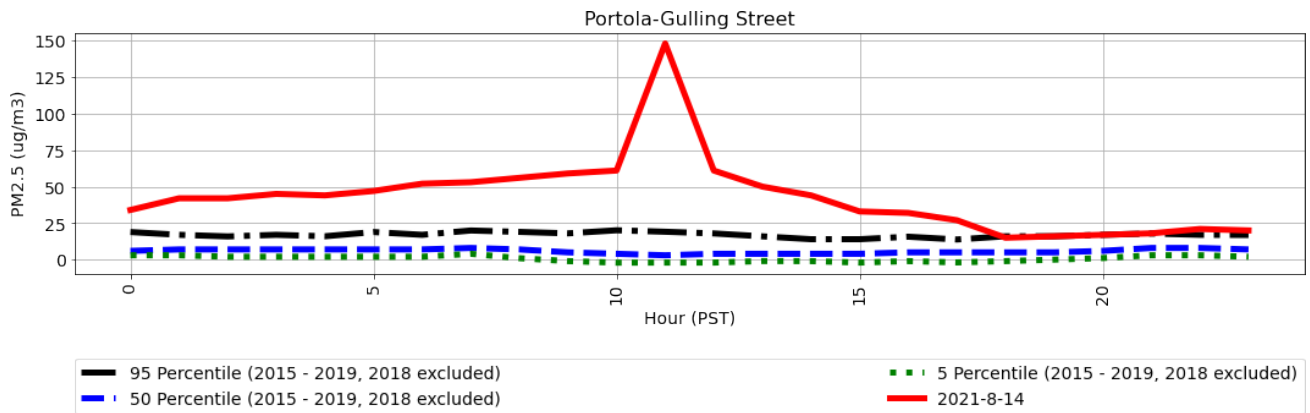
Figure 33: August 11, 2021, Backward Trajectory 18PST (August 12, 02UTC) from Portola overlaid with MODIS Terra satellite image



3. August 14, 2021

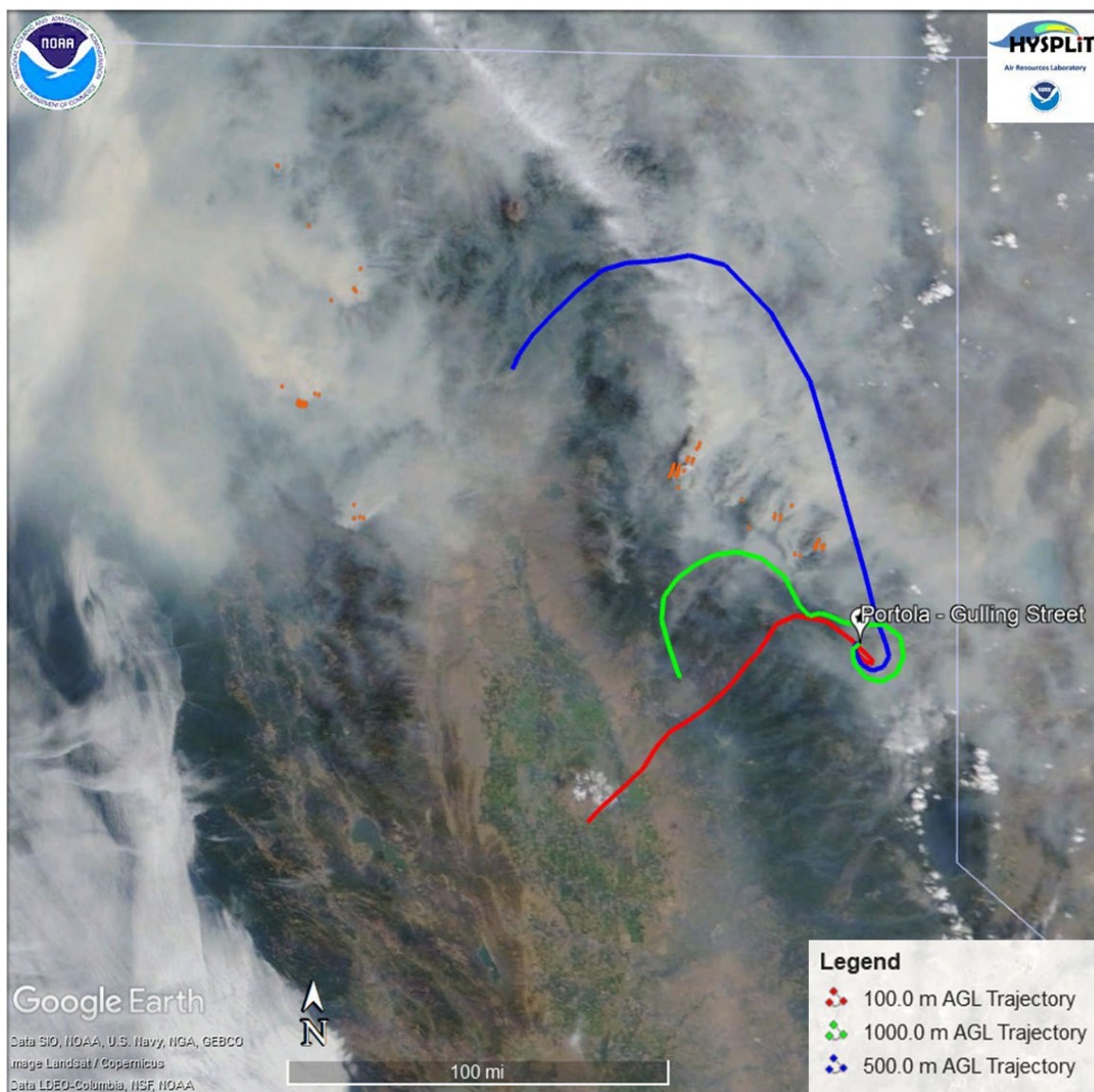
Figure 34 shows the diurnal pattern for August 14, 2021, compared to the percentiles for August 2015-2019, with 2018 excluded due to it being an extreme wildfire year and not an accurate representation of a typical August at the Portola monitor. On August 14, the hourly PM_{2.5} concentrations were elevated above the 95th percentile, between midnight and 15:00 and the peak hourly concentration occurred at 11:00 PST with a concentration of 148 µg/m³. This diurnal pattern was unusual compared to the percentiles of a typical day in August, with high concentrations throughout the day due to the ongoing presence of wildfire smoke.

Figure 34: Percentiles for August PM_{2.5} for 2015-2019 compared with August 14, 2021



Satellite images show thick smoke was visible over Northern California, as well as Portola, on August 14, 2021 (Figure 35). Back-trajectories, beginning at the time of the maximum PM_{2.5} concentrations at Portola on August 14, 2021, are overlaid on the MODIS Terra satellite image for the same day. The surface trajectory indicates a more local smoke influence, while those higher in the atmosphere are more indicative of transport. All trajectories intersected with the widespread smoke.

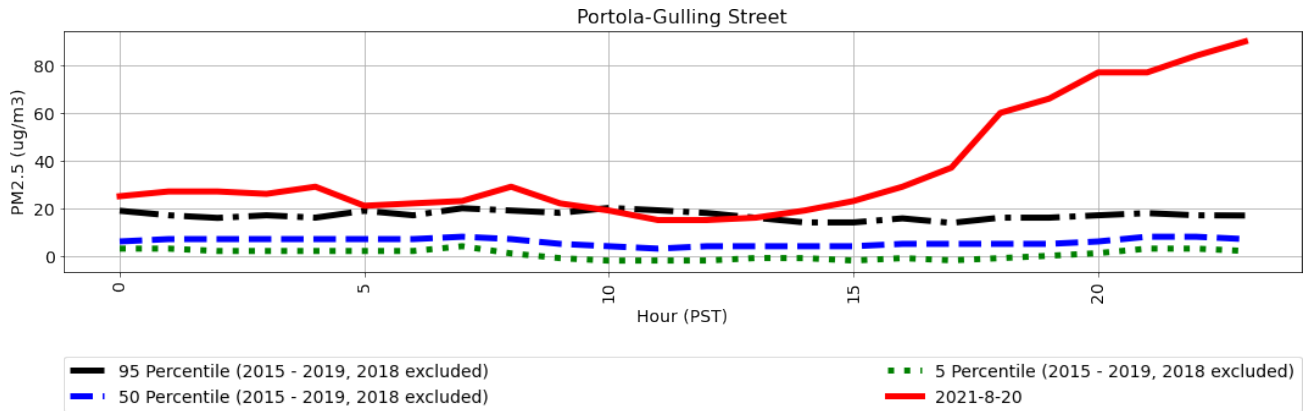
Figure 35: August 14, 2021, Backward Trajectory 11PST (August 14, 19UTC) from Portola overlaid with MODIS Terra satellite image



4. August 20, 2021

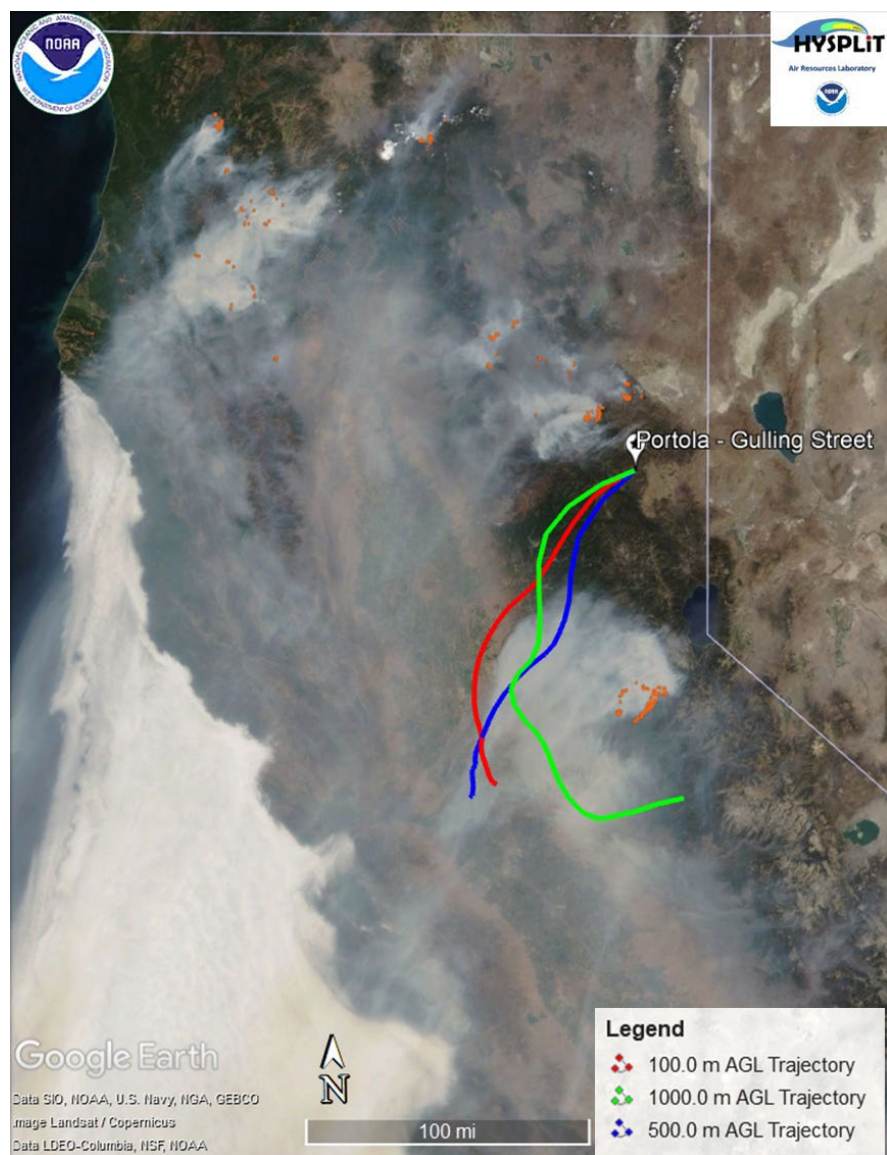
Figure 36 shows the diurnal pattern for August 20, 2021, compared to the percentiles for August 2015-2019, with 2018 excluded due to it being an extreme wildfire year and not an accurate representation of a typical August at the Portola monitor. On August 20, the hourly PM_{2.5} concentrations were elevated above the 95th percentile for most of the day, especially between 15:00 to midnight the following day, and the peak hourly concentration occurred at 23:00 PST with a concentration of 90 µg/m³. This diurnal pattern was unusual compared to the percentiles of a typical day in August, with high concentrations throughout the day due to the ongoing presence of wildfire smoke.

Figure 36: Percentiles for August PM_{2.5} for 2015-2019 compared with August 20, 2021



Satellite images show that smoke was visible over Northern and Central California, including the Portola area, on August 20, 2021 (Figure 37). Back-trajectories, beginning at the time of the maximum PM_{2.5} concentrations at Portola on August 20, 2021, are overlaid on the MODIS Terra satellite image for the same day. The surface trajectory indicates a local smoke influence, while those higher in the atmosphere are more indicative of transport. All trajectories intersected with the widespread smoke.

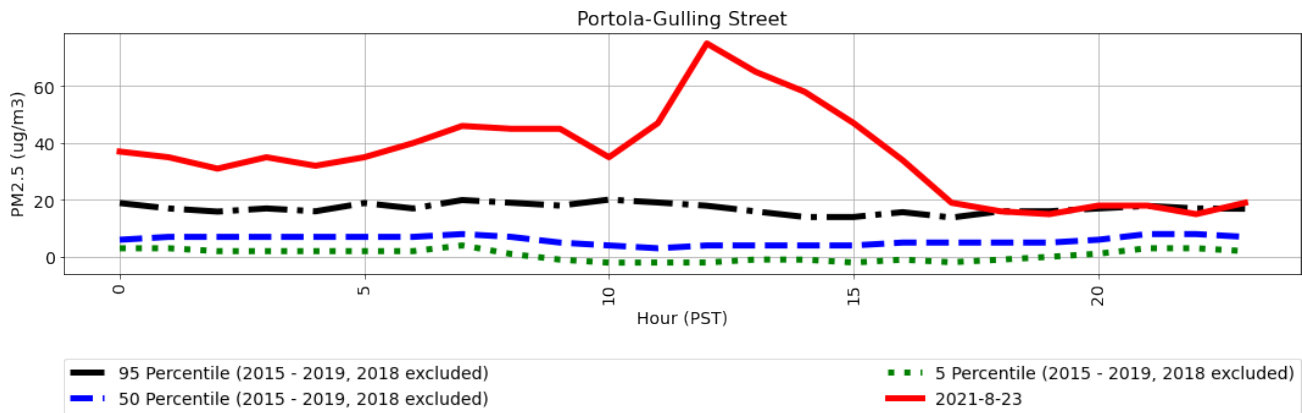
Figure 37: August 20, 2021, Backward Trajectory 23PST (August 21, 07UTC) from Portola overlaid with MODIS Terra satellite image



5. August 23, 2021

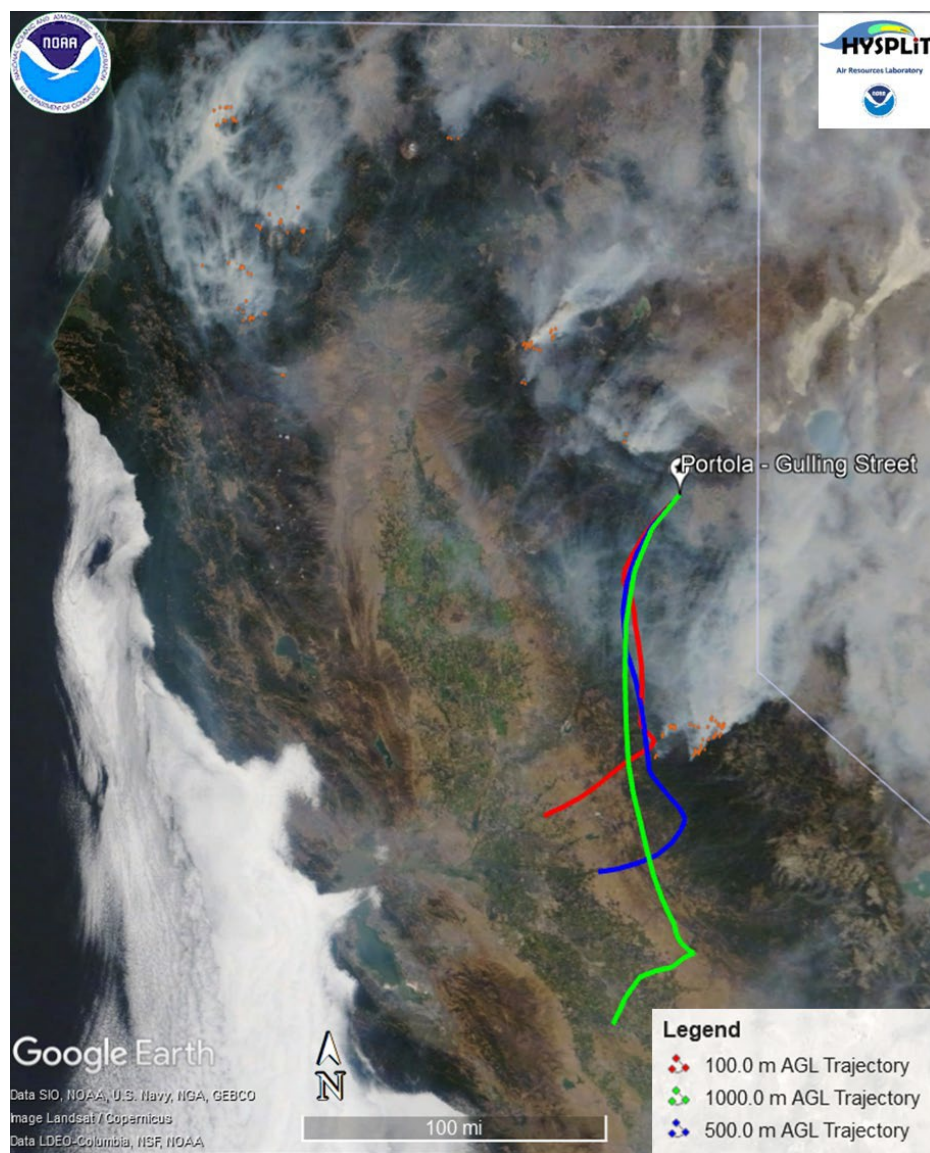
Figure 38 shows the diurnal pattern for August 23, 2021, compared to the percentiles for August 2015-2019, with 2018 excluded due to it being an extreme wildfire year and not an accurate representation of a typical August at the Portola monitor. On August 23, the hourly PM_{2.5} concentrations were elevated above the 95th percentile, between 00:00 to 17:00, and the peak hourly concentration occurred at 12:00 PST with a concentration of 75 $\mu\text{g}/\text{m}^3$. This diurnal pattern was unusual compared to the percentiles of a typical day in August, with high concentrations throughout the day due to the ongoing presence of wildfire smoke.

Figure 38: Percentiles for August PM_{2.5} for 2015-2019 compared with August 23, 2021



Satellite images show that smoke was visible over the Portola area, on August 23, 2021 (Figure 39). Back-trajectories, beginning at the time of the maximum PM_{2.5} concentrations at Portola on August 23, 2021, are overlaid on the MODIS Terra satellite image for the same day. The surface trajectory indicates a more local smoke influence, while those higher in the atmosphere are more indicative of transport. All the trajectories intersect with smoke before reaching the monitor, but the backward trajectory heights (Appendix I. HYSPLIT Backward Trajectory (from Monitor)) indicate that this atypical event was impacted more by local smoke than long-range transport.

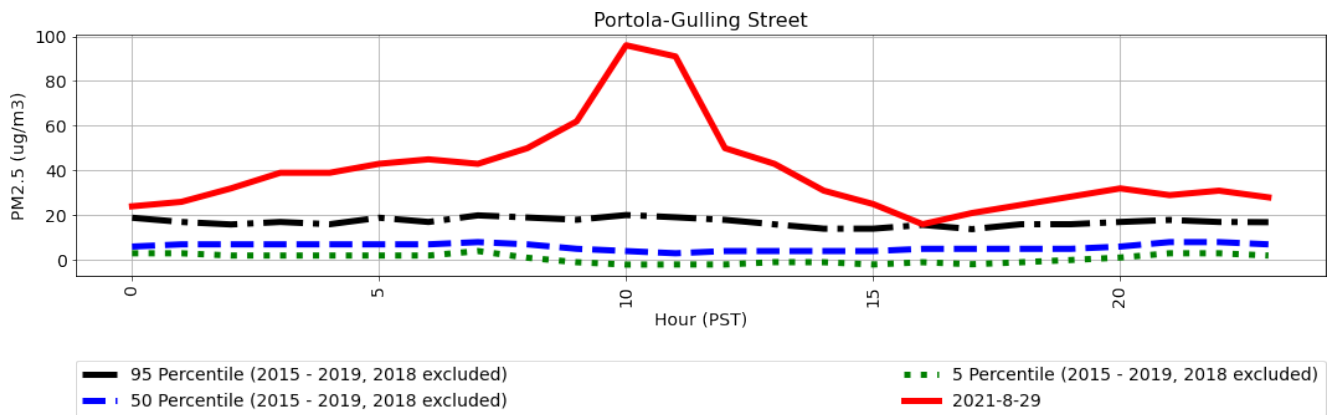
Figure 39: August 23, 2021, Backward Trajectory 12PST (August 23 20UTC) from Portola overlaid with MODIS Terra satellite image



6. August 29, 2021

Figure 40 shows the diurnal pattern for August 29, 2021, compared to the percentiles for August 2015-2019, with 2018 excluded due to it being an extreme wildfire year and not an accurate representation of a typical August at the Portola monitor. On August 29, the hourly PM_{2.5} concentrations were elevated above the 95th percentile all day, and the peak hourly concentration occurred at 10:00 PST with a concentration of 96 µg/m³. This diurnal pattern was unusual compared to the percentiles of a typical day in August, with high concentrations throughout the day due to the ongoing presence of wildfire smoke.

Figure 40: Percentiles for August PM_{2.5} for 2015-2019 compared with August 29, 2021



Satellite images show that smoke was visible near the Portola area, on August 29, 2021 (Figure 41). Back-trajectories, beginning at the time of the maximum PM_{2.5} concentrations at Portola on August 29, 2021, are overlaid on the MODIS Terra satellite image for the same day. Due to the visible smoke (Figure 42) over the Portola area being light, the HMS smoke product is shown in Figure 45 as additional support for this atypical day. The HMS smoke product indicates that there was heavy smoke over Portola on August 29, 2021, and that all the backward trajectories intersected with medium-heavy smoke before reaching the monitor. The backward trajectory heights (Appendix I. HYSPLIT Backward Trajectory (from Monitor)) indicate that this was more of a local smoke impact. Both the lower level trajectories (red, 100m and blue, 500m) dipped near the surface for a majority of the 24-hour period and within the medium-heavy smoke plume for the whole time-period.

Figure 41: August 29, 2021, Backward Trajectory 10PST (August 29, 18UTC) from Portola overlaid with MODIS Terra satellite image

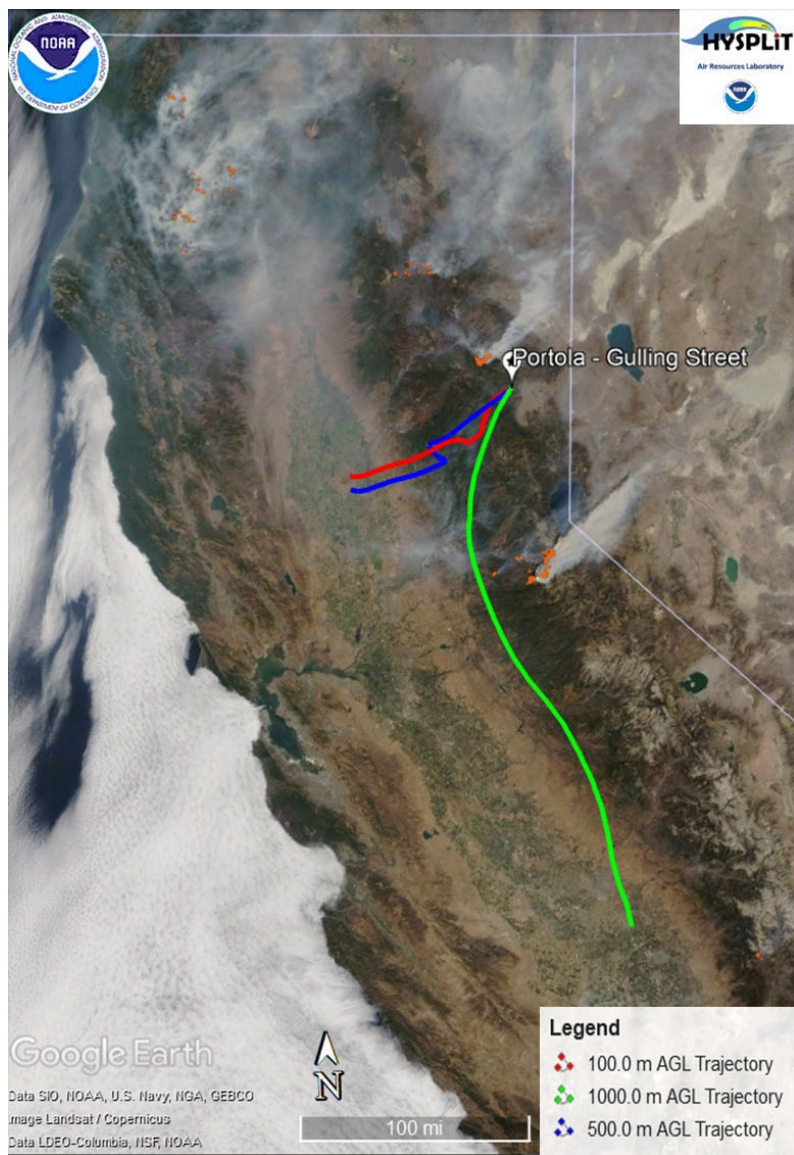
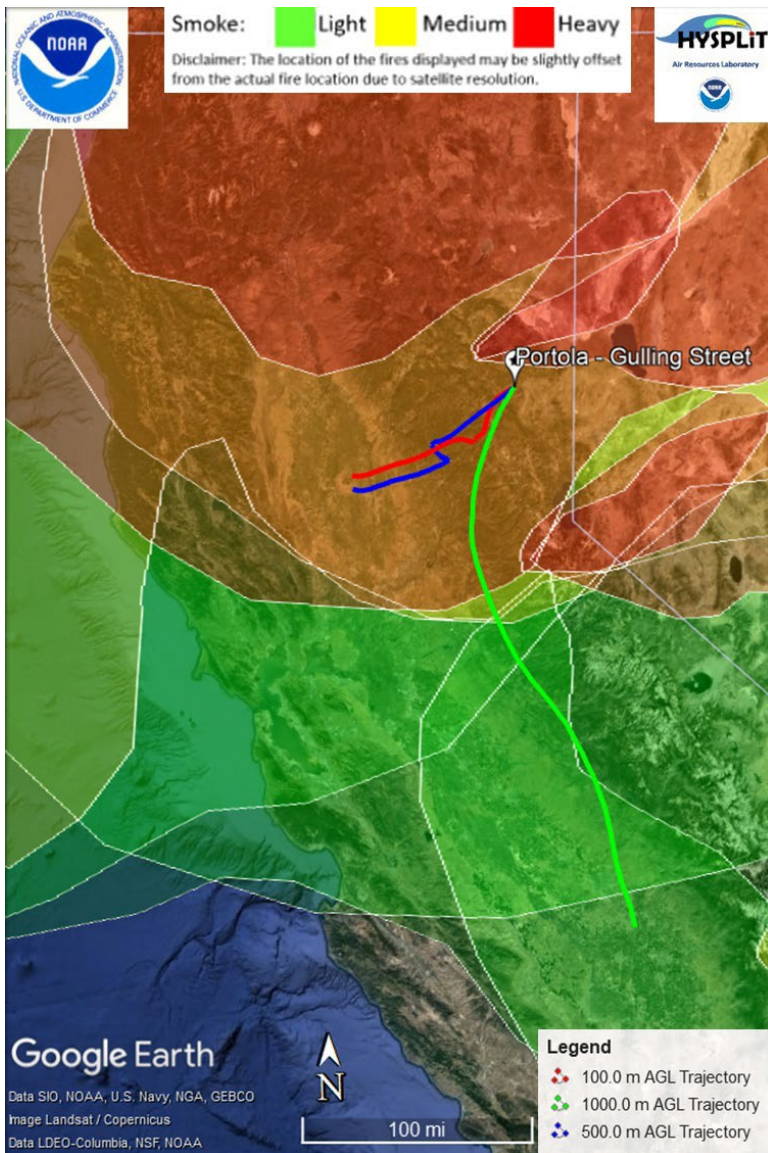


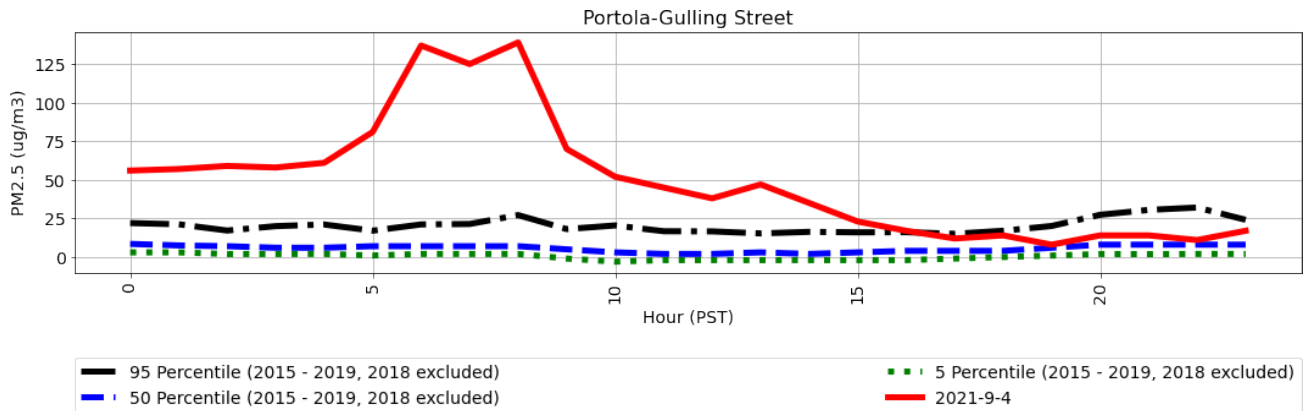
Figure 42: August 29, 2021, Backward Trajectory 10PST (August 29, 18UTC) from Portola overlaid with HMS Smoke



7. September 04, 2021

Figure 43 shows the diurnal pattern for September 4, 2021, compared to the percentiles for September 2015-2019, with 2018 excluded due to it being an extreme wildfire year and not an accurate representation of a typical September at the Portola monitor. On September 4, the hourly PM_{2.5} concentrations were elevated above the 95th percentile, between 00:00 to 15:00, and the peak hourly concentration occurred at 8:00 PST with a concentration of 139 µg/m³. This diurnal pattern was unusual compared to the percentiles of a typical day in September, with high concentrations throughout the day due to the ongoing presence of wildfire smoke.

Figure 43: Percentiles for September PM_{2.5} for 2015-2019 compared with September 04, 2021



Satellite images show that smoke was visible around the Portola area on September 4, 2021 (Figure 44). Back-trajectories, beginning at the time of the maximum PM_{2.5} concentrations at Portola on September 4, 2021, are overlaid on the MODIS Terra satellite image for the same day. Due to the visible smoke (Figure 44) over the Portola area being light, the HMS smoke product is shown in Figure 45 as additional support for this atypical day. The HMS smoke product indicates that there was heavy smoke over Portola on September 4, 2021, and all the backward trajectories intersected with medium-heavy widespread smoke before reaching the monitor. The surface trajectory (red, 100m) intersects with the visible smoke as well as the HMS medium-heavy smoke for the whole 24-hour period, indicating that this was more of a local smoke impact resulting in the high 24-hour PM_{2.5} concentration at the Portola monitor.

Figure 44: September 04, 2021, Backward Trajectory 08PST (September 04, 16UTC) from Portola overlaid with MODIS Terra satellite image

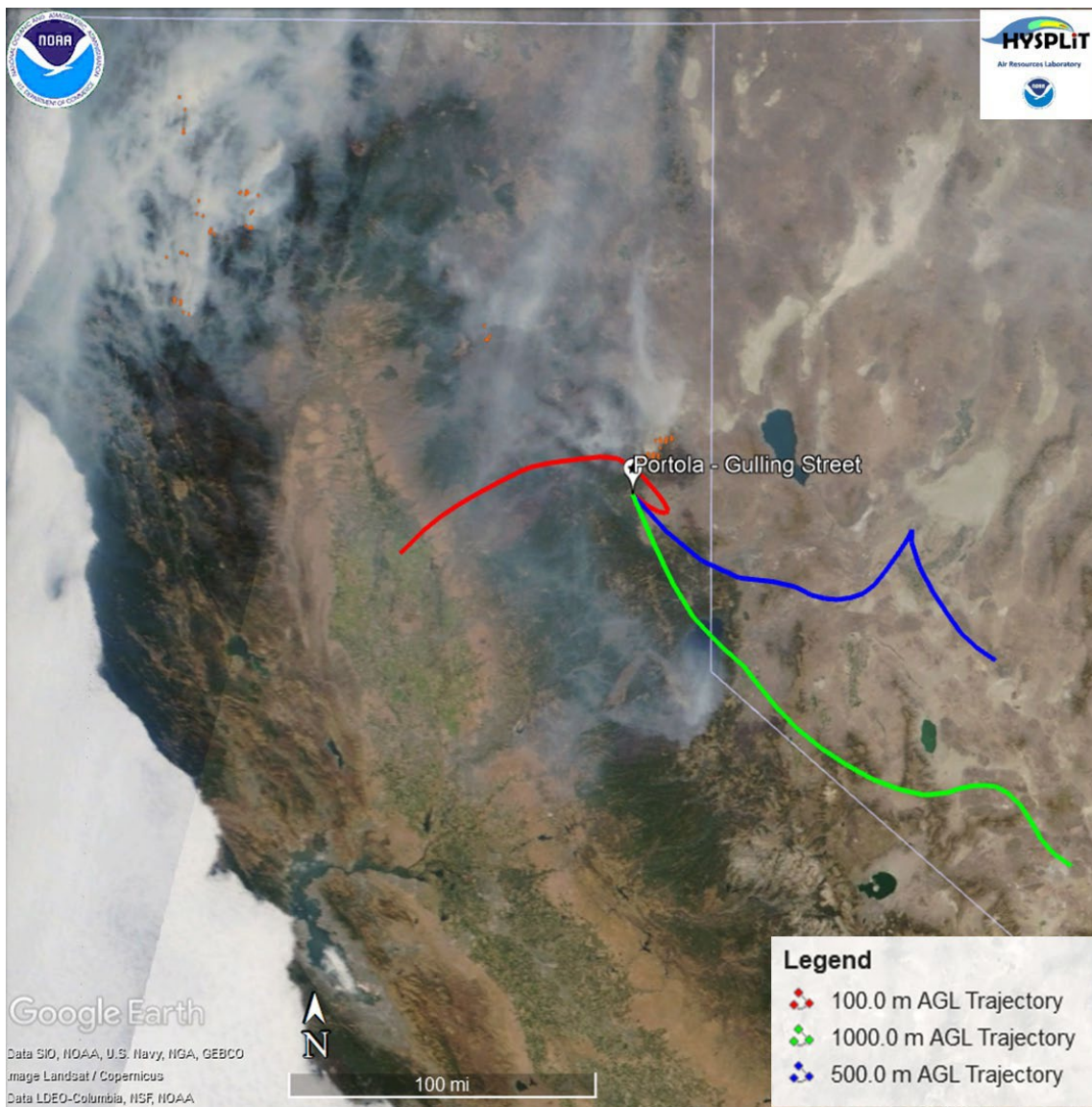
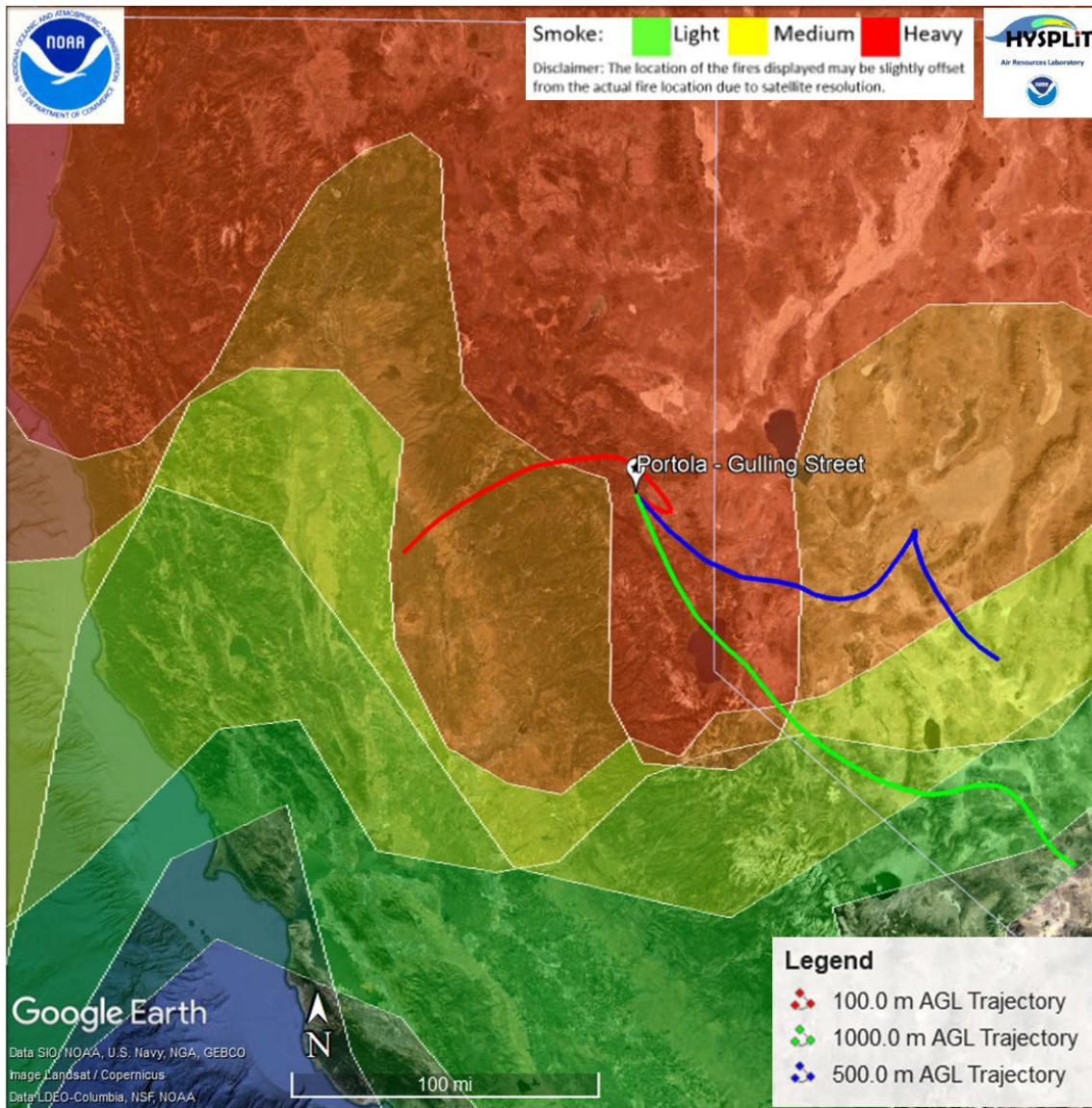


Figure 45: September 04, 2021, Backward Trajectory 08PST (September 04, 16UTC) from Portola overlaid with HMS Smoke



IV. Event Related and Historical Concentrations

A. Event Related Concentrations

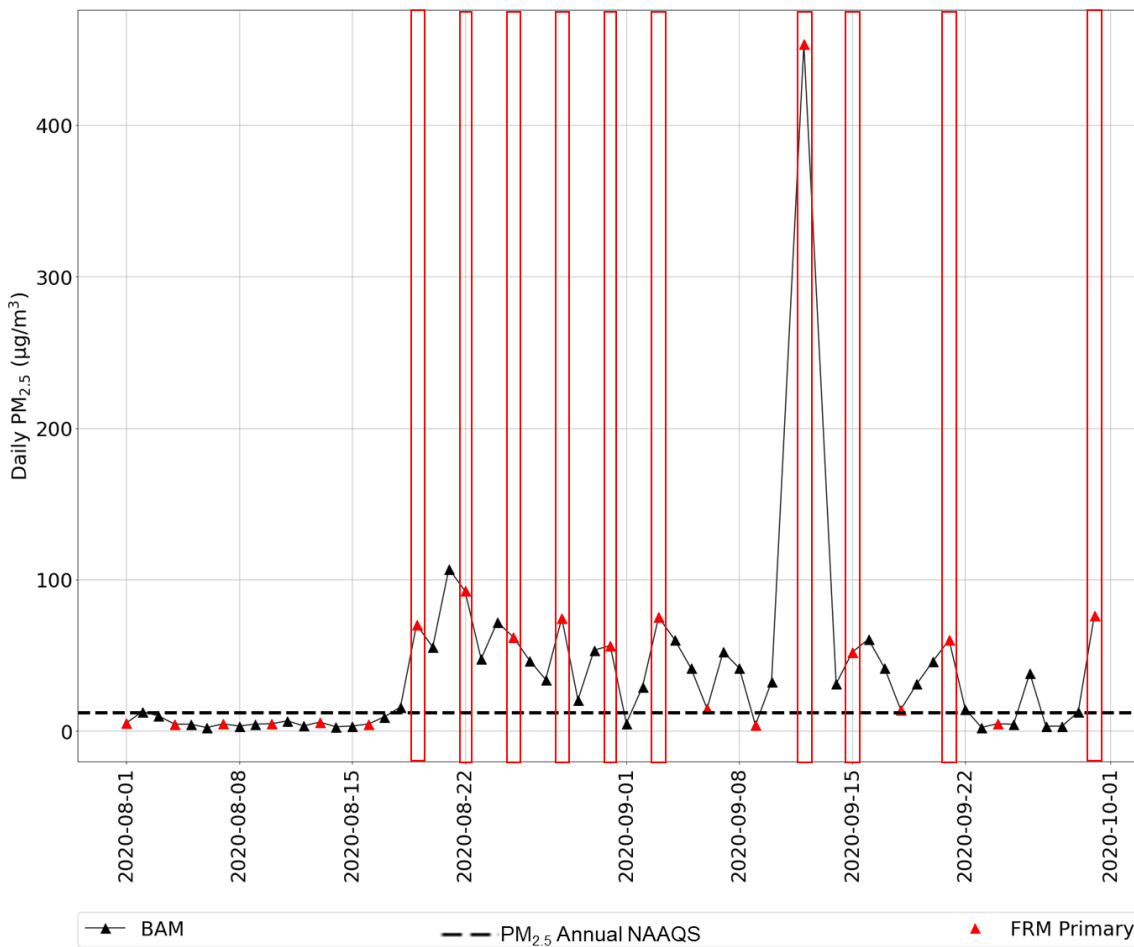
Smoke impacts from different wildfires on the Portola site fluctuated from day to day as variable winds transported wildfire smoke from the fires. Elevated $PM_{2.5}$ concentrations discussed in this section support the presence of wildfire smoke at the surface.

Figure 46 (2020) and Figure 47 (2021) show daily $PM_{2.5}$ concentrations at the Portola monitor for all the atypical event days in 2020 and 2021 (highlighted with the red box around the date). In Figure 46 (2020) and Figure 47 (2021), the red triangles show the primary FRM $PM_{2.5}$ data,

which collected data on a 1-in-6 day schedule. BAM data was used to fill in the missing days (black triangles).

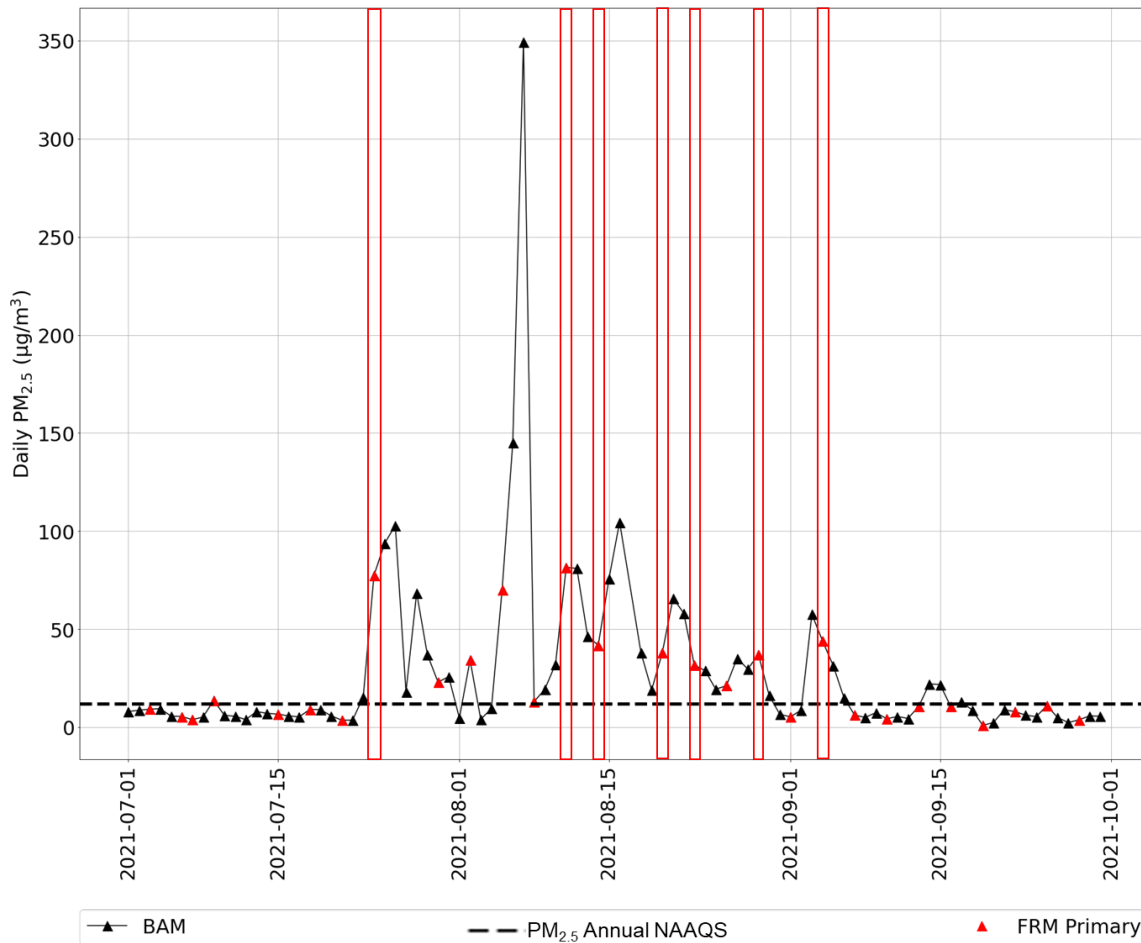
August and September 2020 had many days with high PM_{2.5} concentrations. These two months were impacted greatly by numerous wildfires such as the Loyaltan Fire and the August Complex, the LNU Lightning Complex, and the North Complex. The summer of 2021 also had many days with high PM_{2.5} concentrations. July through September 2021 were impacted by the many wildfires in the area, such as the Dixie and Sugar Fires being the closest two fires to the Portola monitor during all the 2021 atypical events.

Figure 46: Daily PM_{2.5} Averages* at Portola - Gulling Street in 2020 with atypical event days highlighted



* BAM data was used to fill in days that didn't have the primary FRM data

Figure 47: Daily PM_{2.5} Averages* at Portola - Gulling Street in 2021 with atypical event days highlighted

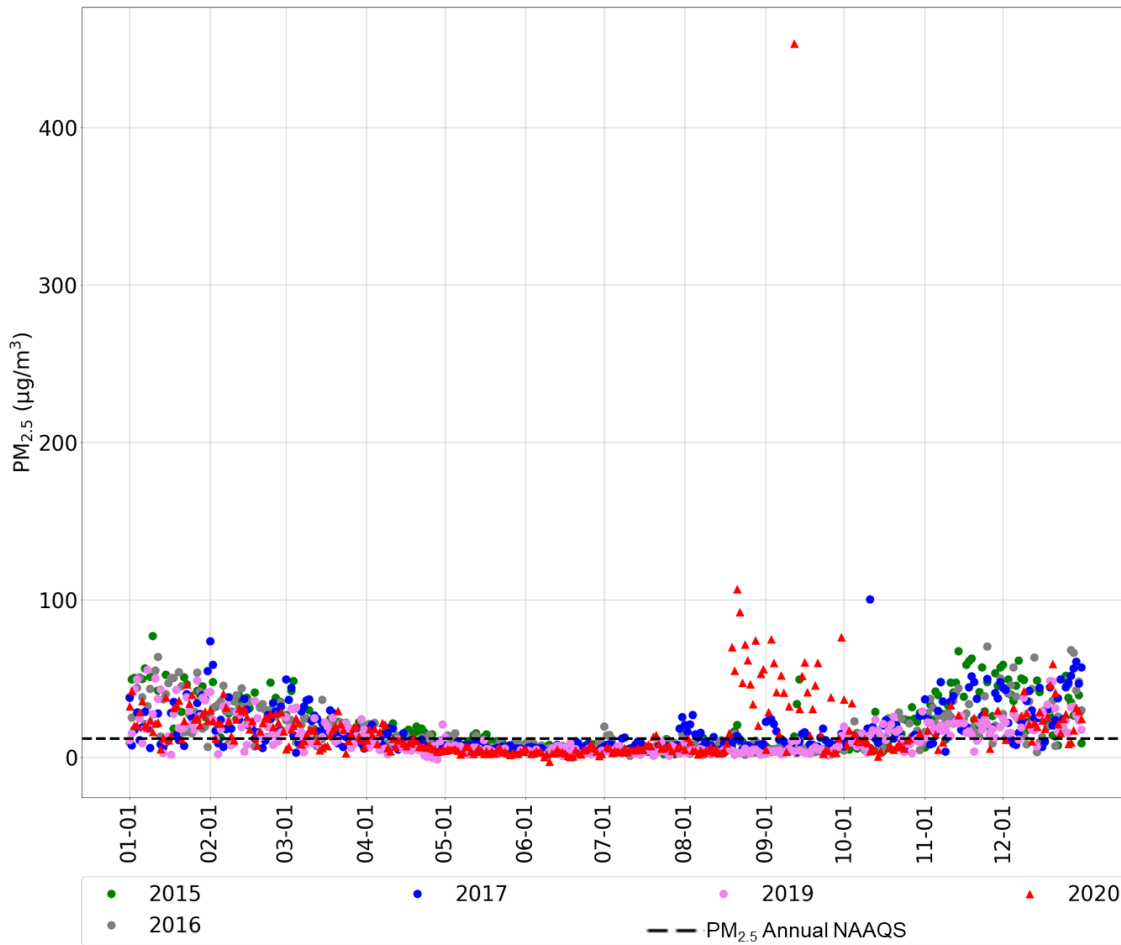


* BAM data was used to fill in days that didn't have the primary FRM data

B. Historical PM_{2.5} Concentrations

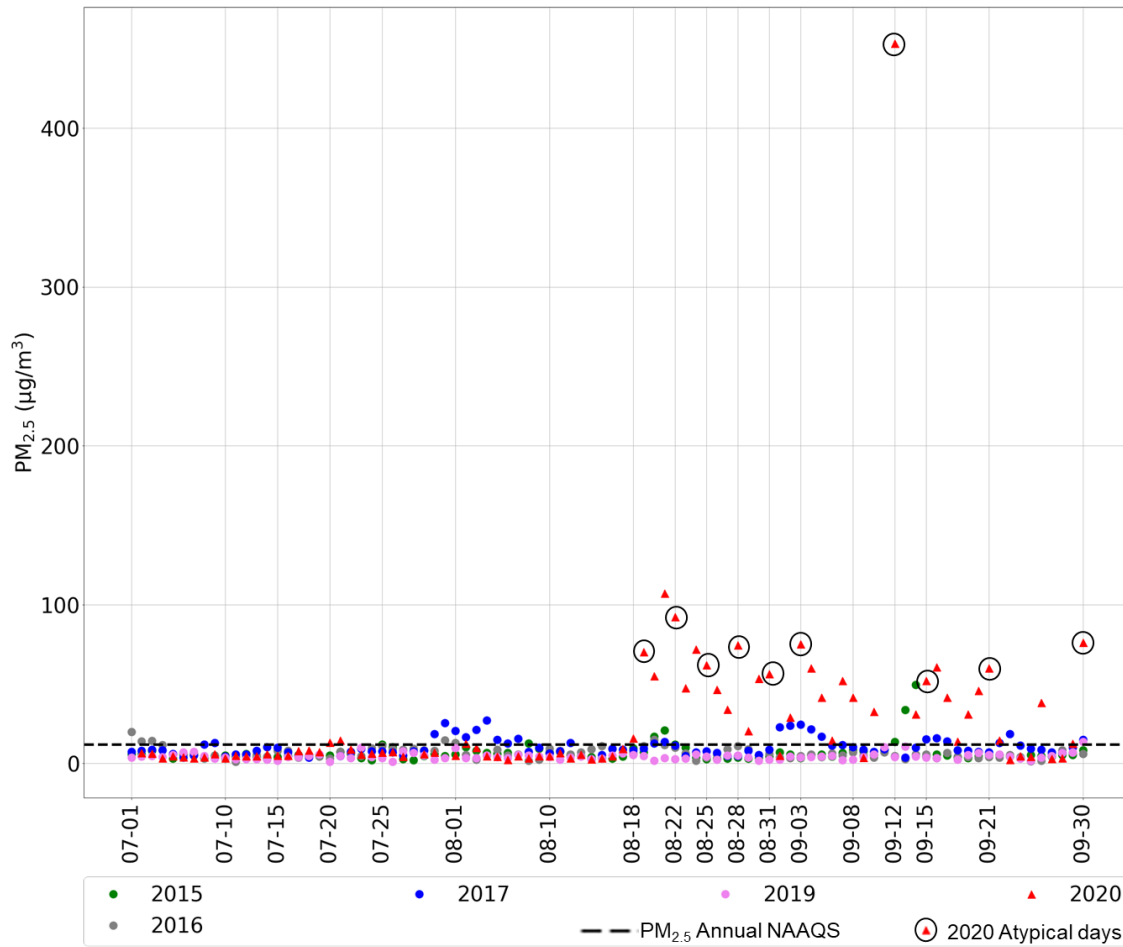
Historically, PM_{2.5} concentrations at the Portola monitor were mostly below the PM_{2.5} annual NAAQS (Figure 48, 2020, and Figure 50, 2021) during the 3rd quarter of 2015-2021. 2018 has been excluded from the historical concentration plots as 2018 was an extreme wildfire year and not an accurate representation of a typical 3rd quarter at the Portola monitor. A few daily concentrations were above the standard during this time, mostly in 2020 and 2021, which are believed to be a result of smoke from numerous wildfires. Figure 50 and Figure 51 also exclude 2020 PM_{2.5} data due to 2020 being the largest wildfire season recorded in California's modern history, and not an accurate representation of a typical 3rd quarter at the Portola monitor. Although it is believed that all the elevated PM_{2.5} concentrations observed at the Portola monitor during the 2020 and 2021 wildfire seasons were affected by wildfires, only the circled dates from the primary FRM monitor in Figure 49 and Figure 51 are requested for exclusion from the modeling exercise as atypical event days.

Figure 48: Portola PM_{2.5} daily averages* by day of year for 2015-2019 and 2020



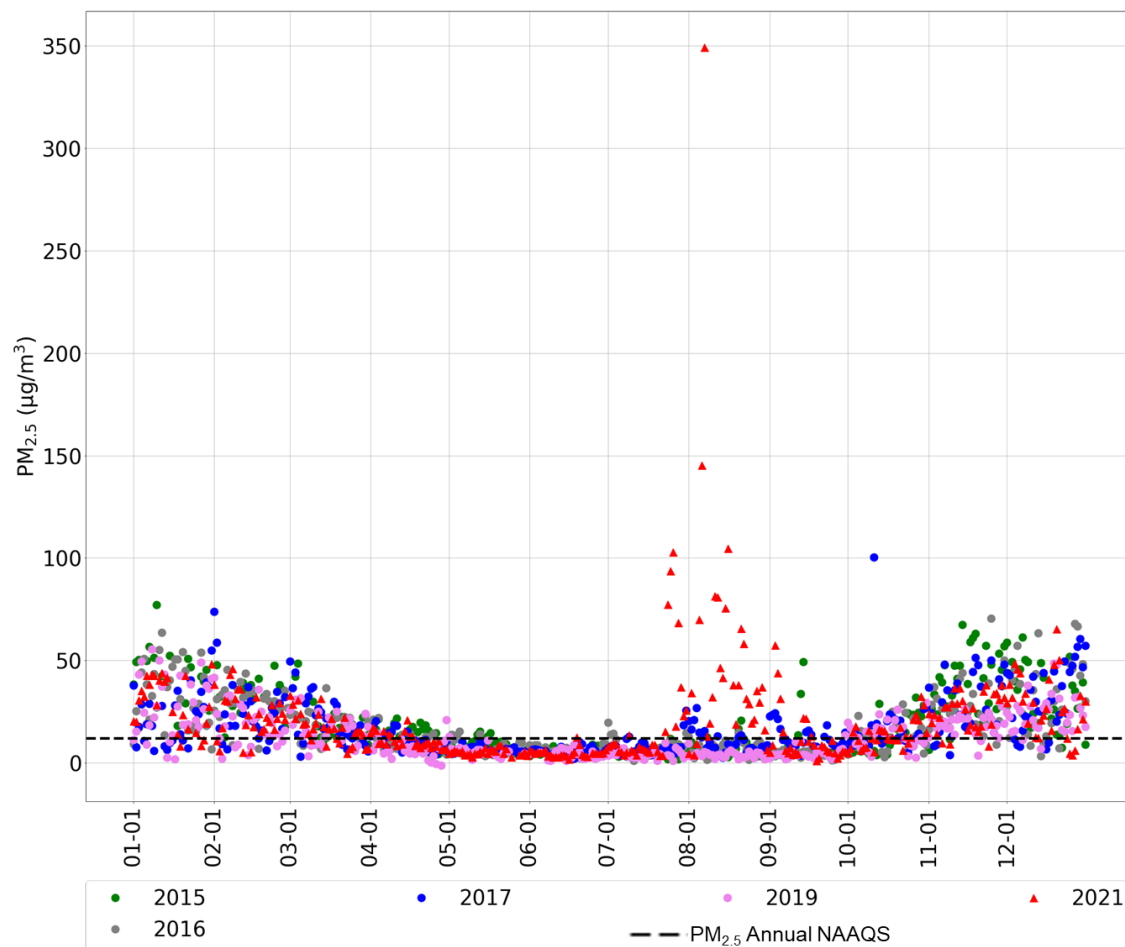
* BAM data was used to fill in days that didn't have the primary FRM data

Figure 49: Portola PM_{2.5} daily averages* from July 1 to September 30, 2015-2019 and 2020



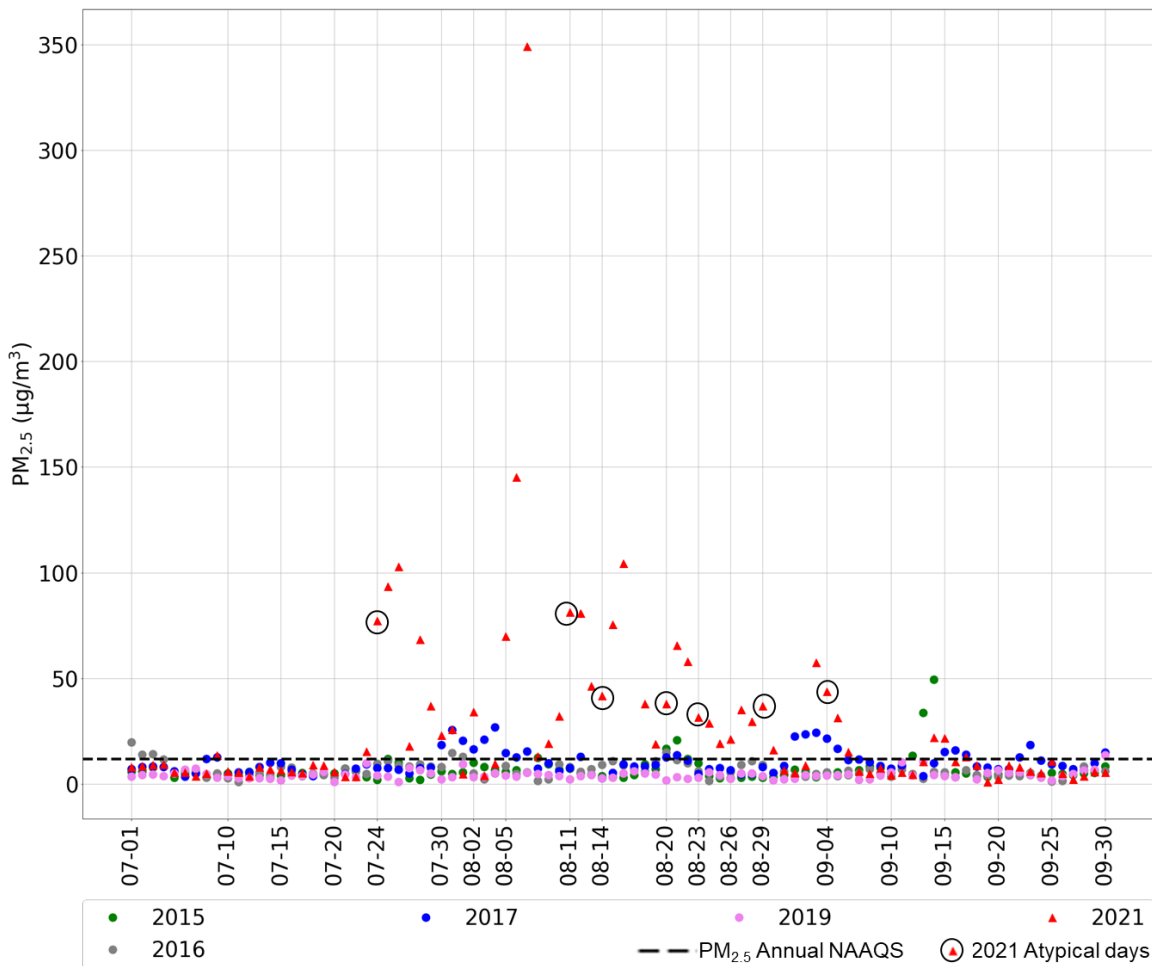
* BAM data was used to fill in days that didn't have the primary FRM data

Figure 50: Portola PM_{2.5} daily averages* by day of year for 2015-2019 and 2021



* BAM data was used to fill in days that didn't have the primary FRM data

Figure 51: Portola PM_{2.5} daily averages* from July 1 to September 30, 2015-2019 and 2021



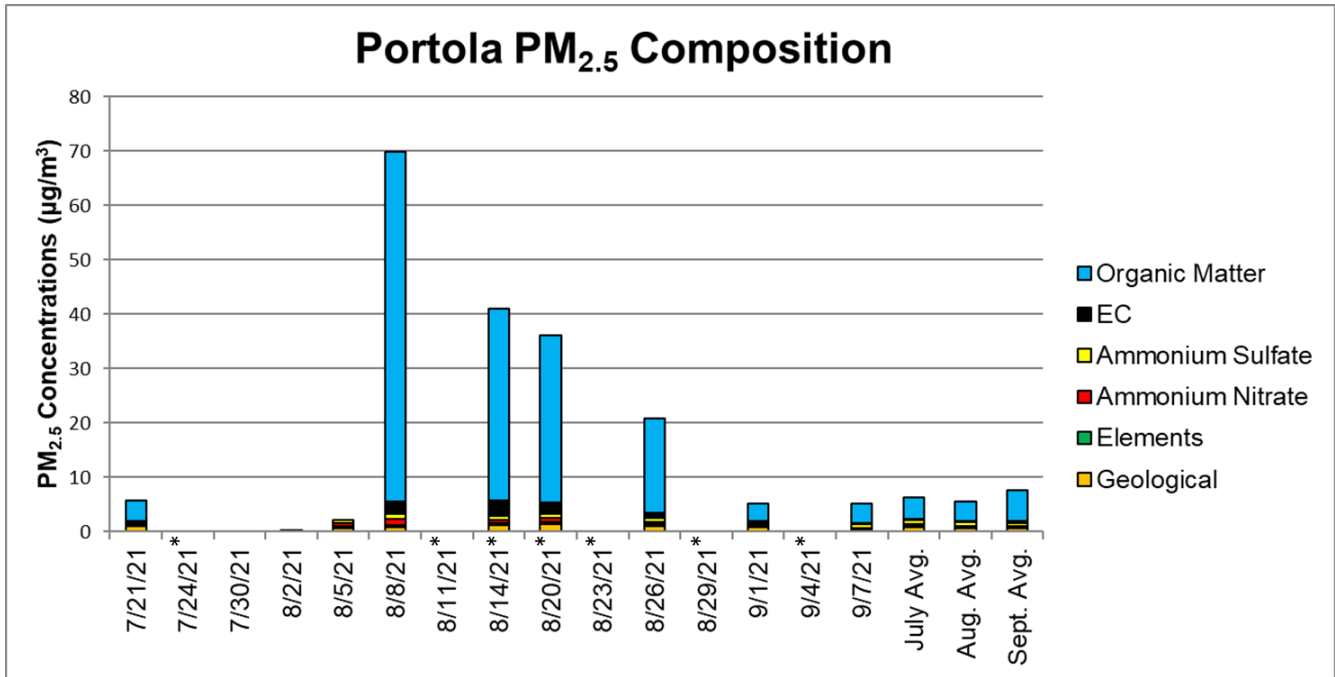
* BAM data was used to fill in days that didn't have the primary FRM data

V. PM_{2.5} Speciation Data

Organic matter is a known chemical tracer for biomass burning and can help track the influence and intensity of wildfire smoke. Portola only has PM_{2.5} speciation data available for the 2021 atypical days. During the COVID-19 pandemic, collection of speciation samples was suspended after quarter 1 of 2020 and not resumed until quarter 2 of 2021. The Portola speciation sampler operates in a 1-in-6-day schedule. This unfortunately means that some of the 2021 atypical days, such as August 11, 2021, don't have speciation data.

Figure 52 shows the July to September 2021 speciation data, along with the monthly averages. The monthly averages are based on data from the Portola monitoring site using the years 2017 through 2021, excluding atypical days in 2018 and 2020. Comparing the event days to the monthly average shows that many days in August, including the atypical days, have higher organic matter than the monthly averages, indicating that these days were impacted by wildfire smoke.

Figure 52: 2021 PM_{2.5} speciation for the July to September atypical events* and surrounding dates compared the monthly averages



*Atypical days

Figure 53 shows the average speciation breakdown at Portola during the third quarter (left) and August (right) averaged from 2017 to 2021, excluding atypical days in 2018 and 2020. Figure 54 shows a pie chart breakdown of the speciation data for two of the 2021 atypical event days, August 14 (left) and August 20 (right). The atypical days have higher organic matter than the quarterly and monthly average, supporting that these days were impacted by wildfire smoke.

Figure 53: Average speciation breakdown at Portola during the third quarter (left) and August (right) averaged from 2017 to 2021

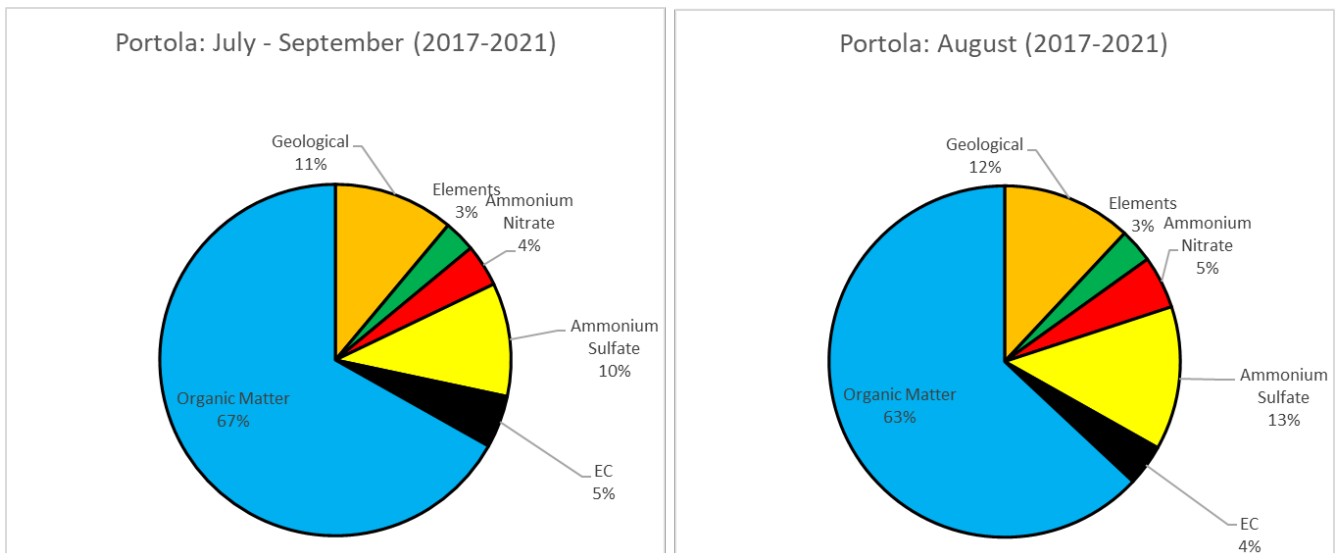
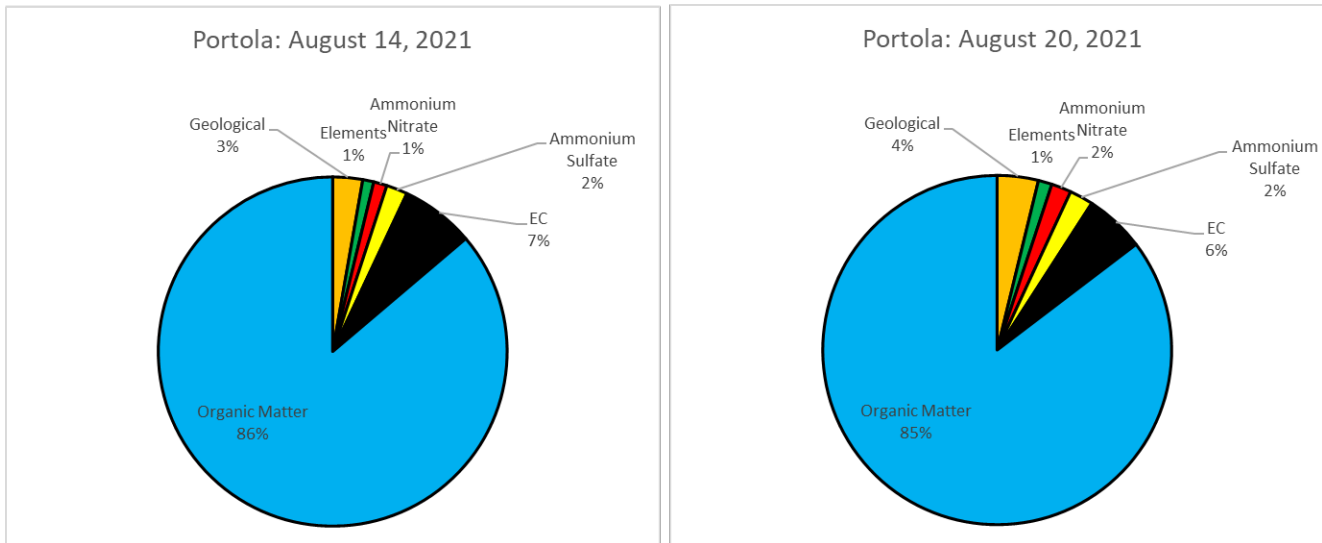


Figure 54: Speciation breakdown at Portola during the 2021 atypical event days of August 14 (left) and August 20 (right)

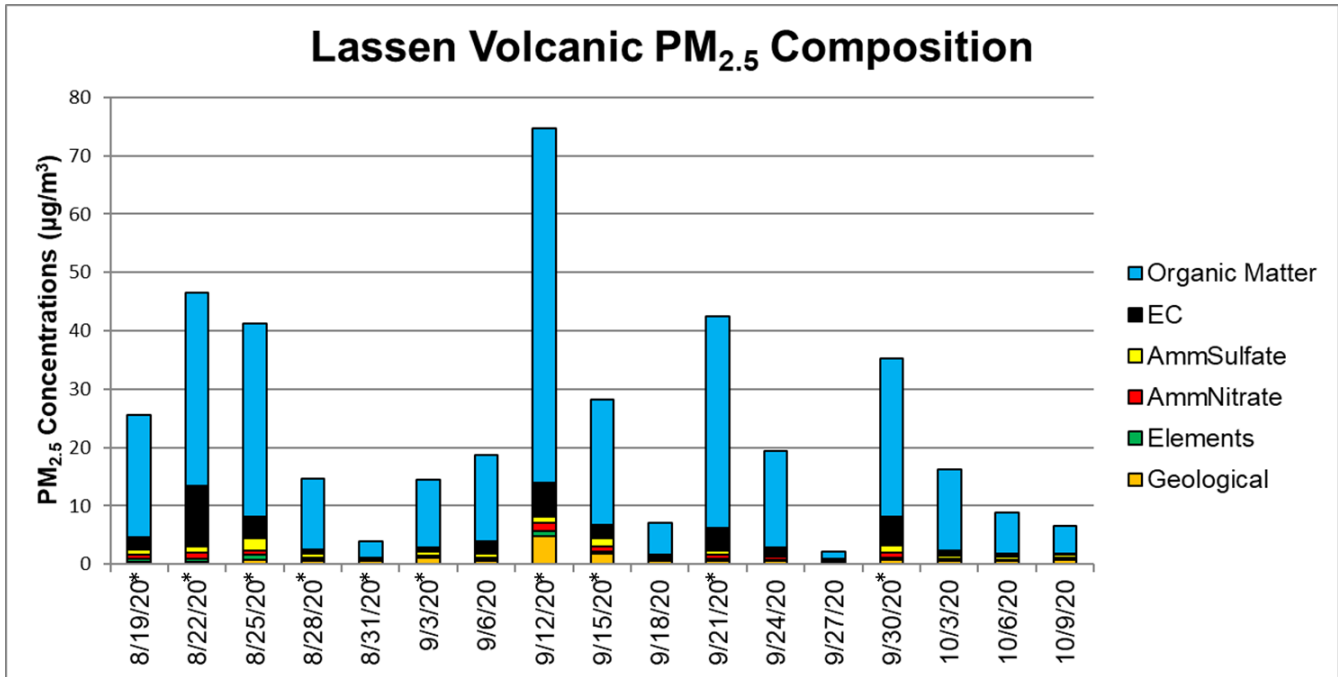


A. Lassen Volcanic National Park Speciation Data

The speciation data from the Lassen Volcanic National Park monitoring site (AQS number 060893003) was also looked at for the atypical days. Portola and the Lassen Volcanic sites have a 277m elevation change and are approximately 76 miles apart. Therefore, the speciation data might not fully represent local wildfire impacts that impacted Portola and not Lassen but should provide a decent idea of smoke impacting the area.

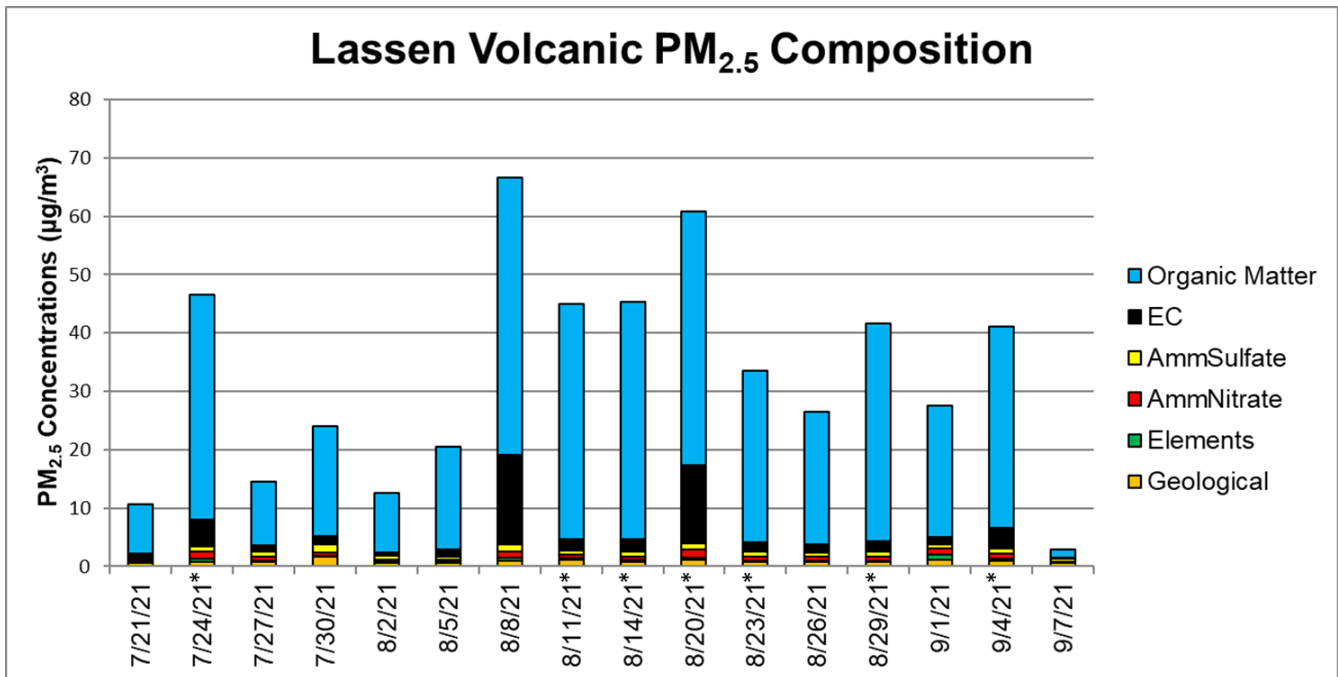
Figure 55 (2020) and Figure 56 (2021) show the Lassen Volcanic PM_{2.5} speciation for atypical dates in 2020 and 2021 (Table 4) and surrounding days. All the atypical dates have a high composition of organic matter, indicating that these days were impacted by wildfire smoke. Figure 57 and Figure 58 show a pie and a bar chart of average Lassen Volcanic concentrations based on 2018-2021 typical data and days considered atypical at Portola, respectively. On a typical day, average PM_{2.5} concentrations were about 2 ug/m³ with less than 60 percent of mass from carbonaceous aerosols. On days considered atypical for the purpose of Portola Serious SIP, average PM_{2.5} concentration was 40 ug/m³ with 92 percent of mass from carbonaceous aerosols. The significant difference in concentration and composition further demonstrates the impact of wildfires and the need to exclude these data from data modeling.

Figure 55: 2020 PM_{2.5} speciation at Lassen Volcanic National Park monitoring site for the August and September atypical events* and surrounding dates



*Portola atypical days

Figure 56: 2021 PM_{2.5} speciation at Lassen Volcanic National Park monitoring site for the July to September atypical events* and surrounding dates



*Portola atypical days

Figure 57. 2018-2021 Average Composition at Lassen Volcanic (Data Impacted by Atypical Events Excluded)

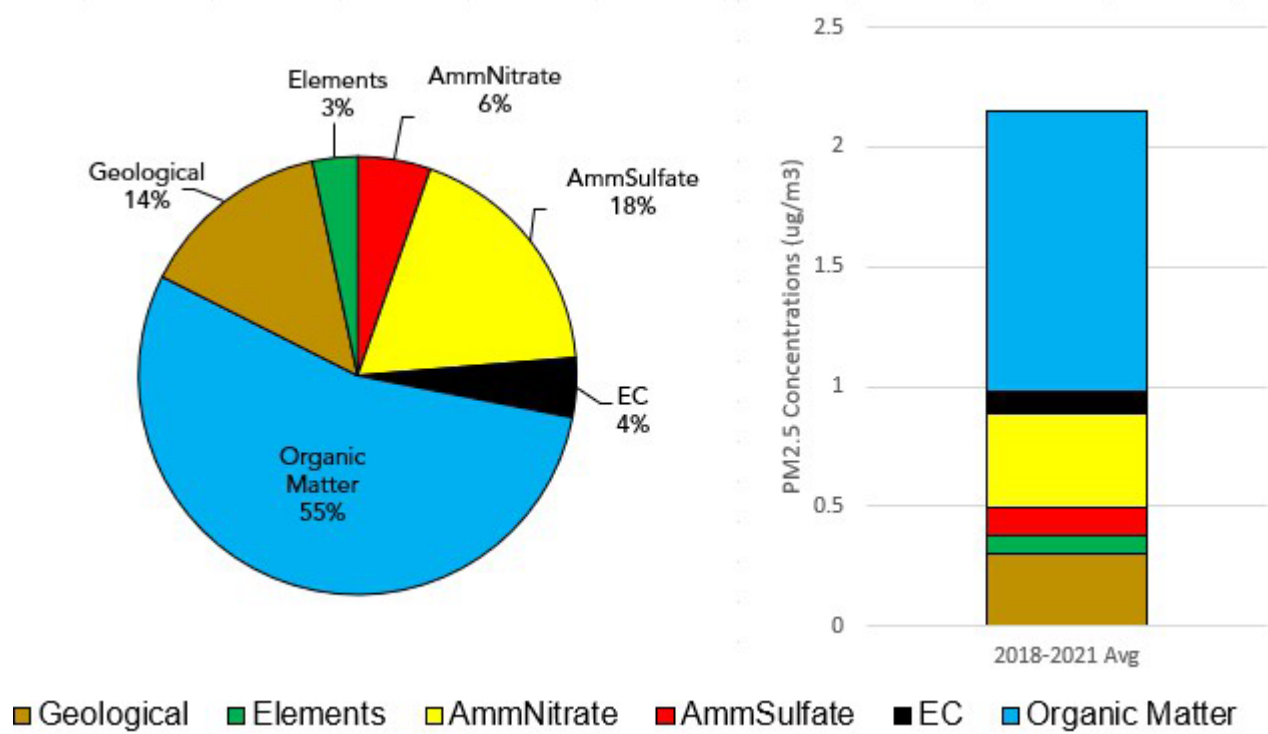
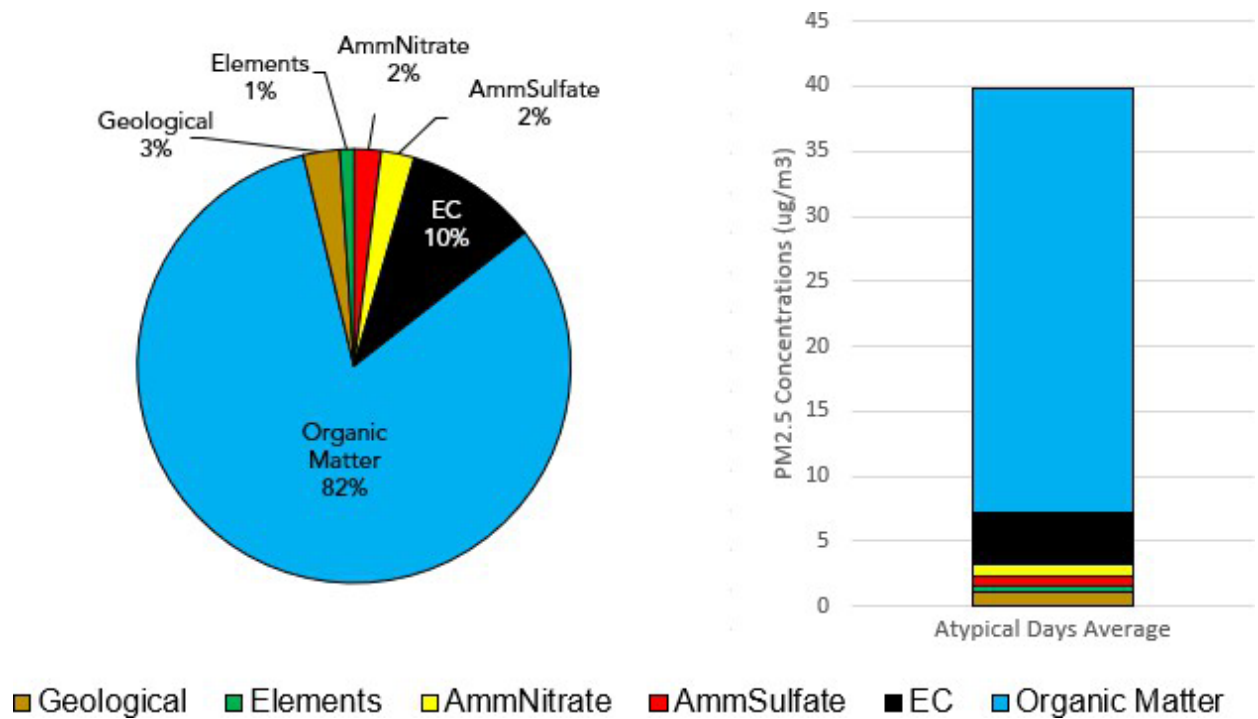


Figure 58. Average Composition at Lassen Volcanic on Portola Days Considered Atypical



VI. Meteorological Conditions

Portola is located in an intermountain basin in the northern portion of the Sierra Nevada Mountains. Situated at an elevation of 1,492 meters (4,895 feet) on the leeward side of the mountain range, the site typically experiences drier conditions than nearby areas with an annual average of 20 inches precipitation. Topography combined with local meteorology frequently plays a significant role in particulate matter concentrations at Portola, emissions can be trapped in the area for extended periods of time when there is strong, persistent high pressure aloft and little dispersion as the area is surrounded on three sides by mountains. PM emissions from residential woodsmoke use can accumulate during the winter months, particularly under stagnant subsident meteorological conditions. Further, PM buildup can occur when a weak surface diurnal windflow pattern is prevalent over in the region, retaining existing PM emissions while adding in new emissions each night as the wind transports pollution up and down the mountainside.

A. 2020 Atypical Days

Table 6 lists averages and standard deviations of daily temperatures and resultant wind speeds during the 2020 atypical event days (as outlined in Table 4), normal (non-event) days, and all combined days in August and September 2020 at the Portola monitoring site. In general, days on which atypical events occurred had slightly higher average maximum daily temperatures and comparable wind speeds to non-event days. Both August and September showed low average wind speeds, which helped keep the area layered with smoke.

Table 6: Averages and Standard Deviations (SD) of maximum daily Temperatures (°F) and Resultant Wind Speeds (mph) in 2020

Atypical Event Period	Temperature (°F)		Wind Speeds (mph)	
	Average	SD	Average	SD
August Event Days	88.3	2.0	2.9	0.3
August Normal Days	88.7	3.5	2.9	0.4
August All	88.6	3.3	2.9	0.4
September Event Days	87.0	6.0	2.4	0.4
September Normal Days	83.3	7.4	2.9	0.7
September All	82.6	7.5	3.0	0.7

Further details of the meteorological conditions, including maximum temperature and wind speed, as well as max hourly PM_{2.5} concentrations on each atypical event day in 2020, are included in Table 7.

Table 7: Maximum Daily Values of Temperature and Wind Speed during the 2020 Atypical Days at the Portola Monitoring Site

Date	8-19	8-22	8-25	8-28	8-31	9-03	9-12	9-15	9-21	9-30
PM _{2.5} Hourly Max (µg/m ³)	436*	203	214	276*	153*	159	654	74.0	152	156
PM _{2.5} Daily Average (µg/m ³)	70.3	92.4	61.9	74.5	56.3	75.1	453	52.0	60.1	76.3
Max Temperature (°F)	88.0	90.5	85.8	90.1	87.1	96.6	88.0	85.3	80.6	84.7
Wind Speed (mph)	3.1	3.1	3.0	2.3	3.0	2.3	2.2	2.8	2.9	2.0

* PurpleAir PM_{2.5} hourly maximum concentration used

During the 2020 atypical days, the maximum daily temperatures were in the 80s and 90s with the maximum daily resultant wind speeds remaining light at 2-3.1 mph. Maximum PM_{2.5} concentrations varied significantly, with daily averages during the atypical days ranging from 52.0 µg/m³ to 453 µg/m³ and hourly maximums ranging from 74.0 µg/m³ to 654 µg/m³.

The weather data for all the atypical days in 2020, supports that PM_{2.5} directly related to wildfire smoke from the wildfires in California affected the Portola monitor. All atypical days showed PM_{2.5} concentrations varied significantly, while the max temperatures and wind speeds stayed relatively constant. August and September also showed low average wind speeds, which helped keep the area layered with smoke. Unusual weather, other than the transport of wildfire smoke, was not a factor contributing to the atypical events.

B. 2021 Atypical Days

Table 8 lists averages and standard deviations of daily temperatures and resultant wind speeds during the 2021 atypical event days (as outlined in Table 4), normal (non-event) days, and all combined days in July, August, and September 2021 at the Portola monitoring site. In general, days on which atypical events occurred had slightly higher average maximum daily temperatures and comparable wind speeds to non-event days. All months showed low average wind speeds, which helped keep the area layered with smoke.

Table 8: Averages and Standard Deviations (SD) of maximum daily Temperatures (°F) and Resultant Wind Speeds (mph) in 2021

Atypical Event Period	Temperature (°F)		Wind Speeds (mph)	
	Average	SD	Average	SD
July Event Days*	96.8	N/A	2.9	N/A
July Normal Days	91.2	4.5	3.0	0.4
July All	91.3	4.6	3.0	0.4
August Event Days	89.0	6.6	3.1	0.7
August Normal Days	87.7	7.5	3.0	0.6
August All	88.0	7.2	3.0	0.6
September Event Days*	87.6	N/A	3.0	N/A
September Normal Days	80.8	8.8	3.1	0.5
September All	81.0	8.8	3.1	0.5

* Month only had 1 event day

Further details of the meteorological conditions, including maximum temperature and wind speed as well as max hourly PM_{2.5} concentrations, on each atypical event day in 2021 are included in Table 9.

Table 9: Maximum Daily Values of Temperature and Wind Speed during the 2021 Atypical Days at the Portola Monitoring Site

Date	7-24	8-11	8-14	8-20	8-23	8-29	9-04
PM _{2.5} Hourly Max (µg/m ³)	134	152	148	90.0	75.0	96.0	139
PM _{2.5} Daily Average (µg/m ³)	77.4	81.5	41.8	38.1	31.6	37.1	44.0
Max Temperature (°F)	96.8	93.9	98.4	84.7	81.0	90.5	87.6
Wind Speed (mph)	2.9	2.0	2.7	3.0	3.2	3.7	3.0

During the 2021 atypical days, the maximum daily temperatures were in the 80s and 90s with the maximum daily resultant wind speeds remaining light at 1.5-4 mph. Maximum PM_{2.5} concentrations varied significantly, with daily averages during the atypical days ranging from 31.6 µg/m³ to 81.5 µg/m³ and hourly maximums ranging from 75.0 µg/m³ to 152 µg/m³.

The weather data for all the atypical days in 2021, supports that PM_{2.5} directly related to wildfire smoke from the wildfires in California affected the Portola monitor. All atypical days showed PM_{2.5} concentrations varied significantly, while the maximum temperatures and wind speeds stayed relatively constant. July, August, and September also showed low average wind speeds, which helped keep the area layered with smoke. Unusual weather, other than the transport of wildfire smoke, was not a factor contributing to the atypical events.

VII. Atypical Wildfire Events Summary/Conclusion

Numerous wildfires (Table 2 and Table 3) were discussed as part of the retroactive analyses as direct, significant contributors to the atypical events being requested. These wildfires were all active producers of vast amounts of smoke and emissions and ultimately consumed over 4.3 (in 2020) and 2.5 (in 2021) million acres of wildlands in California.

During the atypical event days (Table 4) in 2020 and 2021, wildfires were particularly active, producing enormous amounts of smoke, and blanketing vast portions of Central and Northern California. PM_{2.5} speciation data showed high organic matter supporting that these days (Table 4) the monitor was impacted by wildfire smoke.

This documentation used the following evidence to demonstrate the atypical events:

- Ambient air monitoring data
- HYSPLIT backward trajectory analyses
- Satellite imagery
- Historical concentration comparisons
- Meteorological conditions
- NOAA HMS smoke products

This atypical events demonstration clearly demonstrates justification for exclusion of data from the modeling base year design value calculation for the dates as listed in Table 4, due to wildfire smoke impact.

Correlation between FRM and BAM PM_{2.5}

During 2020 and 2021, the Northern Sierra Air Quality Management District operated PM_{2.5} Federal Reference Method (FRM) filter collection in parallel with a non-FEM (Federal Equivalent Method) Beta Attenuation Mass Monitor (BAM) at the Portola – Gulling Street site. PM_{2.5} FRM supplied data for regulatory purposes while the PM_{2.5} BAM monitor supplied hourly data for Air Quality Index (AQI) purposes, forecasting, and diurnal concentration analyses. During the atypical event analysis, Sections VIII through XII, several days were found to have inconsistent PM_{2.5} measurements between the FRM filter and the BAM (e.g., the BAM-measured maximum PM_{2.5} hourly concentration being lower than the filter measurement). The correlation between FRM-measured and BAM-measured PM_{2.5} data are thus investigated in this section.

A scatter plot of 24h-average BAM-measured PM_{2.5} vs. FRM-measured PM_{2.5} in Portola from 2020 to 2021 is shown in Figure 59 together with their linear regression relationship. A slope of 0.8 with the square of correlation coefficient (r^2) of 0.7 based on 210 days with matching data pairs indicate a relatively good agreement between the two monitors, except on a few outlier days. The six outlier days are August 19, August 28, August 31 in 2020, and August 2, August 5 and August 8 in 2021.

Figure 59. 24h-average BAM-measured PM_{2.5} vs FRM-measured PM_{2.5} at the Portola – Gulling Street site from 2020 to 2021 with the linear regression line shown in blue. The six outlier days are marked by their individual date.

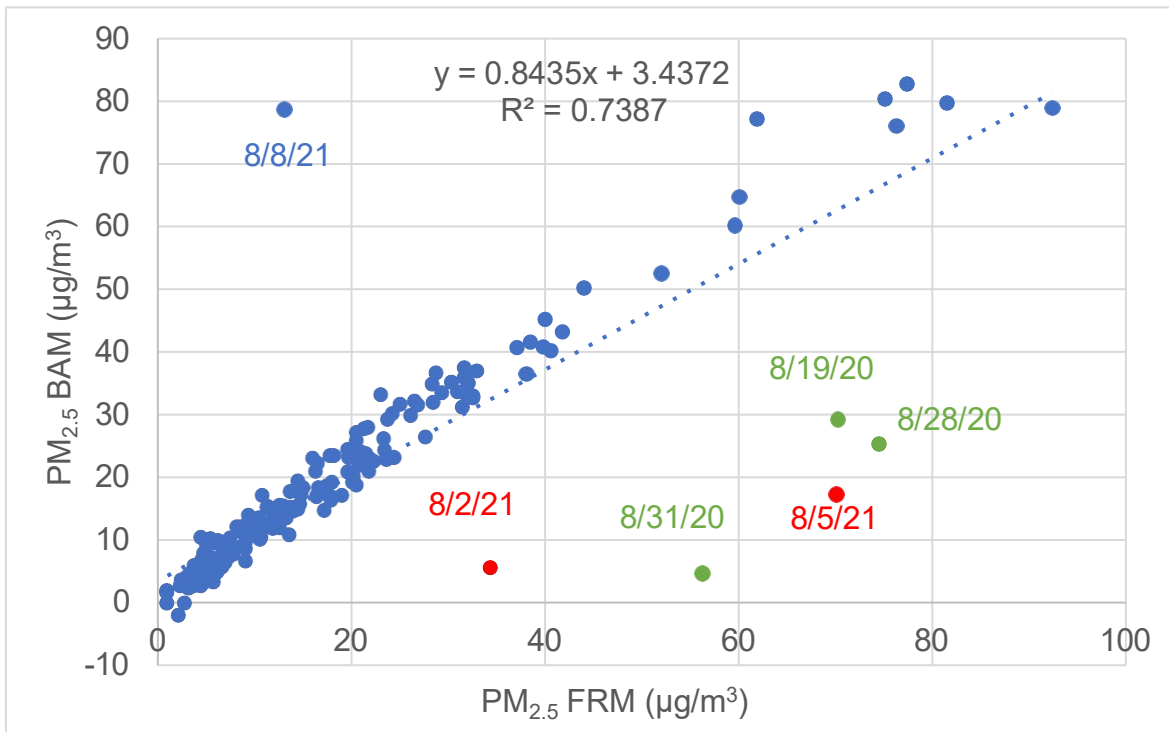
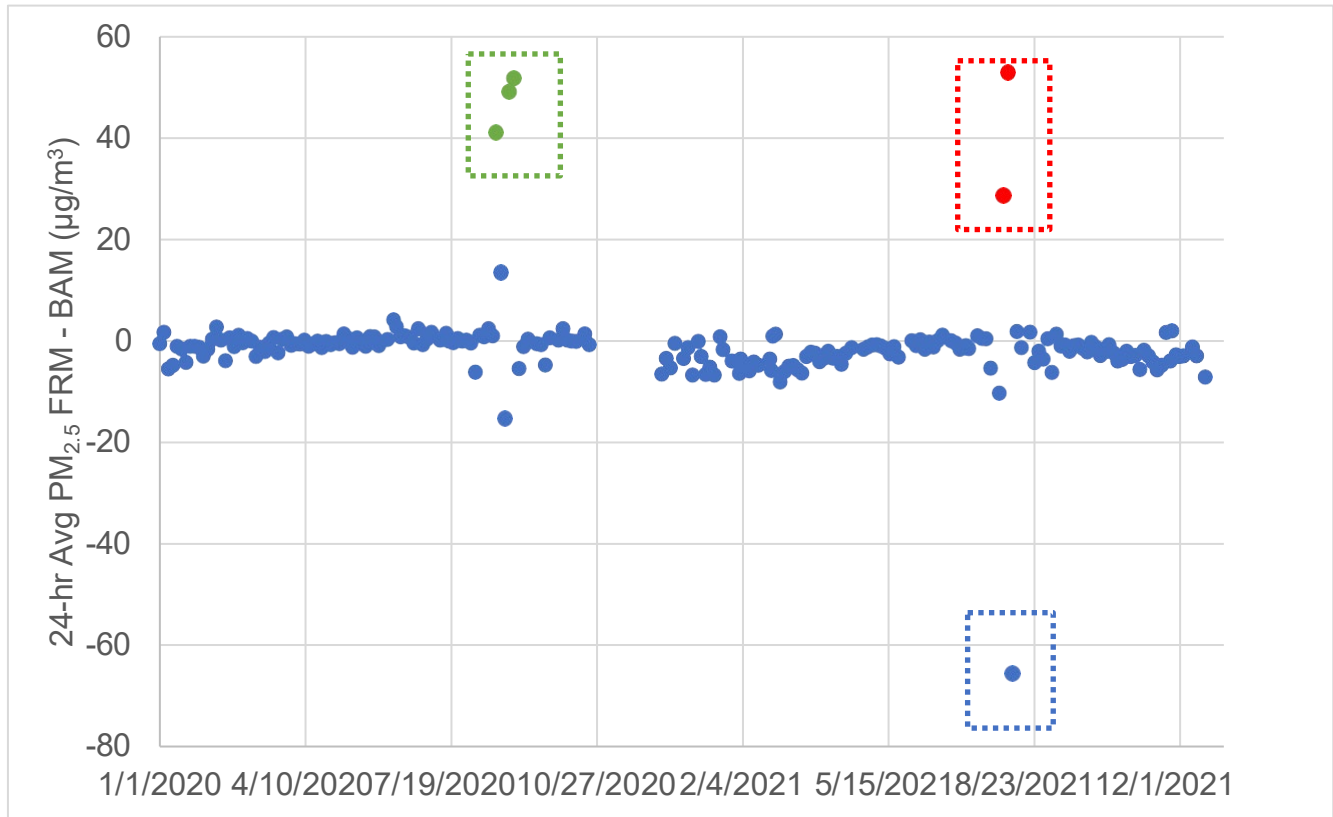


Figure 60 illustrates the difference between the FRM-measured PM_{2.5} concentrations and the 24h average BAM PM_{2.5} concentrations. For August 08, 2021, the filter measurement is 65.5 µg/m³ lower than the 24h average BAM measurement. For the remaining five days in question, the difference between the two monitors ranged from 28.7 µg/m³ to 52.9 µg/m³.

Figure 60. Difference between the FRM-measured PM_{2.5} concentrations and the 24h average BAM PM_{2.5} concentrations from 2020 to 2021 at the Portola – Gulling Street site. The six outlier days are highlighted with dashed boxes.



On the three outlier days in 2020, the 24h-average BAM PM_{2.5} concentrations were 41.1 – 51.7 µg/m³ lower than those measured by the FRM. An analysis of additional data from available PM_{2.5} monitors, including the collocated FRM at the Portola-Gulling Street site, the Purple Air monitors¹⁵ in and surrounding Portola, and the speciation monitor on site confirmed elevated FRM concentrations. These analyses are presented in Sections VIII through XII. Therefore, BAM measurements for these three days were not used for diurnal pattern analyses because they did not reflect the actual air quality.

On 08/02/2021 and 08/05/2021, the FRM-measured PM_{2.5} concentrations were significantly higher (28.7 µg/m³ and 52.9 µg/m³, respectively) than the 24h-average BAM values. In this case, the FRM measurements were determined to be incorrect and thus excluded from the modeling analysis as described in Sections VIII through XII. Detailed analyses investigating potential wildfire influence, unusual weather conditions, Purple Air monitor data in and surrounding Portola, and speciation data demonstrated that the BAM measurements on those two days in question reflected the actual air quality and that the high filter concentrations were unsubstantiated. It is highly likely human error(s) was involved when collecting and/or documenting the filter samples on those two days.

¹⁵ Purple Air sensor

August 08, 2021 was the only outlier day when the FRM-measured PM_{2.5} concentration was significantly lower, i.e., 65.6 µg/m³ than the 24h-average BAM value. However, due to this BAM data being non-regulatory, additional analyses of this day are not included in the atypical event discussion. There is a possibility that the filter measurements on 08/02/2021, 08/05/2021 and 08/08/2021 were inadvertently switched, resulting in PM_{2.5} measurements being not consistent between the FRM and the BAM on all three days.

Unrepresentative PM_{2.5} FRM Data Points

The Federal Reference Method (FRM) filter PM_{2.5} measurements at Portola on August 2, 2021 and August 5, 2021 were found to be significantly higher than the parallel 24h-average Beta Attenuation Mass Monitor (BAM) measurements, 6 times and 4 times respectively. The values are listed in Table 2 with PM_{2.5} concentrations measured by filters at 34.1 µg/m³ and 70.1 µg/m³, and 24h-average PM_{2.5} concentrations by BAM at 5.6 µg/m³ and 17.2 µg/m³. In addition, the maximum hourly PM_{2.5} concentration is lower than the FRM filter measurement on August 2, 2021. Such magnitude of inconsistencies between parallel measurements usually implies at least one of the measurements is erroneous.

The inconsistency was investigated. Laboratory records and instrument notes on both days were examined first, however, with no explanation for the discrepancy found. To determine whether one can trust FRM or BAM (or neither) readings on these two days, available parallel measurements from Purple Air sensors, and speciation samplers were compared against both FRM- and BAM-measured PM_{2.5}. Subsequent analyses of the conditions on those two days, e.g., potential wildfire influence and local meteorology, were also performed to further disprove the elevated FRM-measured PM_{2.5} concentrations.

Results indicate that the elevated FRM filter measurements are likely incorrect on both days, and thus excluded during modeling analysis as described in Portola Serious SIP, Section V.A. Parallel PM_{2.5} measurements from Purple Air sensors and speciation samplers are similar to those measured by BAM. Their relatively low PM_{2.5} readings were further supported by the fact that no significant smoke nor high wind conditions were observed on both days. It is thus reasonable for one to trust the BAM-measured PM_{2.5} on both days.

Table 10: PM_{2.5} measurements at the Portola – Gulling Street from FRM filter and BAM on both days in question.

Date	FRM filter (µg/m³)	24h-average BAM (µg/m³)	Max hourly BAM (µg/m³)
August 2, 2021	34.1	5.6	26.0
August 5, 2021	70.1	17.2	76.0

VIII. Potential Wildfire Influence

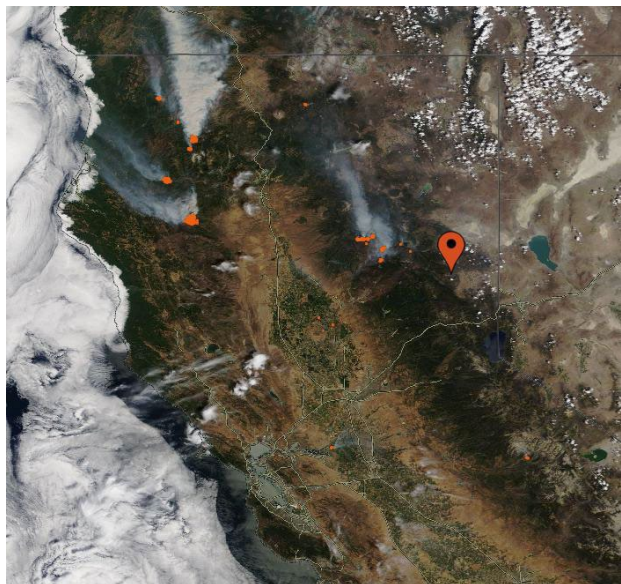
Wildfires are a known cause of elevated PM_{2.5} concentrations in Portola during summer months. As described in Section I, several large wildfires were active in northern California from late July to early-September in 2021. To investigate the possibility of potential wildfire influence contributing to high filter measurements, satellite imageries on both days were examined. Both the National Oceanic and Atmospheric Administration's (NOAA's) Satellite Smoke Text Product¹⁶ and the Moderate Resolution Imaging Spectroradiometer (MODIS) Terra satellite imageries indicate that no significant wildfire or smoke influence was present in Portola on either day.

A. August 2, 2021

NOAA's Satellite Smoke Text Product on August 2, 2021 was examined. Two text products were available for the day in question, i.e., "02 AUG – 17:54 UTC" (09:54 PST on August 2) and "03 AUG – 04:24 UTC" (20:24 PST on August 2). The text narrative recognizes the numerous fires active in parts of Canada and the western United States with "smoke then extended ... south into the Pacific Northwest of the United States." The fires in northern California, including McCash, River Complex, Monument, McFarland, and Dixie, were producing "thick smoke that was moving north from the parent fire."

The text description is consistent with the MODIS Terra Satellite image over northern California on August 2, 2021 as shown in Figure 61. To the northwest of Portola, active fires including McCash, River Complex, Monument, McFarland, and Dixie can be seen as hot spots with dense smoke moving north. The Portola region appears to be clear of dense smoke.

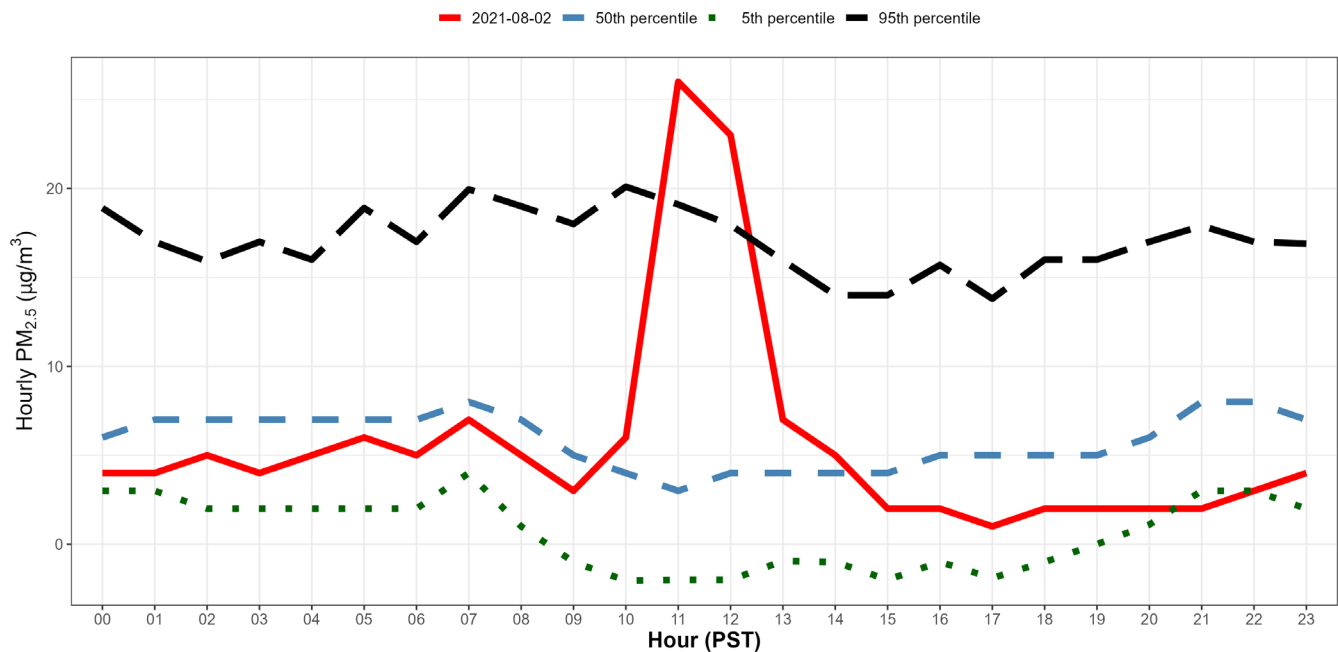
Figure 61: MODIS Terra Satellite image over northern California on August 2, 2021 with Portola highlighted by the red destination symbol.



¹⁶ NOAA Office of Satellite and Product Operations, [Satellite Smoke Text Product](#)

The BAM hourly PM_{2.5} measurements on August 2, 2021 were consistently low, with most hours of the day below the median concentrations based on 2015 – 2017 and 2019 August historical data (2018 excluded due to wildfires) as indicated in Figure 62. Hourly PM_{2.5} concentrations at 11:00 am and 12:00 pm were above the 95th percentile of their historical counterparts, at 26.0 µg/m³ and 23.0 µg/m³ respectively. The elevated concentrations at 11:00 am – 12:00 pm suggest unusual contributing source(s). If it was from wildfire, its influence was short-lived and mild. This is consistent with the lack of significant smoke observed over Portola as indicated in the satellite imagery. Based on the satellite imagery and BAM measurements, the high FRM filter measurement at 34.1 µg/m³ appears unsubstantiated.

Figure 62: Hourly PM_{2.5} concentrations measured by BAM on August 2, 2021 in Portola, together with the 5th, 50th and 95th percentiles of historical PM_{2.5} concentrations based on 2015-2017 and 2019 August data.



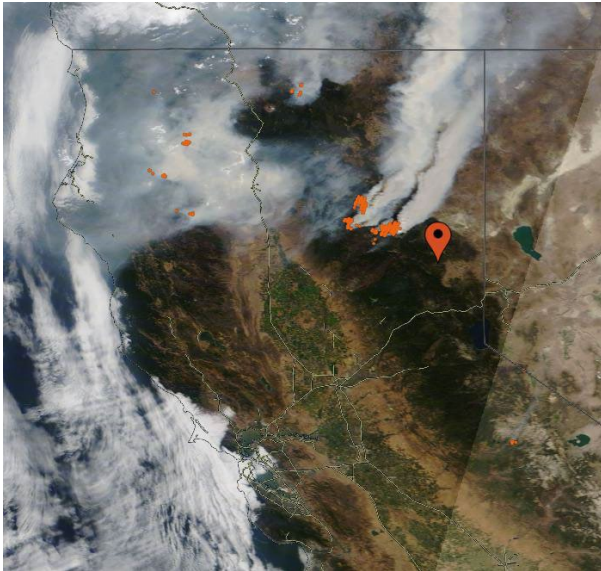
B. August 5, 2021

NOAA’s Satellite Smoke Text Product on August 5, 2021 was examined. Two text products were available for the day in question, i.e., “05 AUG – 15:33 UTC” (07:33 PST on August 5) and “06 AUG – 01:56 UTC” (17:56 PST on August 5). According to the text narrative, “thick density smoke and pyro-cumulus clouds from the Dixie wildfire complex was observed in this evening GOES visible satellite imagery. Several other wildfires to the northwest and west of the Dixie wildfire were also observed over Northern California. Smoke from the wildfire activity was seen progressing off towards the northeast, north, and east into Oregon, Washington, North Idaho, Northern Montana, Northwestern Nevada, and Southern British Columbia Province. Moderate and thick density smoke was observed away from the large complex fire activity over most of Northern California, the Northwestern U.S., and off the coast of Oregon and California over parts of the Pacific Ocean this evening.”

The text description is consistent with the MODIS Terra Satellite image over northern California on August 5, 2021 as shown in Figure 63. Thick smoke from several active fires

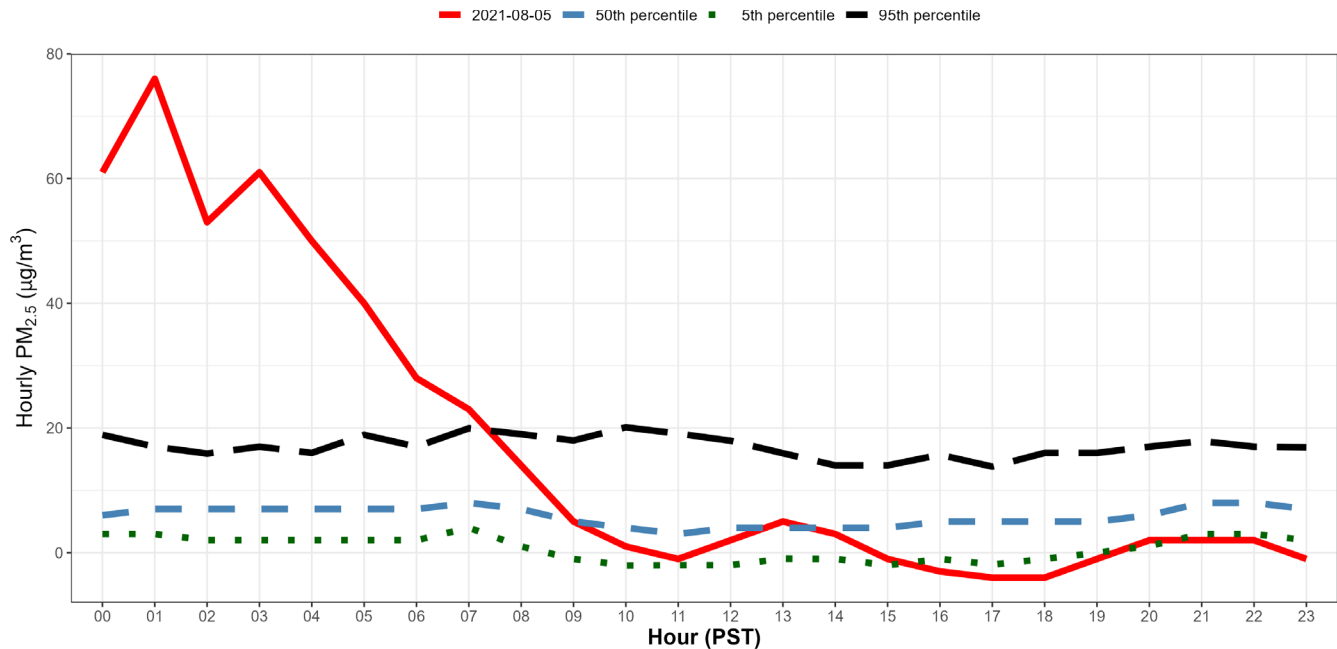
including the large complex fire mentioned above, were moving northeast of Portola, covering much of the terrain north of Portola and into Oregon. No dense smoke was observed directly over the Portola region.

Figure 63: MODIS Terra Satellite image over northern California on August 5, 2021 with Portola highlighted by the red destination symbol.



The BAM hourly $PM_{2.5}$ measurements on August 5, 2021 started off high, peaking at $76.0 \mu\text{g}/\text{m}^3$ at 01:00 am in the morning, and then gradually dropped back down at 09:00 am below the median concentrations based on 2015 – 2017 and 2019 August historical data (2018 excluded due to wildfires) as indicated in Figure 64. The morning peak in $PM_{2.5}$ concentrations suggests unusual contributing source(s). If it was from wildfire, its influence was relatively mild, lasting for less than half a day. This is consistent with the lack of significant smoke observed over Portola as indicated in the satellite imagery. Based on the satellite imagery and BAM measurements, the high FRM filter measurement at $70.1 \mu\text{g}/\text{m}^3$ appears unsubstantiated.

Figure 64: Hourly $PM_{2.5}$ concentrations measured by BAM on August 5, 2021 in Portola, together with the 5th, 50th and 95th percentiles of historical $PM_{2.5}$ concentrations based on 2015-2017 and 2019 August data.



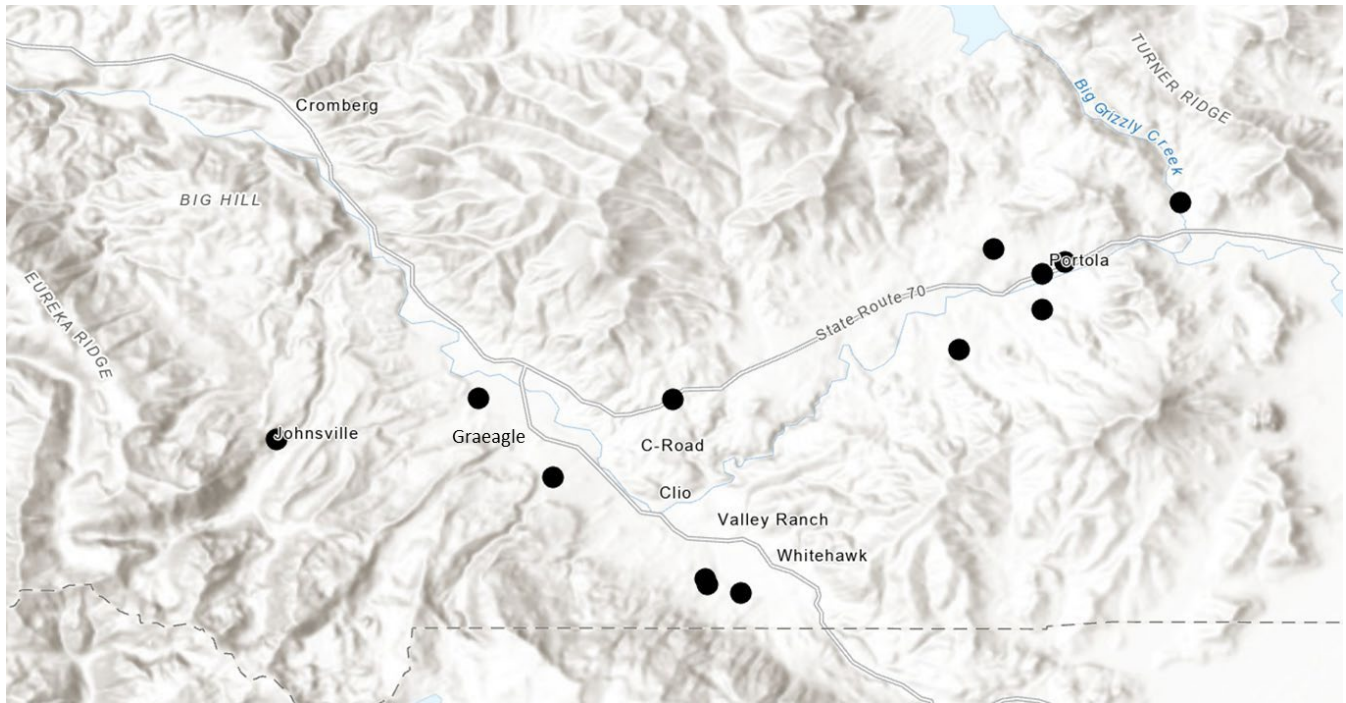
IX. Purple Air Monitor Data

Due to the lack of additional regulatory monitors surrounding Portola, local Purple Air (PA) monitor data¹⁷ were examined and compared against the BAM data collected on both days. Hourly data from 13 PA monitors surrounding Portola were retrieved and corrected with the EPA-recommended method¹⁸. Figure 65 shows the locations of the 13 PA monitors. Six monitors were centered in and around the city of Portola, and the remaining seven were installed about 10 miles west of Portola in and around Graeagle. While during winter, PM_{2.5} concentrations at Portola are significantly higher compared to the surrounding areas because of combination of meteorological conditions, terrain, and emissions, during summer concentrations are fairly uniform across the region. Therefore, PA data collected outside of Portola and Graeagle should be similar to levels measured in Portola.

Figure 65: Map of 13 Purple Air monitor locations in and around Portola.

¹⁷ [Purple Air sensor](#)

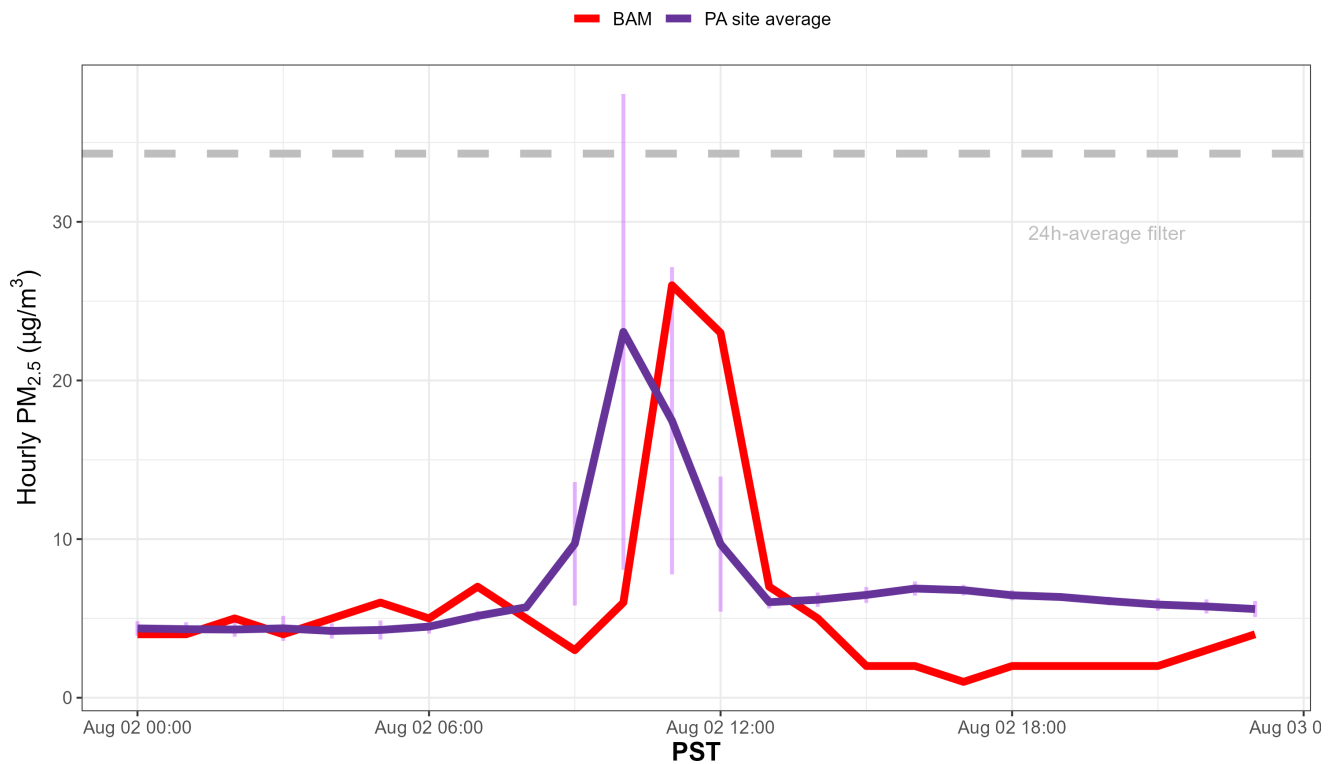
¹⁸ Johnson, K., A. Holder, S. Frederick, AND A. Clements. PurpleAir PM_{2.5} U.S. Correction and Performance During Smoke Events 4/2020. International Smoke Symposium, Raleigh, NC, April 20 - 24, 2020.



A. August 2, 2021

To compare the hourly $PM_{2.5}$ concentrations from the PA monitors against hourly BAM data, PA Channel A data from the 13 sites were averaged on August 2, 2021. As indicated in Figure 46, the PA averaged measurements track closely with BAM, both in concentrations and in trend. During the entire day, the hourly concentrations remained well below the FRM filter 24-hour average, with the maximum BAM-measured hourly concentration being $8.1 \mu\text{g}/\text{m}^3$ less at $26.0 \mu\text{g}/\text{m}^3$. Given that the 13 PA monitors measured $PM_{2.5}$ concentration levels similar to the BAM, the FRM filter measurement of $34.1 \mu\text{g}/\text{m}^3$ is highly inconsistent with these other data sources.

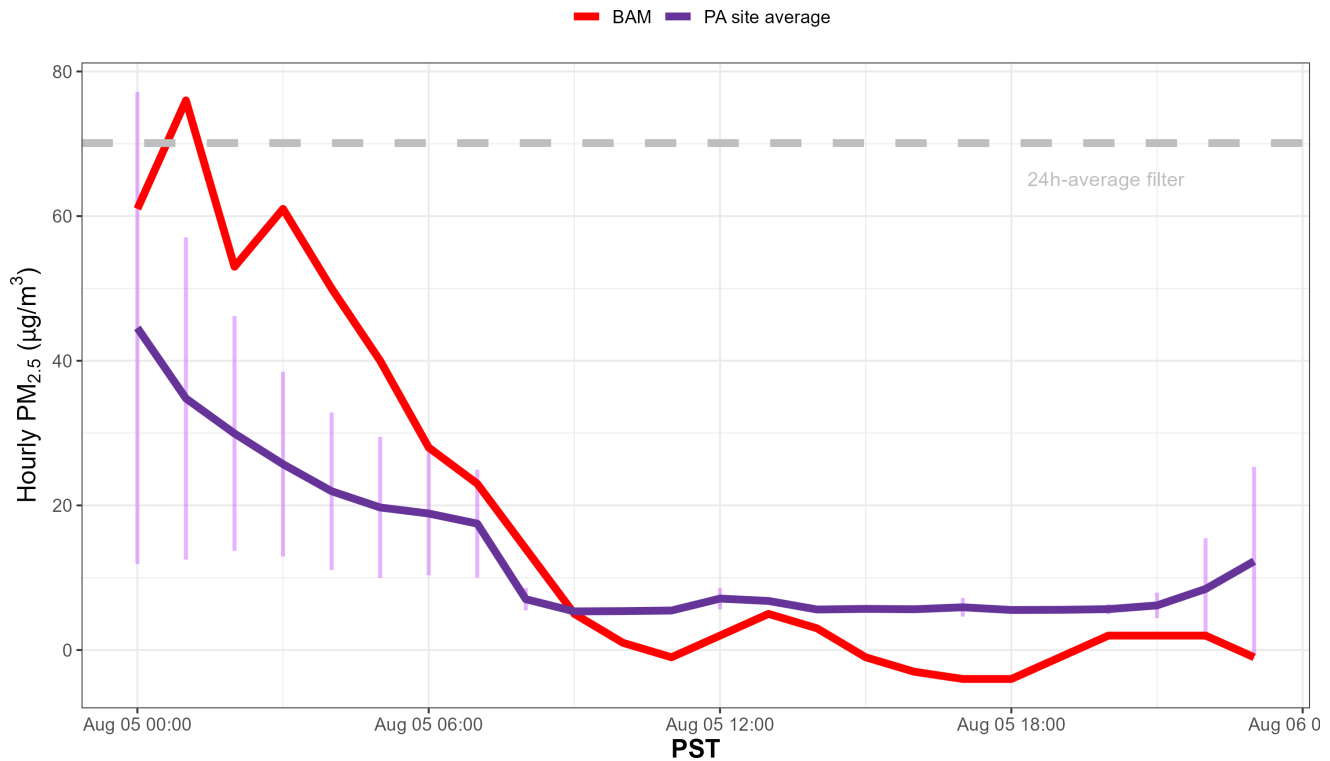
Figure 66: Hourly PM_{2.5} concentrations in Portola on August 2, 2021 measured by BAM, and by the surrounding 13 Purple Air monitors (only Channel A data used). The FRM filter measurement is indicated as a grey dashed line, and the lavender vertical lines indicate standard deviation of the Purple Air monitors site average.



B. August 5, 2021

The 13-site average hourly PM_{2.5} concentrations from the PA monitors were compared against hourly BAM data on August 5, 2021. As indicated in Figure 67, the PA averaged measurements track closely with BAM in trend, peaking around midnight and dropping back down below 20.0 µg/m³ at around 07:00 am. The maximum hourly average PM_{2.5} concentration measured by PA monitors is about 30.0 µg/m³ less than the BAM counterpart. During the entire day, only 1 hour of BAM measured PM_{2.5} (at 01:00 am) exceeded the FRM filter measurement. For more than half of the day, BAM PM_{2.5} concentrations remained consistently low below 10.0 µg/m³. Given that the 13 PA monitors measured PM_{2.5} concentration levels similar to the BAM, the FRM filter measurement of 70.1 µg/m³ is highly inconsistent with these other data sources.

Figure 67: Hourly PM_{2.5} concentrations in Portola on August 5, 2021 measured by BAM, and by the surrounding 13 Purple Air monitors (only Channel A data used). The FRM filter measurement is indicated as a grey dashed line, and the lavender vertical lines indicate standard deviation of the Purple Air monitors site average.



X. PM_{2.5} Speciation Data

To further investigate the substantial difference between the filter-measured and the BAM-measured PM_{2.5} concentrations on the two days in question, speciated data collected on those two days were compared to the average chemical composition for the month of August in Portola. At the Portola-Gulling Street site, PM_{2.5} constituents including ions (sulfate, nitrate, sodium, potassium, and ammonium) are collected by a SASS sampler while elemental and organic carbon data by a URG 3000N (URG) sampler (Portola Serious SIP, Section II.C.1). Both speciation samplers (SASS and URG) operate on a 1-in-6 day sampling schedule. To obtain the average PM_{2.5} chemical composition in August, speciation data collected during August from 2017 to 2021 were used (15 days total).

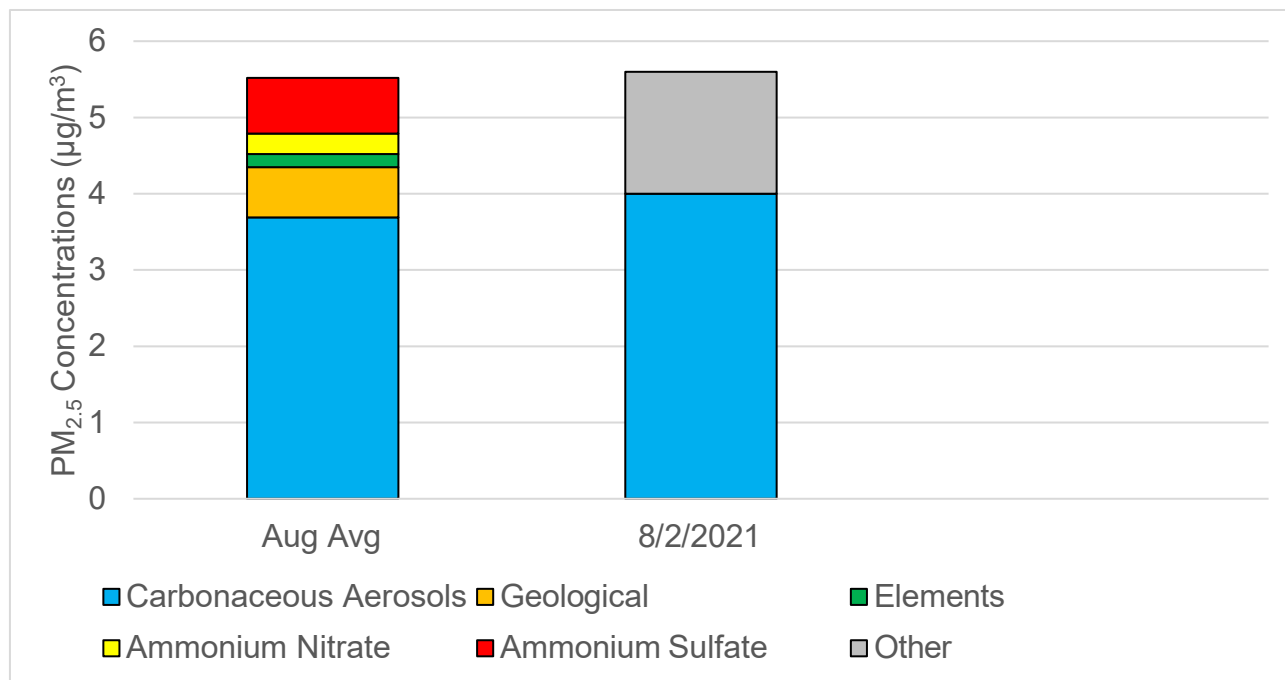
A. August 2, 2021

On August 2, 2021, the chemical composition data are limited to carbonaceous aerosols, which are estimated by summing the elemental carbon and organic matter estimated by applying the 1.4 multiplier¹⁹ to the measured organic carbon. The data for other species are not available for that day. Carbonaceous aerosols are estimated to be 4.0 µg/m³. Since 24-hr average BAM PM_{2.5} concentration on that day is 5.6 µg/m³, all other species combined are

¹⁹ Chow JC, Lowenthal DH, Chen LW, Wang X, Watson JG. Mass reconstruction methods for PM_{2.5}: a review. *Air Qual Atmos Health*. 2015;8(3):243-263. doi: 10.1007/s11869-015-0338-3. Epub 2015 May 7. PMID: 26052367; PMCID: PMC4449935.

estimated to contribute 1.6 $\mu\text{g}/\text{m}^3$. As shown in Figure 68, this is consistent with the sum of non-carbon components on a typical day in August, further indicating no atypical events such as significant wildfire influence existed on that day.

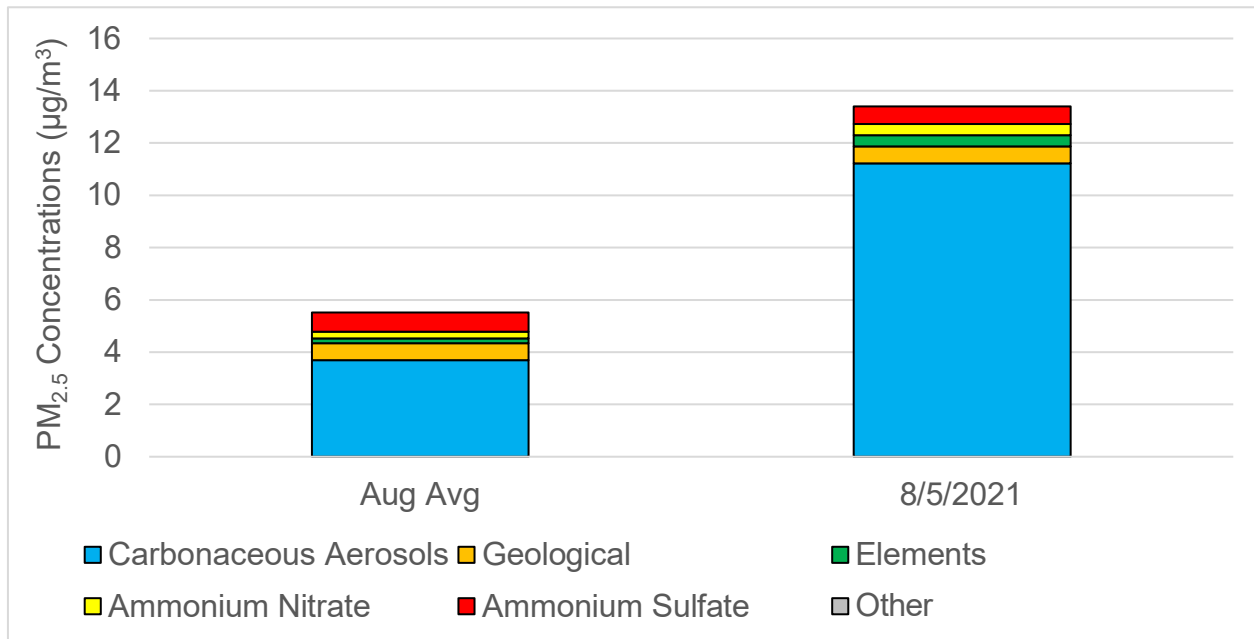
Figure 68. $\text{PM}_{2.5}$ speciation at Portola on August 2, 2021 and during August from 2017-2021



B. August 5, 2021

On August 5, 2021, all non-carbon species were reported, but the carbon data were missing. To reconstruct the mass, carbonaceous aerosols were estimated as a difference between the total $\text{PM}_{2.5}$ mass of the speciation sampler and the remaining reconstructed species. While the concentration at $13.4 \mu\text{g}/\text{m}^3$ is slightly elevated for August (Figure 69), it is close to the $17.2 \mu\text{g}/\text{m}^3$ measured by BAM, further confirming that the $70.1 \mu\text{g}/\text{m}^3$ in $\text{PM}_{2.5}$ mass measured by FRM was not consistent with other data and thus not reliable.

Figure 69. PM_{2.5} speciation at Portola on August 5, 2021 and during August from 2017-2021



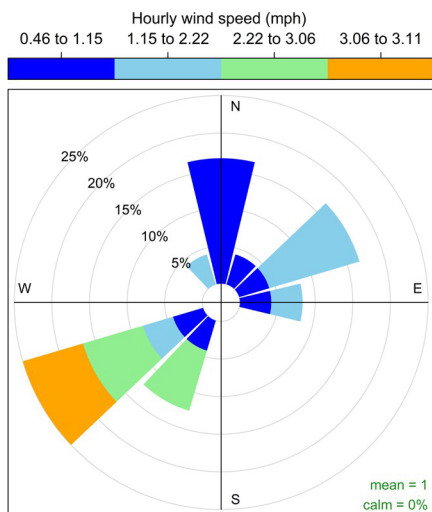
XI. Meteorological Conditions

Hourly resultant wind data on the two days in question were investigated to determine the potential of unusual conditions impacting the high PM_{2.5} readings. According to Section VI.A and B, wind speeds in Portola are usually low in August, with the average at 2.9 ± 0.4 mph.

A. August 2, 2021

On August 2, 2021, the average hourly wind speed at the Portola-Gulling Street site was 1.4 ± 0.9 mph, lower than the August average. The maximum daily wind speed was also low, at 3.1 mph. Wind was primarily from the southwest with almost no wind coming from either the northwest or the southeast (Figure 70). The low wind speeds on August 2, 2021 indicate no atypical events such as unusual weather likely happened on that day, further demonstrating that the $34.1 \mu\text{g}/\text{m}^3$ reported PM_{2.5} FRM filter measurement is not reliable.

Figure 70: Wind rose at the Portola – Gulling Street site on August 2, 2021 with the breaks being the minimum, the 50th, the 75th, the 95th percentile and the maximum resultant wind speeds.

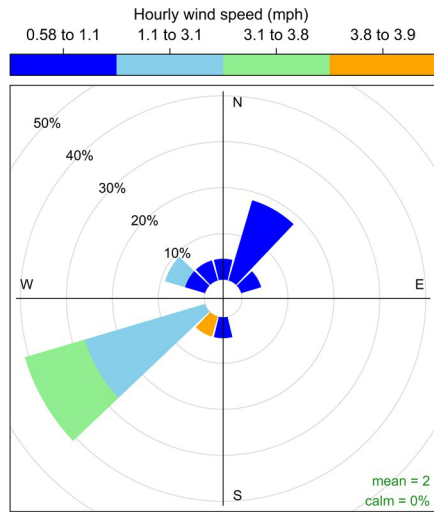


Frequency of counts by wind direction (%)

B. August 5, 2021

On August 5, 2021, the average wind speed at the Portola-Gulling Street site was 1.8 ± 1.3 mph, lower than the August average. The maximum daily wind speed was also low, at 3.9 mph. Wind was primarily from the southwest, followed by the northwest and the southeast (Figure 71). The low wind speeds on August 5, 2021 indicate no atypical events such as unusual weather likely happened on that day, further demonstrating that the $70.1 \mu\text{g}/\text{m}^3$ reported $\text{PM}_{2.5}$ FRM filter measurement is not reliable.

Figure 71: Wind rose at the Portola – Gulling Street site on August 5, 2021 with the breaks being the minimum, the 50th, the 75th, the 95th percentile and the maximum resultant wind speeds.



Frequency of counts by wind direction (%)

XII. Unrepresentative Data Evaluation Conclusion

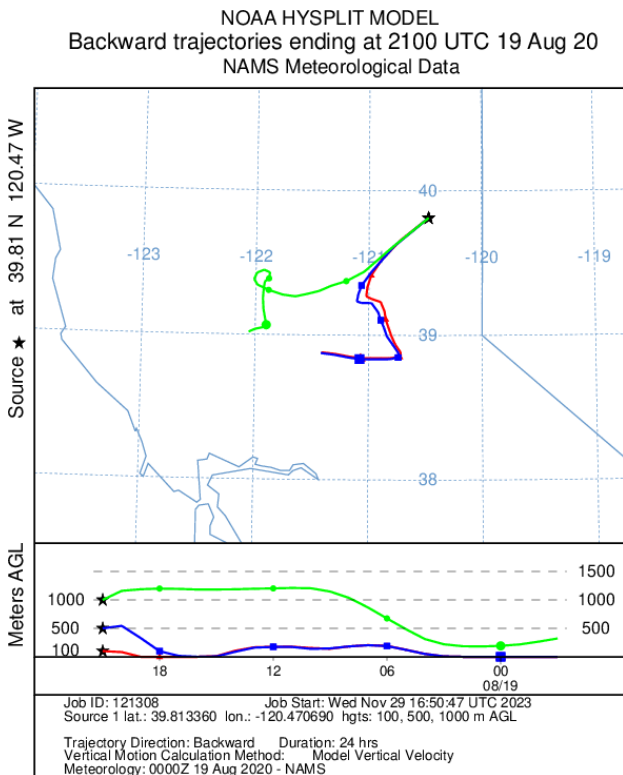
The elevated FRM filter PM_{2.5} measurements in Portola on August 2, 2021 and August 5, 2021 were proven unsubstantiated, and thus excluded from the modeling analysis. The filter measurements were found to be 6 times and 4 times higher than those from the parallel BAM, respectively. No atypical events (either significant wildfire influence or unusual weather) that could contribute to elevated PM_{2.5} readings were observed on those two days based on satellite imagery and meteorology data. Multiple independent sources of PM_{2.5} measurements agree well with those from the BAM, including the 13 Purple Air monitors in and surrounding Portola and the speciation monitors at the Portola-Gulling Street site. Although no records of faulty filter measurements were found on those two days, it is reasonable, based on the above analyses, that human error(s) may have occurred during either the collection and/or the documentation process of the FRM filters on the two days in question.

Appendix

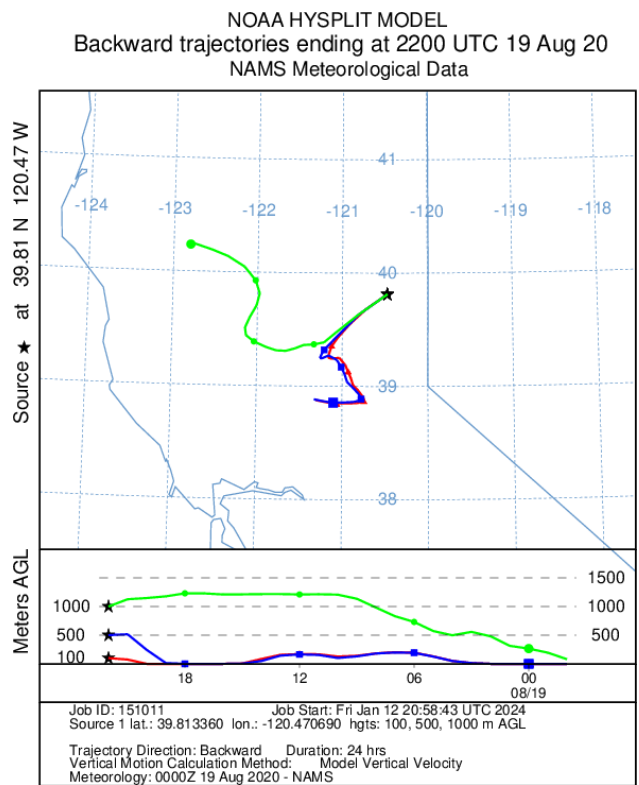
I. HYSPLIT Backward Trajectory (from Monitor)

NOAA's HYSPLIT model was used to determine simple back-trajectories showing the estimated path that an air parcel took for a specified period of time (here, 24 hours) before reaching the Portola PM_{2.5} monitor at the hour of maximum concentration in the exceeding PM_{2.5} daily average. Table 5 indicates the hour of the maximum concentrations within the exceeding PM_{2.5} daily average (in PST and UTC) which correspond to each of the figures below. The back-trajectory as well as the height for each hour of the back-trajectory are shown below, for each atypical event date. The three height levels indicate transport near the surface and in the mid to upper levels of the atmosphere.

2020-08-19 13:00 PST – BAM

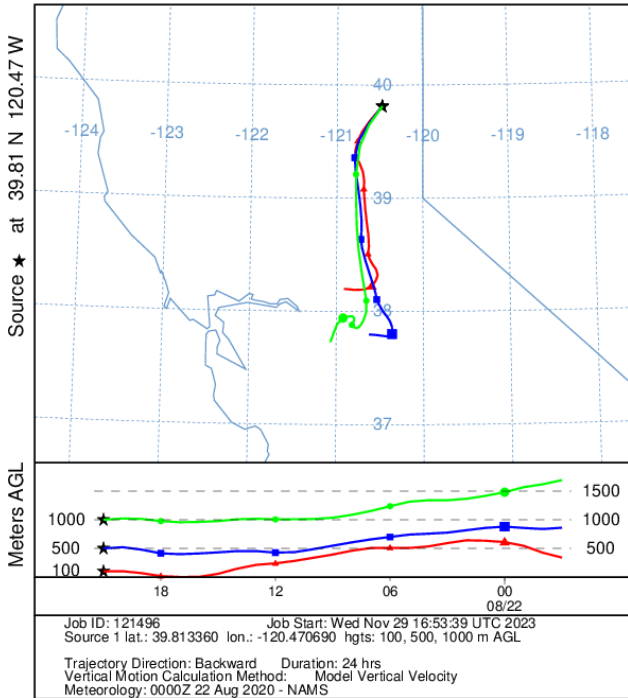


2020-08-19 14:00 PST – PurpleAir



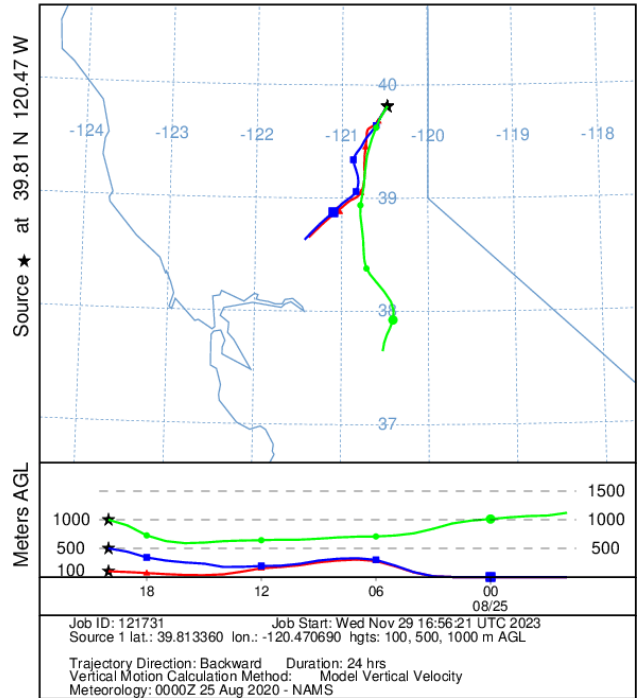
2020-08-22 13:00 PST

NOAA HYSPLIT MODEL
Backward trajectories ending at 2100 UTC 22 Aug 20
NAMS Meteorological Data



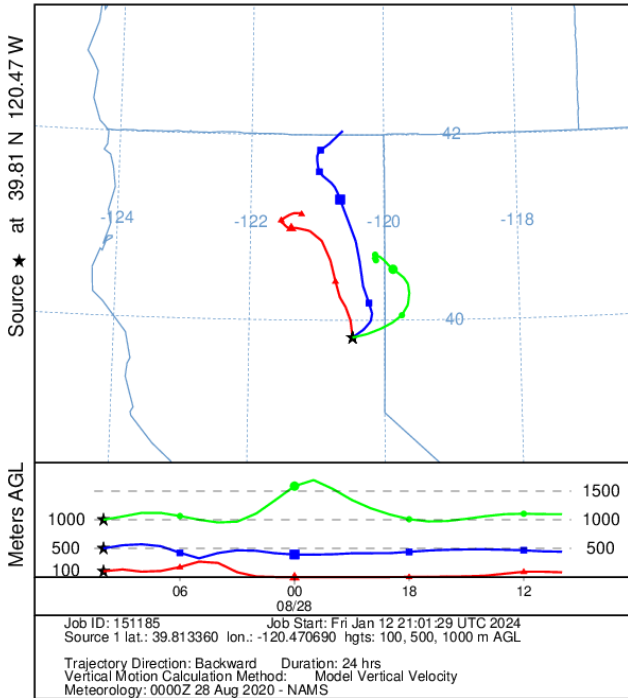
2020-08-25 12:00 PST

NOAA HYSPLIT MODEL
Backward trajectories ending at 2000 UTC 25 Aug 20
NAMS Meteorological Data



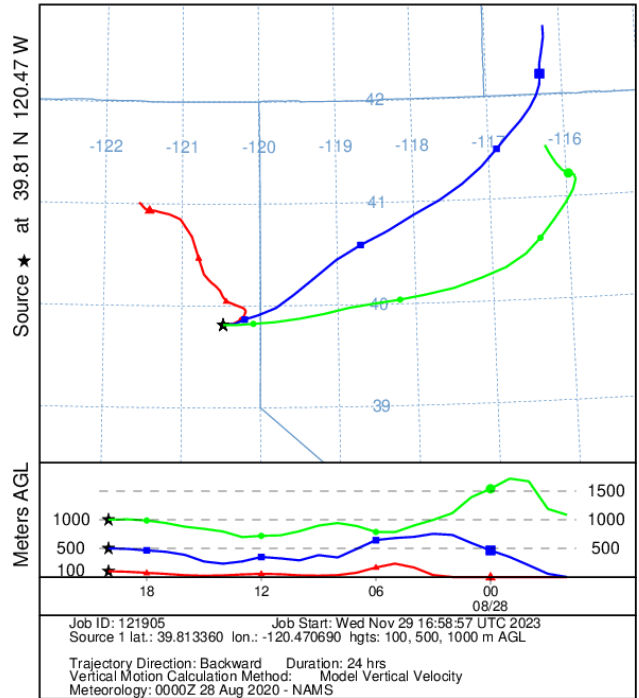
2020-08-28 02:00 PST - PurpleAir

NOAA HYSPLIT MODEL
Backward trajectories ending at 1000 UTC 28 Aug 20
NAMS Meteorological Data



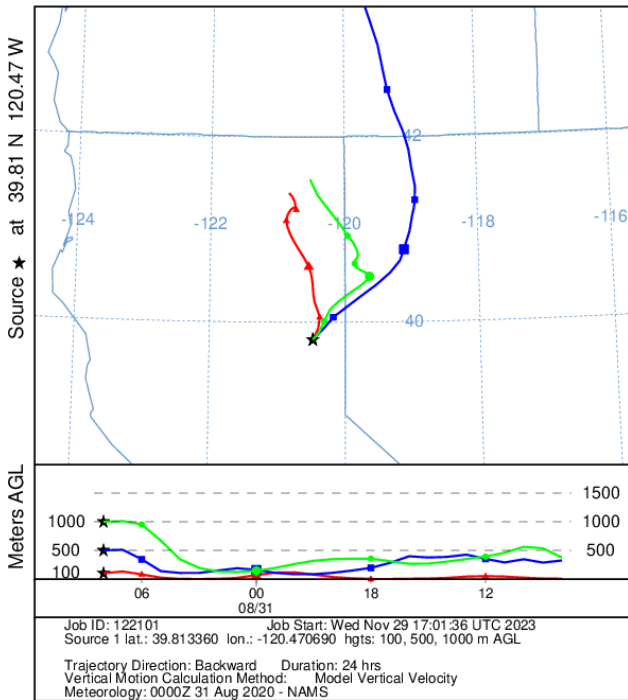
2020-08-28 12:00 PST - BAM

NOAA HYSPLIT MODEL
Backward trajectories ending at 2000 UTC 28 Aug 20
NAMS Meteorological Data



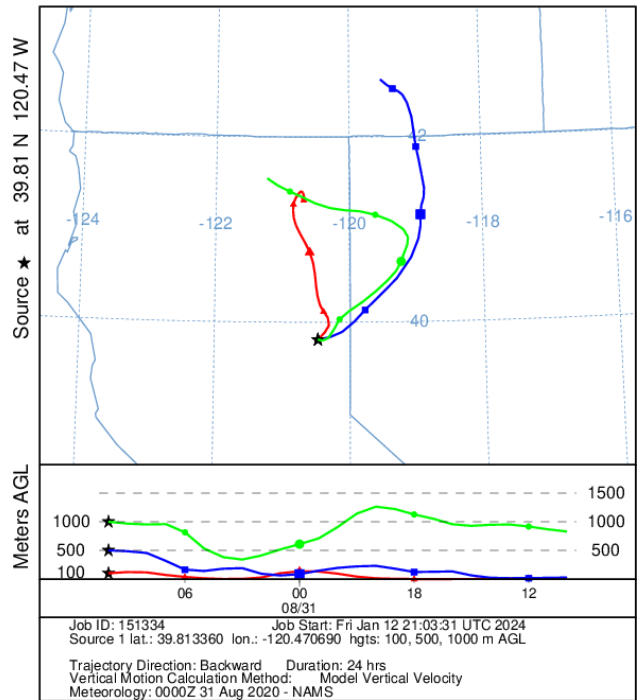
2020-08-31 00:00 PST – BAM

NOAA HYSPLIT MODEL
Backward trajectories ending at 0800 UTC 31 Aug 20
NAMS Meteorological Data



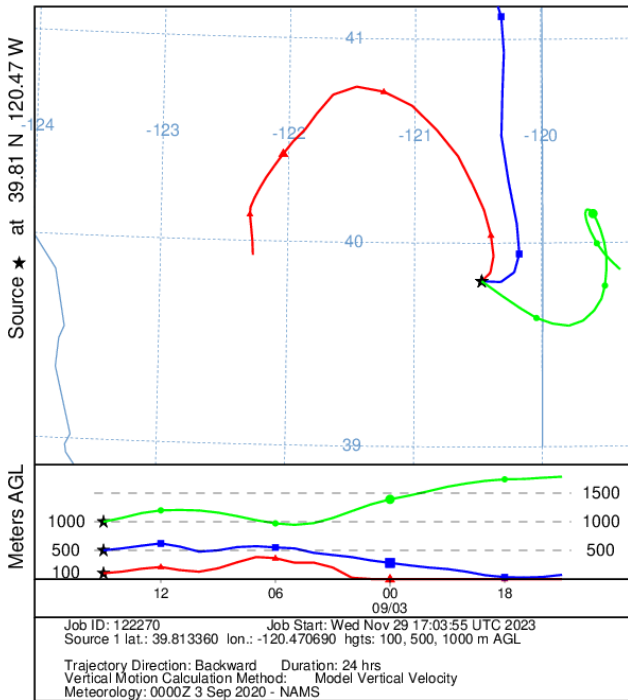
2020-08-31 02:00 PST – PurpleAir

NOAA HYSPLIT MODEL
Backward trajectories ending at 1000 UTC 31 Aug 20
NAMS Meteorological Data



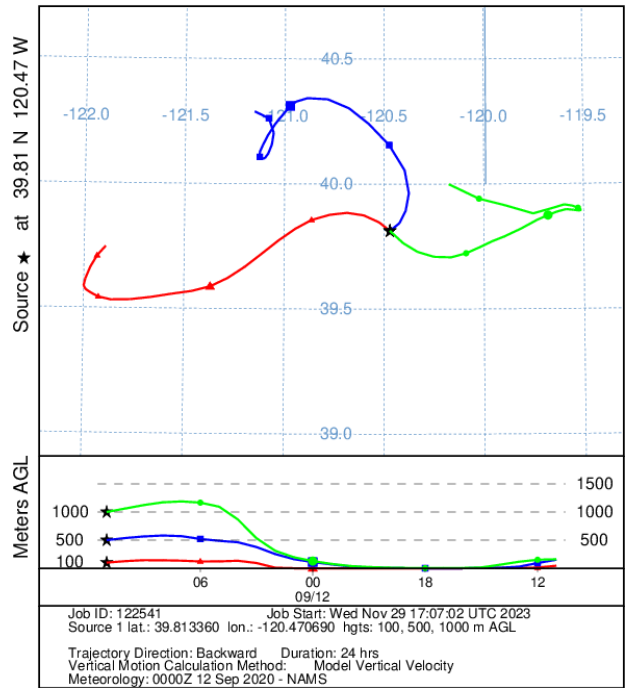
2020-09-03 07:00 PST

NOAA HYSPLIT MODEL
Backward trajectories ending at 1500 UTC 03 Sep 20
NAMS Meteorological Data



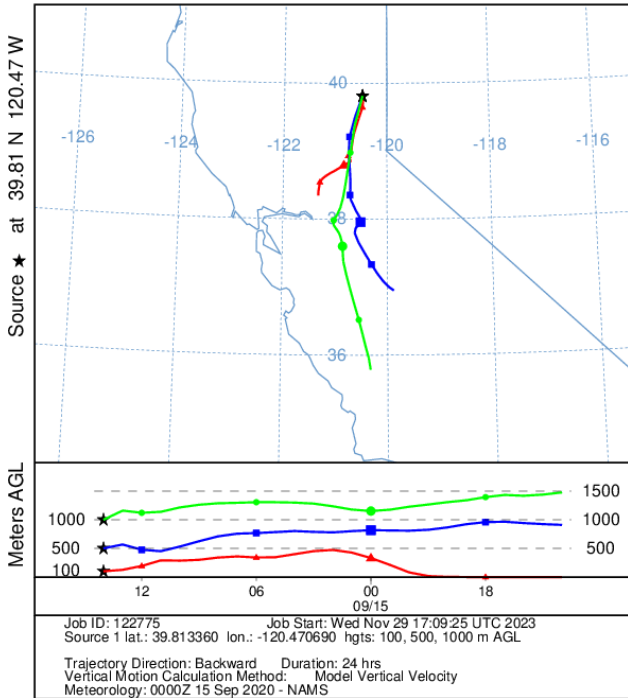
2020-09-12 03:00 PST

NOAA HYSPLIT MODEL
Backward trajectories ending at 1100 UTC 12 Sep 20
NAMS Meteorological Data



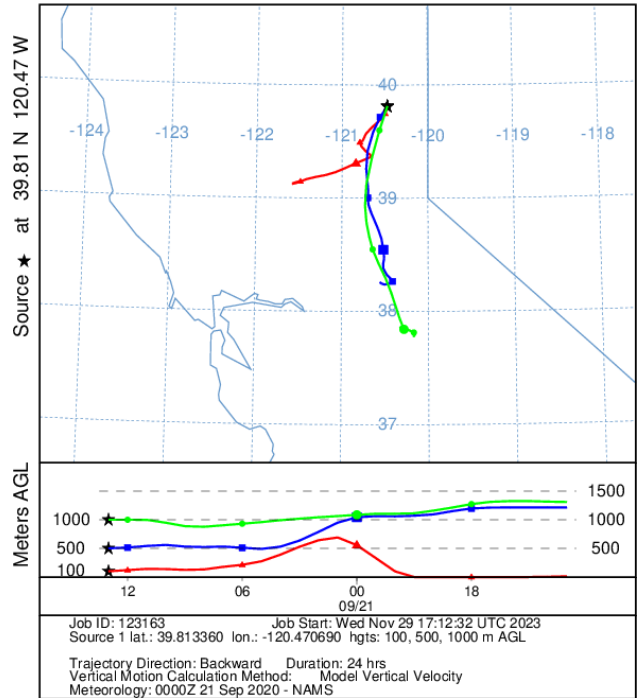
2020-09-15 06:00 PST

NOAA HYSPLIT MODEL
Backward trajectories ending at 1400 UTC 15 Sep 20
NAMS Meteorological Data



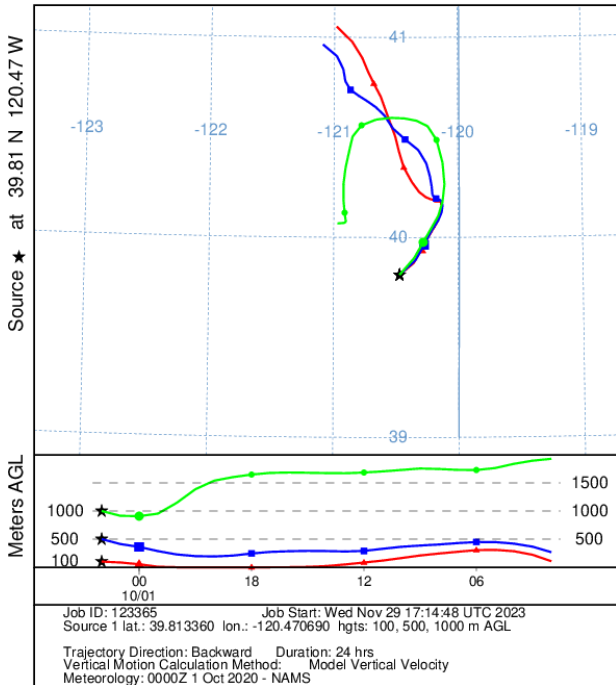
2020-09-21 05:00 PST

NOAA HYSPLIT MODEL
Backward trajectories ending at 1300 UTC 21 Sep 20
NAMS Meteorological Data



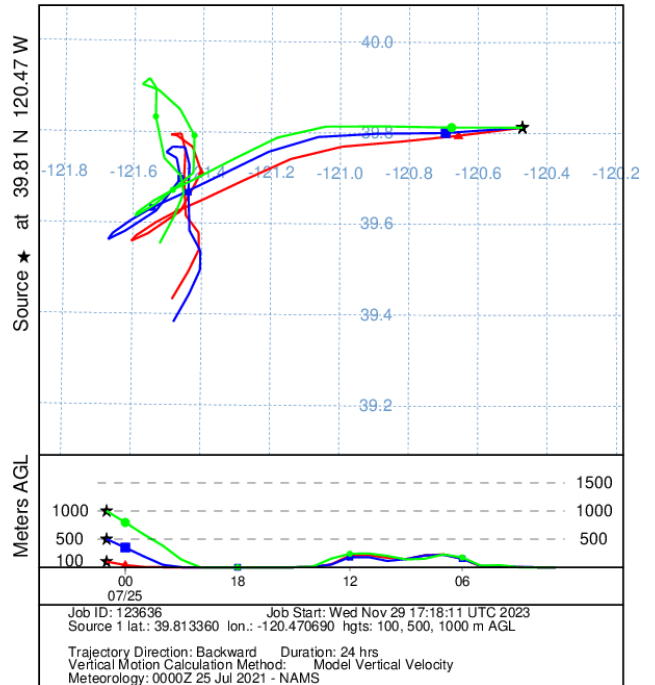
2020-09-30 18:00 PST

NOAA HYSPLIT MODEL
Backward trajectories ending at 0200 UTC 01 Oct 20
NAMS Meteorological Data



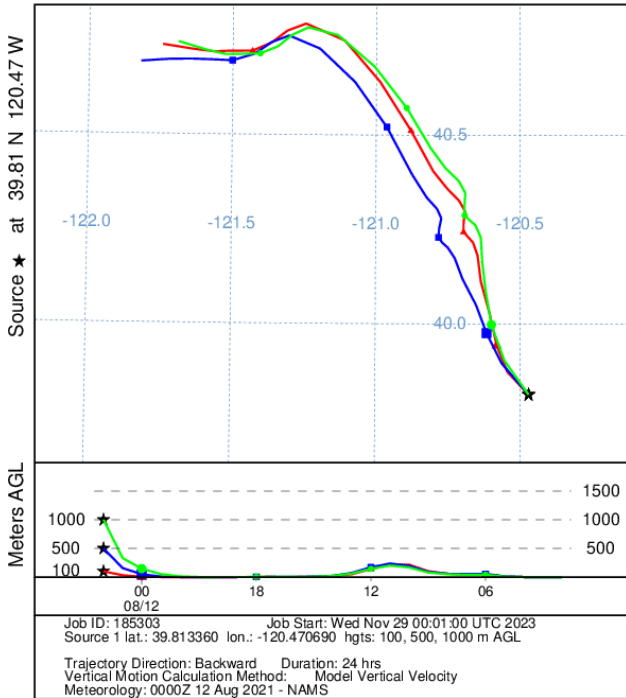
2021-07-24 17:00 PST

NOAA HYSPLIT MODEL
Backward trajectories ending at 0100 UTC 25 Jul 21
NAMS Meteorological Data



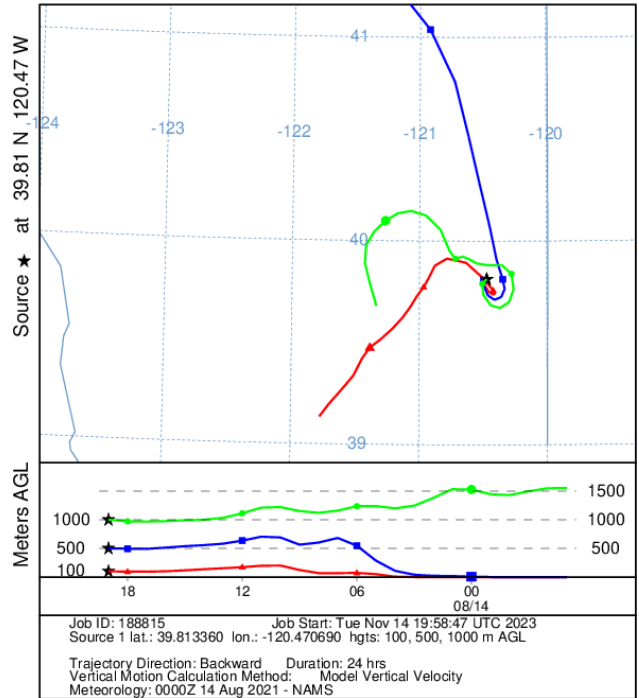
2021-08-11 18:00 PST

NOAA HYSPLIT MODEL
Backward trajectories ending at 0200 UTC 12 Aug 21
NAMS Meteorological Data



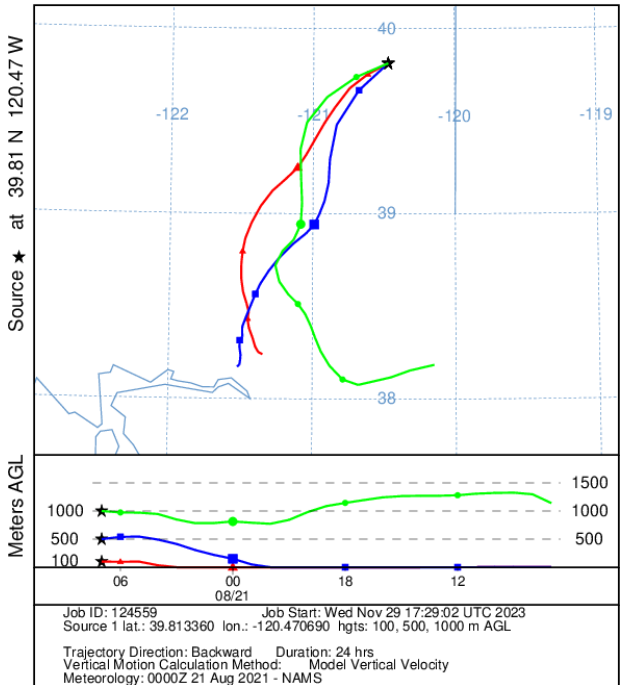
2021-08-14 11:00 PST

NOAA HYSPLIT MODEL
Backward trajectories ending at 1900 UTC 14 Aug 21
NAMS Meteorological Data



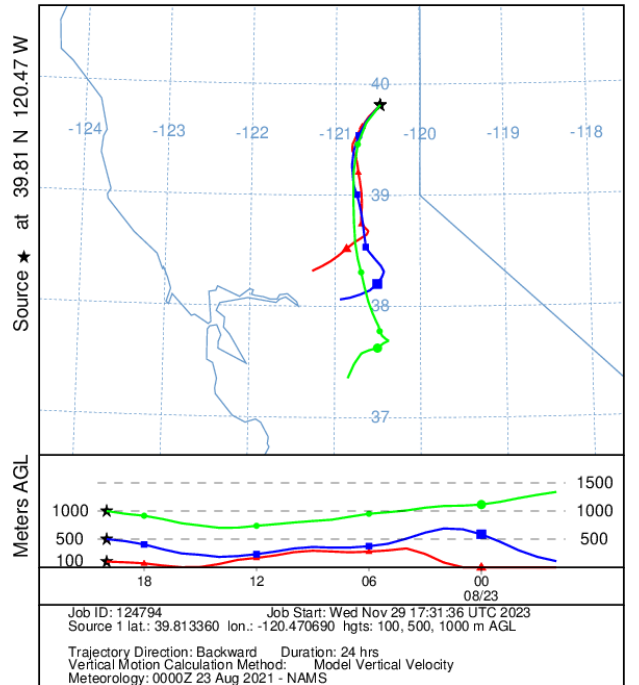
2021-08-20 23:00 PST

NOAA HYSPLIT MODEL
Backward trajectories ending at 0700 UTC 21 Aug 21
NAMS Meteorological Data



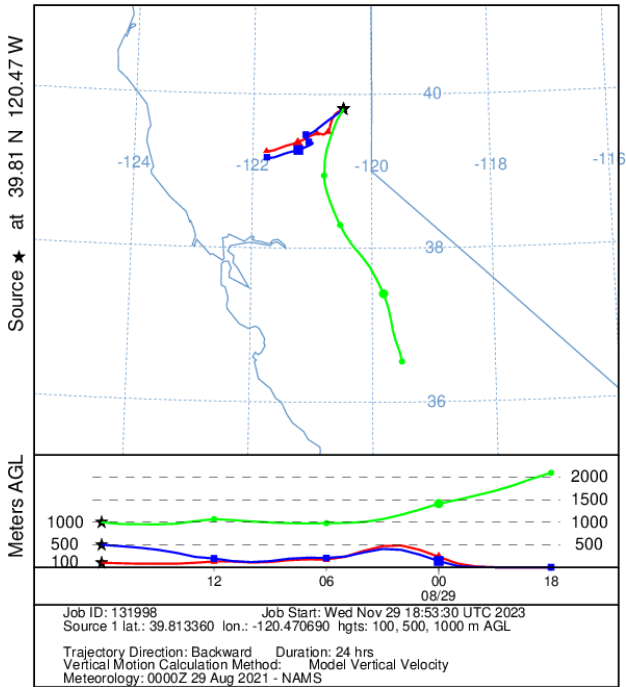
2021-08-23 12:00 PST

NOAA HYSPLIT MODEL
Backward trajectories ending at 2000 UTC 23 Aug 21
NAMS Meteorological Data



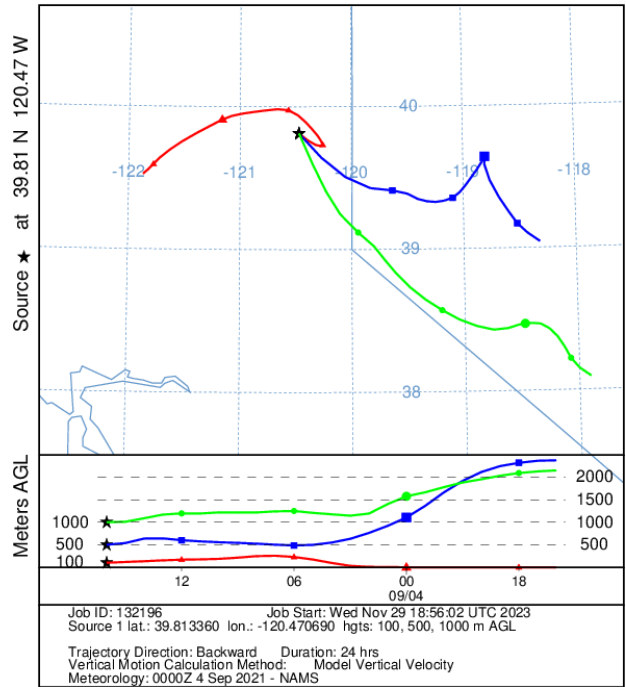
2021-08-29 10:00 PST

NOAA HYSPLIT MODEL
 Backward trajectories ending at 1800 UTC 29 Aug 21
 NAMS Meteorological Data



2021-09-04 08:00 PST

NOAA HYSPLIT MODEL
 Backward trajectories ending at 1600 UTC 04 Sep 21
 NAMS Meteorological Data



Appendix K

Portola 2015 TAG Close-out Report

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Introduction

On January 15, 2015, the United States Environmental Protection Agency (U.S. EPA) designated and classified a portion of Plumas County as a Moderate PM_{2.5} nonattainment area (Portola Nonattainment Area) for the 2012 12.0 µg/m³ annual PM_{2.5} National Ambient Air Quality Standards (NAAQS) (12.0 µg/m³ PM_{2.5} NAAQS). Burning wood for residential heating is a dominant source of PM_{2.5} in the Portola Nonattainment Area. In 2016, the Northern Sierra Air Quality Management District (District) launched the Greater Portola Wood Stove Change-out Program (Program) funded initially by the 2015 U.S. EPA Targeted Airshed Grant (TAG).

The total U.S. EPA award for the Portola 2015 TAG was \$2,483,607. California Air Resources Board (CARB) retained \$175,000 for overseeing the Program and the remaining funding, \$2,308,607, was passed to the District (Figure 1). District also committed to providing \$40,000 to the Program. Table 1 lists funding expanded by the District including pass-through and cost-share while Figure 2 illustrates percent of pass-through funding by category.

Figure 1. Grant Amount Expanded by CARB and District.

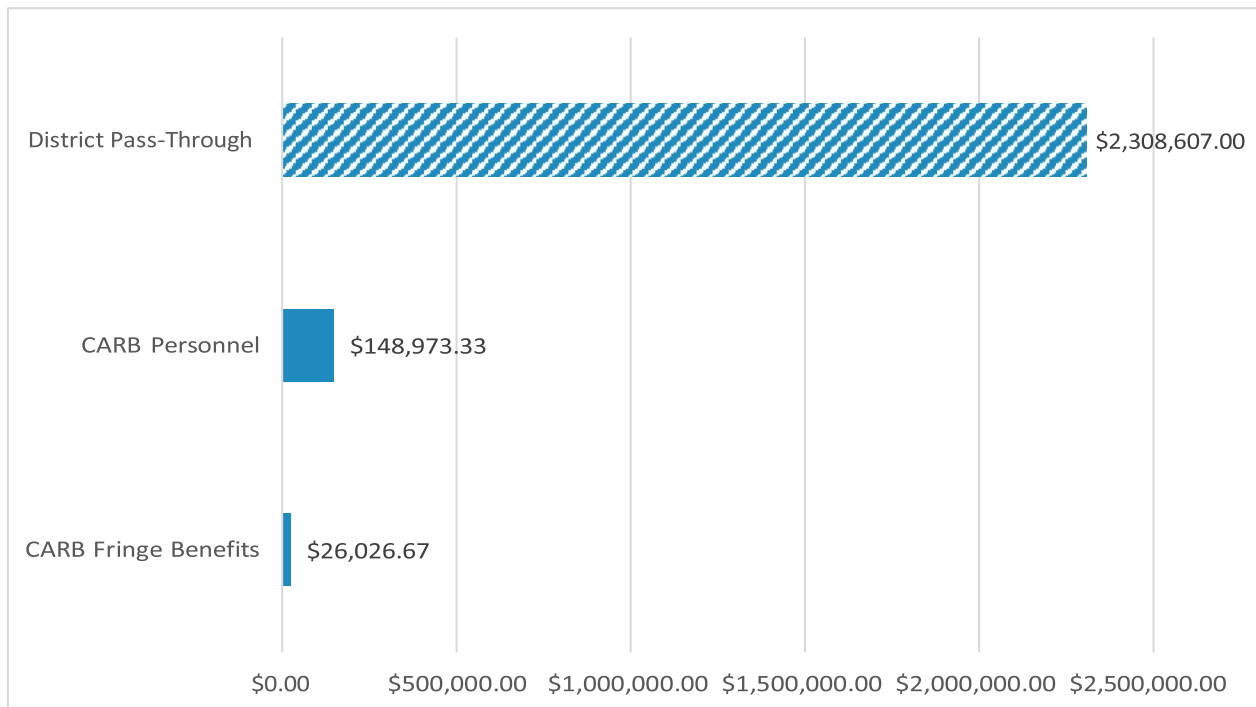
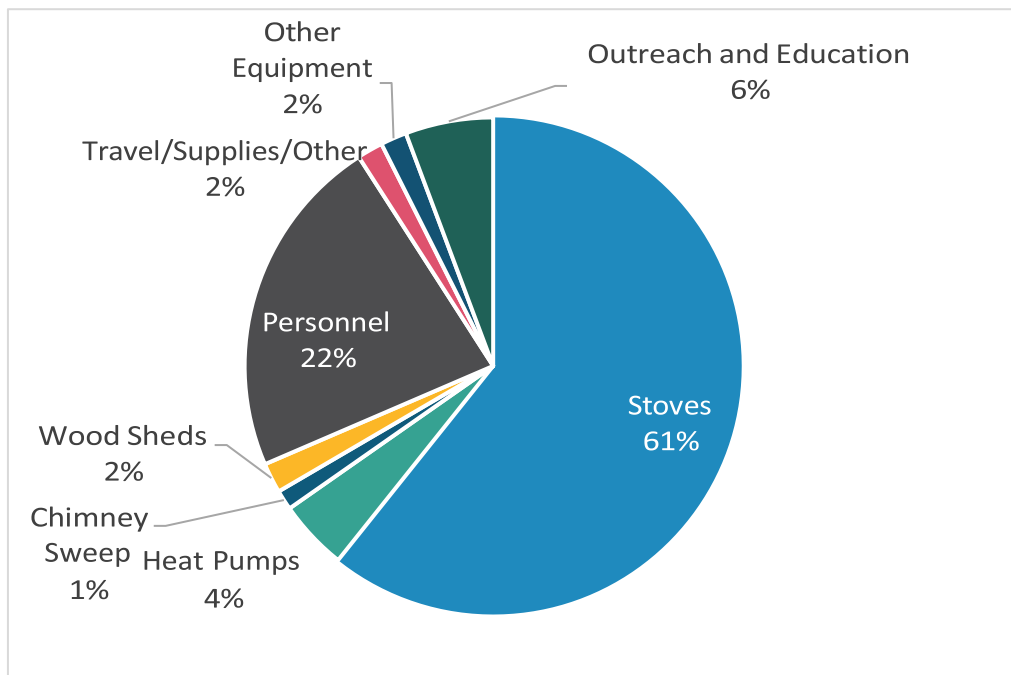


Table 1. Pass-through and Cost-share Funding Expanded by District

Category	TAG Funding (\$)	Cost-Share (\$)
Stoves	\$1,401,890.46	\$13,645.12
Heat Pumps	\$105,255.38	
Chimney Sweep	\$29,849.00	
Woodsheds	\$45,127.01	
Stove Destruction & Metal Hauling	\$25,931.90	\$9,045.08
Moisture Meters	\$3,833.70	
Purple Air Monitors	\$6,319.65	
Generators	\$2,219.38	
Stove Thermometers	\$1,079.21	
Personnel	\$516,532.79	
Travel	\$11,604.19	\$7,563.12
Other	\$17,651.74	\$7,994.08
Supplies	\$9,447.48	\$2,005.13
Public Outreach/Webpage Design	\$49,760.01	
Progressive	\$52,000.00	
STI	\$30,105.18	
NSAQMD Grand Total	\$2,308,607.08	\$40,252.53

Figure 2. Percent of Pass-through Funding Expanded in each Category.



Implemented Projects

The Program provided incentives to households in the PM2.5 nonattainment area to reduce emissions from residential wood combustion. The main elements of the Program were as follows:

- Replacing uncertified wood stoves and fireplaces used as primary sources of heat with cleaner burning and more energy efficient alternatives.
- Supplying woodsheds to households lacking proper wood storage.
- Improving device operation by providing annual chimney sweep which included device inspection.
- Educating households on the importance of reducing emissions from residential wood burning by properly operating and maintaining the device and using seasoned wood.
- Implementing Wood Burning Curtailment Program during periods of stagnation to prevent the air quality from reaching unhealthy conditions and reducing overall annual concentrations.

I. Change-out Program

Wood stove change-out was the main element of this Program, with 65 percent of pass-through funding going directly to change-out projects. Because the area is surrounded by forest, residents have access to free or inexpensive wood. There is also no access to a natural gas line and propane is prohibitively expensive for most households. Therefore, 77 percent of households chose certified wood stove as a replacement device (Table 2). The second most popular replacement was pellet stove with 13.5 percent. The remaining replacement devices included propane (5.9 percent), kerosene (1.9 percent) and heat pumps (1.5 percent). Three of the heat pumps installed through this grant were installed as a replacement for uncertified device and the other five were installed in addition to existing certified device. Table 3 summarizes new wood stoves by the emission control technology.

Table 2. Change-out Projects by Category.

Old Device Type	Wood Stove	Pellet	Propane	Kerosene	Heat Pump	Total
Non-certified Wood Stove	323	52	19	8	3	405
Fireplace	49	12	12	1		74
Certified Stove Repair/Replace	45	9	1	1		56
Certified Stove/Heat Pump Combo					5	5
Total	417	73	32	10	8	540
% of Total	77.2	13.5	5.9	1.9	1.5	100.0

Table 3. New Wood Stoves by Emission Control Technology

Emission Control	# of Change-outs	% of Wood Stoves	\$ Paid from TAG
Non-Catalytic	245	59	\$534,820.12
Catalytic	164	39	\$458,263.92
Hybrid	8	2	\$15,700.00
Total	417	100	\$473,963.92

Initial estimates of emission reductions achieved by replacing uncertified wood stoves with cleaner burning and more energy efficient home heating devices were based on U.S. EPA Burnwise Emission Calculator (EPA Calculator). The U.S. EPA Calculator is designed to calculate the average emission reductions for the entire Program using the default emission factors. CARB staff developed a more detailed procedure for estimating PM2.5 emission reductions achieved from this Project.

The individual calculations for each device, along with the device tracking number and new equipment type, are presented in Appendix A. Listed below are the step-by-step instructions and formulas.

The first step in calculating emission reductions required converting certification test emission rates in grams per hour (g/hr) to emission factors in pounds per ton (lb/ton), as described below:

- The certification test emission rate was scaled upward by 50 percent to reflect real world in-home performance.
- The scaled emission rate was divided by the average burn rate of 1.5 kilograms per hour (kg/hr) to calculate grams of PM2.5 emissions per kilogram of wood (g/kg); and
- The result was multiplied by 2 to convert g/kg to lb/ton.

The following equation was used to calculate emission factor in pounds per ton:

$$\text{Equation 1: } EF = (ER \times 1.5) / BR \times 2$$

Where:

EF Emission factor in pounds per ton

ER Emission rate in grams per hour

BR Average burn rate in kilograms per hour of operation

1.5 Factor used to scale certification test emission rate to reflect real world emissions

2 Factor used to convert grams per kilogram to pounds per ton

The following formulas were used to calculate PM2.5 emissions of the old device, the new device, and the difference between them.

$$\text{Equation 2: } E_{old} = (EF_{old} \times WU \times WD)/2000$$

$$\text{Equation 3: } E_{new} = (EF_{new} \times WU \times WD \times (EFC_{old}/EFC_{new}))/2000$$

$$\text{Equation 4: } E_{benefit} = E_{old} - E_{new}$$

Where:

E_{old}	Emissions of old device (ton/year)
E_{new}	Emissions of new device (ton/year)
EF_{old}	Emission factor for the old device (lb/ton)
EF_{new}	Emission factor for the new device (lb/ton)
WU	Wood usage (cords/year)
WD	Wood density (ton/cord)
EFC_{old}	Device efficiency for the old device (%)
EFC_{new}	Device efficiency for the old device (%)
$E_{benefit}$	Emission reductions from change-out (ton/year)

Since emission factors for pellet stoves are more representative of actual in-home usage, a default emission factor of 3.06 lb/ton, consistent with the National Emission Inventory (NEI 2020, USEPA Wagon Wheel), was used for all pellet stoves. Portola households using a pellet stove as a main source of heat use two to three tons of pellet fuel per year. To ensure a conservative estimate for emission reductions, three tons was assumed. Consistent with California’s Short-Lived Climate Pollutant Reduction Strategy, propane and kerosene fueled heating devices were assumed to have negligible PM2.5 emissions. Table 3 includes parameters used in calculating emission reductions achieved from change-outs.

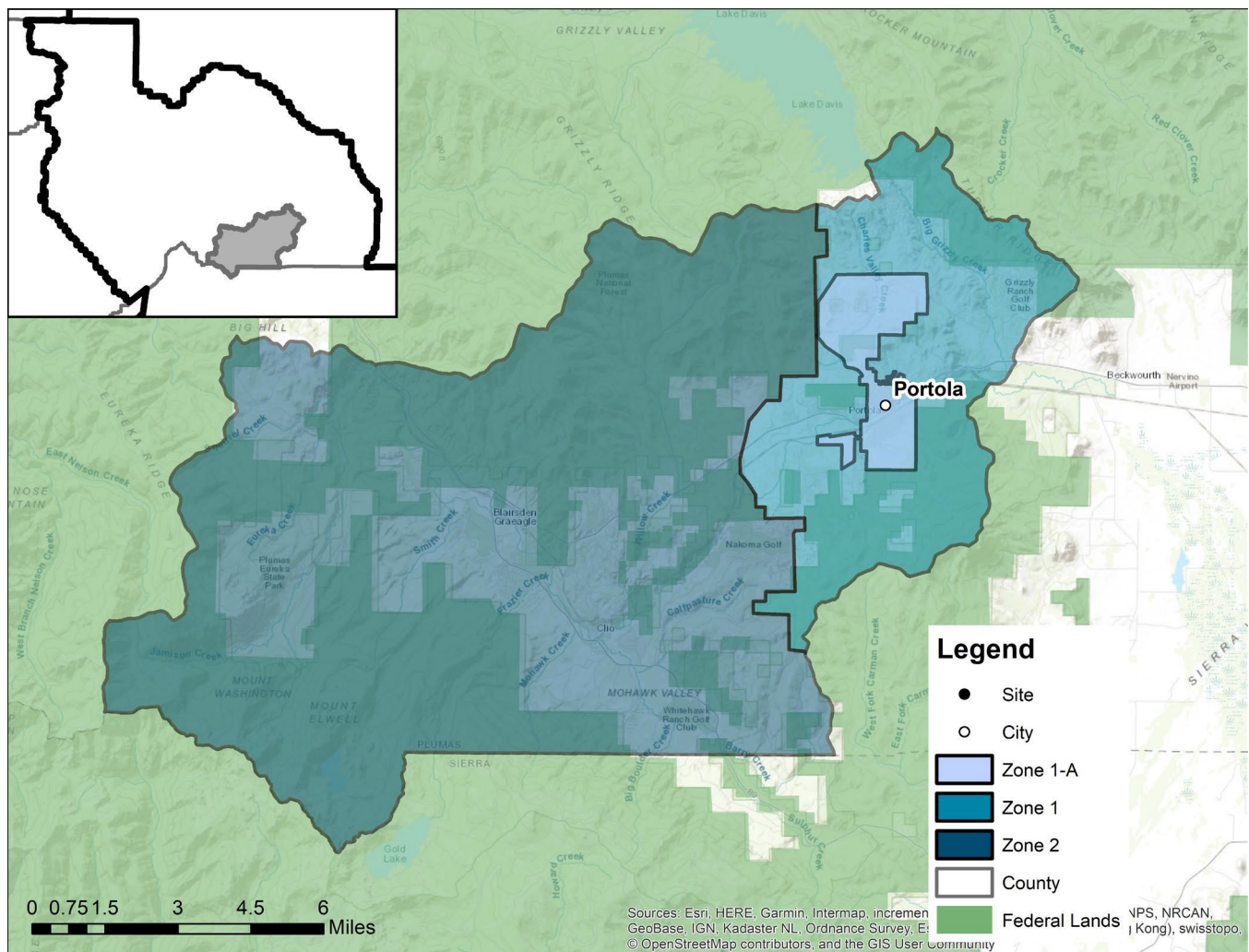
Table 4. Constants and Conversion Factors for Estimating Emission Reductions from Change-outs

Constants & Conversions	Value	Unit	Source
Wood stove Uncertified PM10 Emission Factor	30.60	lb/ton	AP-42, Table 1.10.-1
Fireplace PM10 Emission Factor	34.6	lb/ton	AP-42, Table 1.9.-1
Pellet Stove PM10 Uncertified Emission Factor	8.8	lb/ton	AP-42, Table 1.10.-1
Wood stove Average PM10 Emission Rate for Change-out Program	2.38	g/hr	Based on 413 devices installed through 2022
Wood stove Average PM10 Emission Factor for Change-out Program	4.75	lb/ton	PM10 Emission Rate*Scaling Factor /Burn Rate* Conversion from g/kg to lb/ton
Emission Rate Scaling Factor	1.50		Assuming in use emission are 50% higher
Pellet Stove PM10 Certified Emission Factor	3.06	lb/ton	2020 NEI Nonpoint Wagon Wheel
Old Device Efficiency	54	%	AP-42, Table 1.10-5
New Device Efficiency	68	%	AP-42, Table 1.10-5
Wood Use in Uncertified Wood Stove	4.3	cords/year	District Survey
Wood Use in Fireplace	6.0	cords/year	District Survey
Wood Use in Heat Pump & Wood Stove Combo	2.5	cords/year	Assuming about 30% reduction in wood usage in certified stove due to heat pump
Pellet Use	3	tons/year	Quincy Hot Spots Personal Communication
Wood Density	1.54	ton/cord	CARB Emission Methodology
Average Burn Rate	1.5	kg/hour	Gary Blais Personal Communications
Conversion from lb to ton	2000		
Conversion from g/kg to lb/ton	2		

To maximize the emission reductions, the Nonattainment Area was divided into zones with varying incentive amounts and eligibilities. At the start of the Program, only the Portola Sphere of Influence was considered Zone 1, and the remaining portion of the Nonattainment Areas was Zone 2. In November 2021, these boundaries were redrawn to include outlining communities in Zone 1 and add a third zone as described below and illustrated in Figure 3:

1. Zone 1 encompassed the Portola Sphere of Influence and the communities of Delleker, Iron Horse, and the southern edge of Lake Davis. These communities were included in Zone 1 due to their proximity to Portola and their population density.
 - a. City of Portola was considered a subset of Zone 1 and labeled Zone 1.A. Zone 1.A was subject to the same incentive levels as Zone 1, but households were eligible for a heat pump and a certified wood stove combo providing their woodburning device was registered with the District for mandatory woodburning curtailment.
2. The remaining portion of Portola PM2.5 Nonattainment Area was considered Zone 2.

Figure 3. Portola Wood stove Change-out Program Zones as of November 2021



Change-outs completed as part of the 2015 TAG are estimated to reduce PM2.5 emissions 53 tons per year (Table 4) or 1,060 tons over the estimated device life of 20 years. This equates to a reduction of 0.1453 tons per day. The other elements of the Program, especially outreach and education, woodsheds, and chimney sweeps were necessary to ensure the optimal reductions were achieved from the change-out program. Estimating

reductions from these elements, independent of change-out program, would result in double counting. The amount of wood burned is estimated to decrease by 1,331 tons annually or 26,615 tons over the 20-year device lifetime. The reduction in wood was estimated by assuming the wood usage would decrease proportionally to the increase in the device efficiency. Therefore, the estimated 4.3 cords of wood needed to heat an average home using uncertified wood stove were reduced by the ratio of 54% to 68% (average efficiency of the uncertified to certified device). For households which replaced wood burning devices with a non-wood alternative, wood usage was eliminated.

Table 5. List of Change-out Projects and Associated PM2.5 Emission Reductions

New Device Type	# of Change-outs	Emission Reductions	
		(tpy)	(tpd)
Wood Stove	417	39.9293	0.1094
Pellet	73	7.7616	0.0213
Propane	32	3.9439	0.0108
Kerosene	10	1.0714	0.0029
Heat Pump	3	0.3039	0.0008
Heat Pump and Wood Combo	5	0.0132	0.0000
Totals	540	53.0233	0.1453

District contracted with the City of Portola Public Works Department (City) for destruction of wood stoves and recycling of metal. Over the life of the grant, the District paid City about \$35,000 or estimated \$75 per stove for their services. This included \$25,931.90 in TAG funding and about \$9,000 in leveraged funding. As part of the final documentation, each change-out packet includes images of the old wood stove before and after it was destroyed. Upon destroying the old device, the City of Portola Public Works department loaded the old devices into a large metal recycling bin until full then Intermountain Disposal (IMD) hauled away the recycled materials.

II. Woodshed Program

Many households in the Nonattainment Area were lacking proper wood storage. Moist, unseasoned wood, even if burned in a low-emitting device, will still lead to high emissions.¹ District established a Woodshed Program to offer incentives for woodsheds to households lacking proper wood storage. Only households which participated in the wood stove change-out program or registered their U.S. EPA certified wood burning device with the District were eligible for incentives.

¹ Kindbom, K., Mawdsley, I., Nielsen, O.-K., Saarinen, K., Jónsson, K., & Aasestad, K. (2018). Emission factors for SLCP emissions from residential wood combustion in the Nordic countries : Improved emission inventories of Short Lived Climate Pollutants (SLCP). Copenhagen. <https://doi.org/10.6027/TN2017-570>

The Woodshed program had a few different facets. Initially, District had an agreement with the local high school to build woodsheds as part of the workshop class. Later, District worked with local contractors who build and delivered woodsheds to households. District also provided materials to households to construct woodsheds on their own. Each woodshed was inspected by the District to verify that materials were used for this purpose and the woodshed was used for storing wood. Because of the variety of projects, District often purchased materials for multiple woodsheds at a time. Therefore, the average cost of a woodshed is calculated in Table 5 below by dividing the total amount of money spent by the number of households receiving the woodshed.

Table 6. Estimating Average Cost of a Woodshed

Category	Amount
Number of woodsheds	64
Total cost	\$45,127.01
Average cost per unit	\$705.11

Table 7 shows the potential impact on emissions if 64 households were using seasoned wood instead of wet. The assumption was that burning wet wood increases the emissions fivefold.

Table 7. Impact of Woodsheds on Emission Reductions.

Scenario	Number of Households	Emissions Before (tpy)	Wet Wood Scaling Factor	Emissions After (tpy)	Difference (tpy)	Difference (tpd)
Seasoned Wood	64	6.9138		0.7933	6.1205	0.0168
Wet Wood	64	6.9138	5	3.9663	2.9474	0.0081
Benefits					3.1730	0.0087

III. Chimney Sweep

Annual chimney sweep is important for maintaining good draft and preventing fire. In addition to sweeping chimneys, participating providers inspected the wood burning device and instructed households on device maintenance and operation as well as importance of using seasoned wood. Almost \$30,000 was spent on chimney sweeps with 143 households benefiting from these services. The cost of the service varied from \$119 to \$250 depending on the complexity of the service, with an average of \$209. Table 7 shows the potential impact on emissions if 143 households operated their stove with a clean chimney instead of a dirty one.

Table 8. Impact of Clean Chimney on Emission Reductions

Scenario	Number of Households	Emissions Before (tpy)	Dirty Chimney Scaling Factor	Emissions After (tpy)	Difference (tpy)	Difference (tpd)
Clean Chimney	143	15.4479		1.7724	13.6755	0.0375
Dirty Chimney	143	15.4479	1.2	2.1269	13.3210	0.0365
Benefits					0.3545	0.0010

IV. Outreach and Education

District has taken a hands on approach with the community by being present for both pre assessments and a year later returning to homes for follow up visits where possible. During a pre assessment District staff visits the home to determine if the existing wood burning device qualifies for the program and explains the how the program works, why we are doing it, and what the resident can do to help reduce woodsmoke. At the later follow up visit District asks the resident about observed smoke output, how the new device fuel and heating efficiency compares to their old stove, and offers wood moisture meters, an annual chimney sweep voucher if applicable, and reminds the resident of the curtailment programs issued during the winter months. Reoccurring issues District encountered were new homeowners unfamiliar with operating the new existing wood burning device and inadequate maintenance and operation like waiting for the stove to reach ideal temperatures before tightening the air controls. District as well as chimney sweeps have been able to help address these issues by educating residents.

District contracted with Progressive Source Communications to design and manage a marketing and educational outreach campaign utilizing both digital and traditional print advertising. Topics covered included the following:

- Promoting wood stove change-out program by emphasizing that upgrading to clean burning and efficient home heating will reduce PM2.5 emissions.
- Promoting other elements of the Program including chimney sweeps, and woodsheds.
- Raising awareness of Portola Ordinance 359 which prohibits burning wood in fireplaces and uncertified wood stoves when air quality is forecasted to be poor.
- Protecting community members from the adverse health effects of PM2.5.
- Impact of weatherization on reducing home heating needs.
- Impact of proper device maintenance and using seasoned wood on reducing emissions.

District also contracted with Sonoma Technology Institute (STI) for issuing woodburning curtailments during the 2022/2023 season. This contract allows for accurate daily forecasts Tuesday-Friday with a three-day forecast made Friday-Monday each week. As a contingency measure upon reclassification to serious nonattainment, the District expanded the curtailment season from November-February to September-April in 2023. In addition to the email notifications sent by STI to subscribers District used the forecasts to update the website and curtailment phone line daily. A part of the contract with STI included an End of Season Summary included as an attachment.

District contracted with R&B Communications to create and manage the Greater Portola webpage on the myairdistrict.com website. R&B created monthly newsletters and a Facebook posting schedule sharing BurnWise materials and other relevant District grant programs. On the webpage District offers Program information along with curtailment status updates.

Additionally, District worked with Plumas News to publish public notices and connect with the community about upcoming events and programs.

Initially the curtailment season, also known as Clear the Air; Check Before You Light, lasted 120 days a year. Once the contingency measure was triggered in 2023, the curtailment season increased to 242 days. District staff updates the website and curtailment phone line for the duration of the season and makes opacity observations on curtailment days to identify wood stoves with excessive smoke output.

During a curtailment period the District used the following messages:

Website:

“Using non EPA certified wood heating devices is prohibited at this time in the City of Portola and subject to enforcement under City Ordinance 359.”

Phone message:

“You have reached the Northern Sierra Air District’s CLEAR THE AIR; CHECK BEFORE YOU LIGHT information line. For December XX through December XXth, indoor wood burning is prohibited in the City of Portola in fireplaces and non-epa certified heating devices. EPA certified wood and pellet stoves are exempt. Weather forecasts indicate stagnant conditions, prompting this health advisory. If you burn in an EPA certified heating device, check to make sure your fire is burning hot enough that smoke is not being emitted from your chimney. Please check this information line daily for advisories or the District website at www.myairdistrict.com. Call the Air District at 530-832-0102 to find out how to upgrade your non-certified wood stove or fireplace to an EPA certified heating device at little to no cost. Thank you. “

V. Other Equipment

Over \$13,000 was spent on other types of equipment, including generators for select households switching to pellet stoves, moisture meters, purple air monitors, and stove thermometers as specified in Table 6.

Table 9. Other Equipment Purchased with TAG Funding

Category	Amount
Moisture Meters	\$3,833.70
Purple Air Monitors	\$6,319.65
Generators	\$2,219.38
Stove Thermometers	\$1,079.21
Total	\$13,451.94

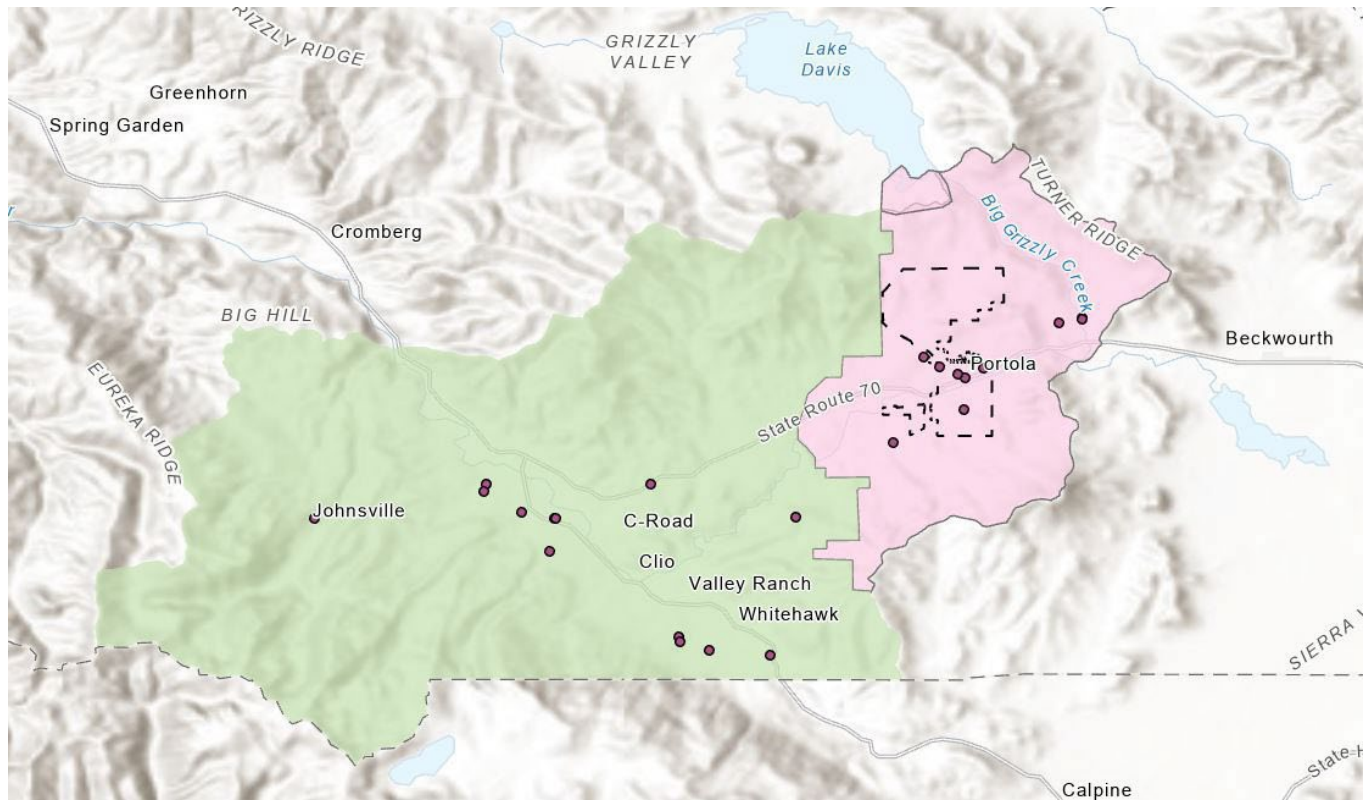
A. Moisture Meters and Stove Thermometers

Moisture meters were distributed to households to help them monitor the wood moisture and avoid burning wet wood. They were also used as an educational tool to raise awareness about the importance of burning seasoned wood to reduce emissions and keep the device and the chimney in optimal condition. Stove thermometers were distributed to households to help maintain the stove temperature in the optimal range. Maintaining optimal burn temperature helps reduce emissions, prolongs the life of the firebox, and reduces fuel usage and creosote buildup.

B. Purple Air Monitors

Since there is only one regulatory monitoring station in the nonattainment area, indoor and outdoor purple air monitors were located throughout the area to characterize spatial variations in concentrations, especially within the Zone 2 (Figure 3). District purchased 25 purple air monitors and an indoor PM2.5 tracker by Wynd Technologies. The Wynd indoor PM2.5 tracker is used by office staff while the indoor and outdoor Purple Air monitors are placed throughout the NAA. District created a survey in each monthly newsletter where members of the community with power and Wi-Fi can sign up to receive a purple air monitor from the District if they agree to make the data visible to the public. The only complication with placing purple air monitors in the community is weak or inadequate internet connectivity and frequent power outages where the purple air monitor has a difficult time reconnecting, and the resident may not notice. District works to address offline monitors and help residents troubleshoot the device reboot. Some location examples are C. Roy Carmichael Elementary School, Portola High School, the Northern Sierra AQMD District office, City Hall, and High Sierra Animal Rescue, among other private residences.

Figure 4. Map of Purple Air Monitors in Portola Nonattainment Area



C. Power Generators

Power backup generators were available to residents switching to a pellet stove. The generators meet the best available control technologies (BACT). Due to Portola's cold climate, it was necessary to ensure households could operate their pellet stoves during a power outage. These residents had to sign a contract agreeing to only use this emergency power backup generator during power outages. Four generators were purchased with the 2015 TAG funding.

VI. Average Incentive Amount

Table 7 shows the average incentive amount for each category of projects or equipment purchased.

Table 10. Average TAG Incentive Amount per Project

Category	Amount	Units	Average TAG Incentive (\$)
Stoves	\$1,401,890.46	532	\$2,635.13
Heat Pumps	\$105,255.38	8	\$13,156.92
Chimney Sweep	\$29,849.00	143	\$208.73
Woodsheds	\$45,127.01	64	\$705.11
Stove Destruction & Metal Hauling	\$25,931.90	463	\$56.01
Moisture Meters	\$3,833.70		
Purple Air Monitors	\$6,319.65	25	\$252.79
Generators	\$2,219.38	4	\$554.85
Stove Thermometers	\$1,079.21		

Portola Demographics

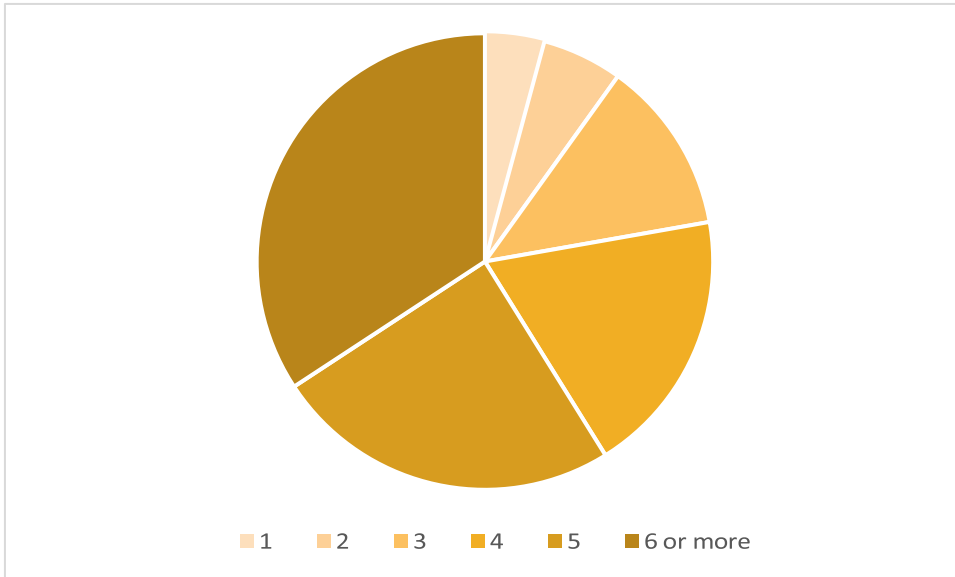
Portola Census County Division is estimated to include 2,214 households with a median income of \$54,396. About 12.9% of households live below the poverty level and 30% include one or more person with disability. According to the City’s housing survey conducted January-March 2018, only 17.5 percent of homes are in sound condition and need no repairs. The remaining 82.5 percent of homes need some kind of repair, with 22.2 percent needing moderate repairs and 15.2 percent dilapidated or in need of substantial repairs.

Survey Results

Surveys are attached to the initial change-out application. Unfortunately, not every applicant completes the survey. However, the surveys collected to date are very valuable by providing additional information beyond what’s required as part of the application. Surveys revealed that average households paid \$200 for a cord of wood for the total cost of about \$950 annually. About 34% of households surveyed indicate they were low income and 6% received energy assistance.

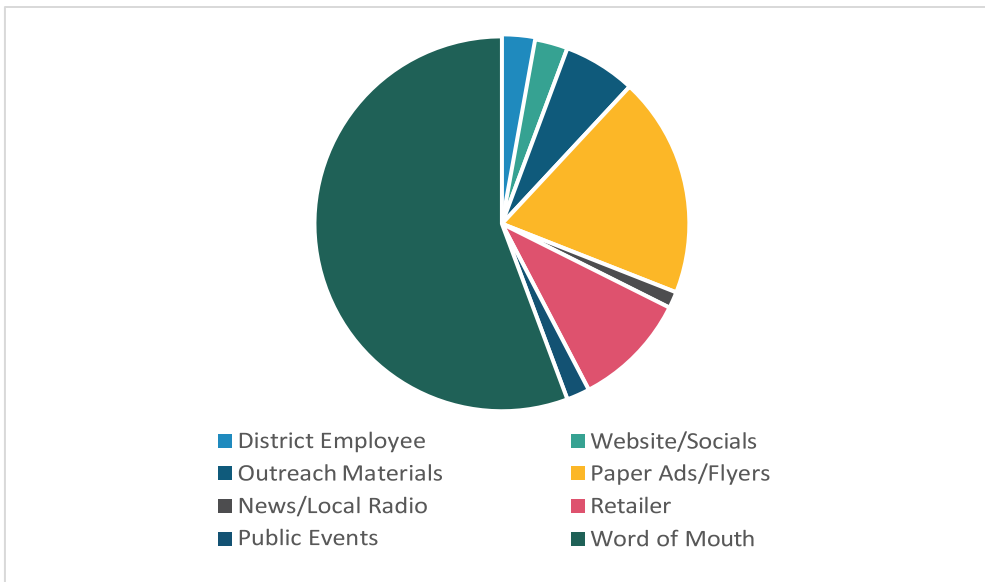
Figure 4 represents the survey responses to the question about amount of wood burned annually.

Figure 5. Cords of Wood Typically Burned in One Season



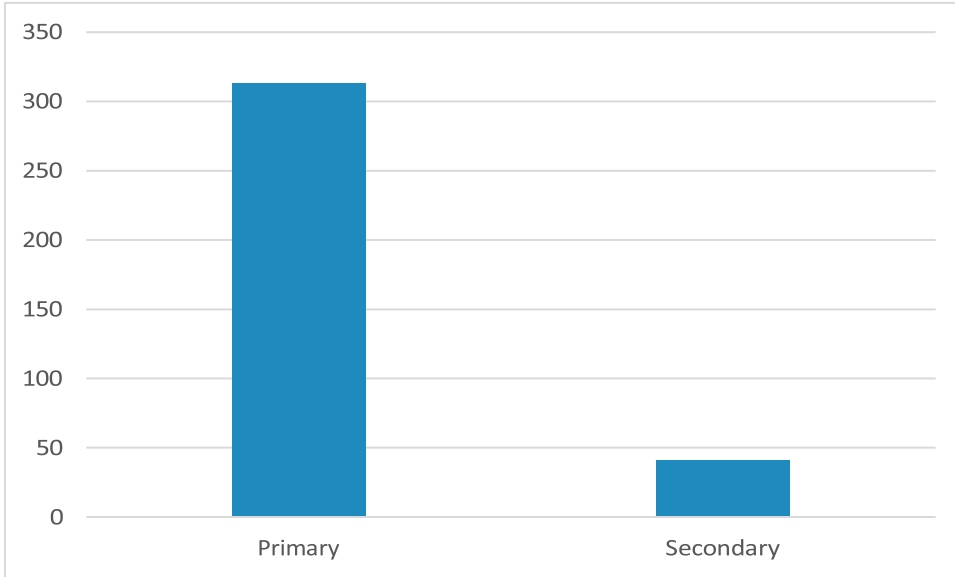
When asked how the residents learned about the programs offered by TAG the overwhelming majority learned word of mouth (Figure 5). District efforts to aid the program along with retailers and chimney sweeps has created a professional, reliable, and efficient program that is recommended by participants to their neighbors and friends.

Figure 6. Survey Results: How did you hear about the change out program?



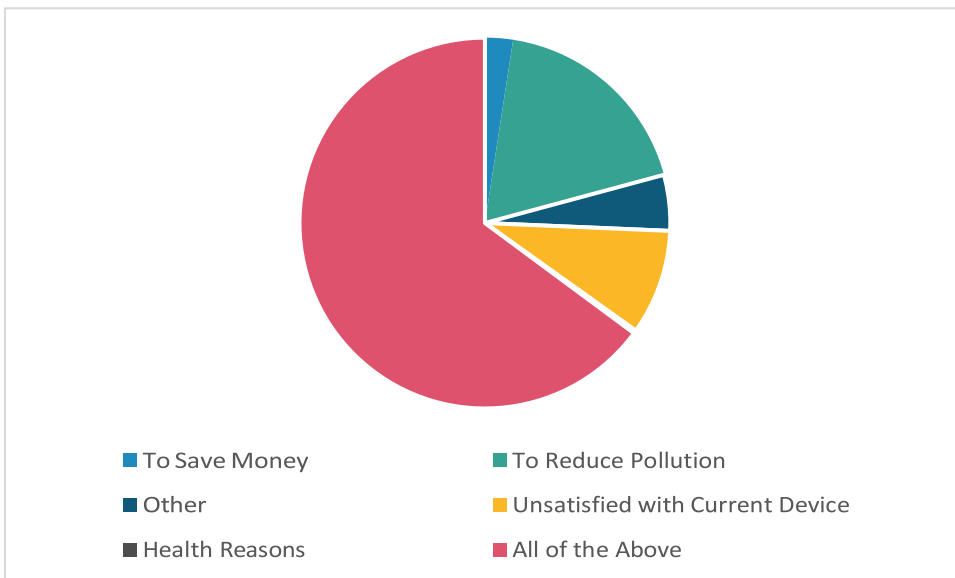
The overwhelming majority of participants lived in the home where the change out took place as a primary residence (Figure 6).

Figure 7. Primary or Secondary Residence



As illustrated in Figure 7, majority of respondents had multiple reasons for applying for the Program, including dissatisfaction with the current heating device, health concerns, to reduce pollution, to save money, and a total of 18 applicants replied with “other” reasons.

Figure 8. Reasons for Applying



Successes and Lessons Learned

The impact of the change-outs and other programs and activities on the air quality was evaluated by analyzing a data set which excluded wildfire-impacts. This is important for understanding trends and evaluating the impact of the Program. The first home heating device funded by the Program was installed on May 10, 2016. By early 2023, 540 home heating devices in the Nonattainment Area were replaced with cleaner burning and more efficient alternatives. As described in previous sections, upgrading home heating devices to better technology was only one aspect of the comprehensive Program designed to reduce emissions from home heating. Other elements of the Program, especially providing woodsheds and chimney sweep services, were important for achieving emission reductions. Since the inception of the Program, annual design values decreased 15 percent (Figure 8) and 24-hr design values decreased 28 percent (Figure 9) but Portola failed to attain the moderate State Implementation Plan attainment deadline of December 31, 2023.

Figure 9. Trends in Annual PM2.5 Design Values.

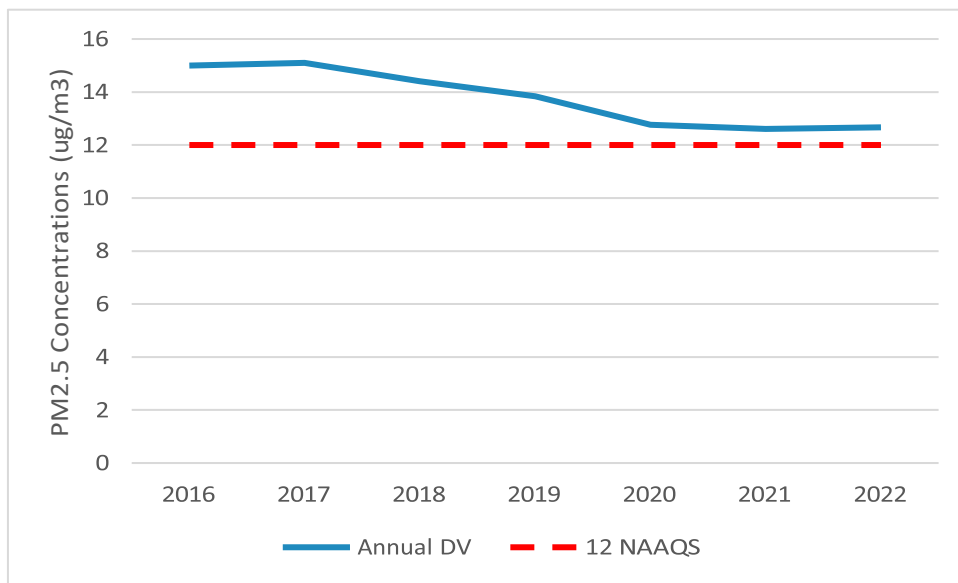
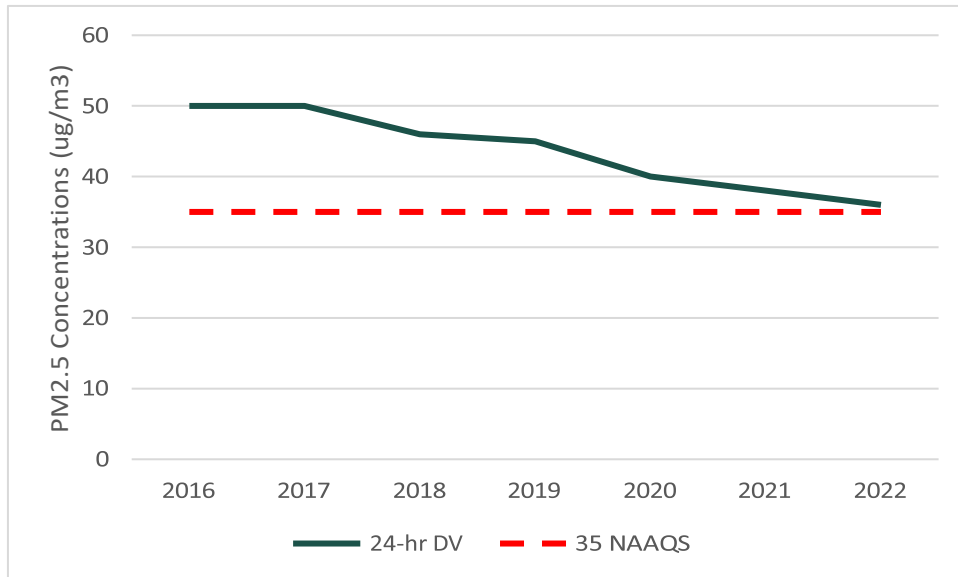


Figure 10. Trends in 24-hr Design Values.



The first home heating device funded by the Program was installed on May 10, 2016. Since that time, prices of home heating devices and installation increased significantly not only in Portola but across the State. Over time District had to increase incentives to better reflect the current prices. Many households in Portola have limited income and would not be willing to change-out their home heating devices unless incentive covered the full cost of the change-out. The most significant adjustment to incentives took place in 2021 (Table 10). In Zone 1, incentives for wood, pellet, kerosene, or propane heaters increased over 40 percent. In Zone 2 District eliminated income-based incentive and instead offered what was a low-income incentive prior to November 2021 to all households.

Table 11. Changes to Incentive Levels.

Replacement Device	Incentive Level (Prior to November 2021)			Incentive Level (Starting November 2021)	
	Zone 1	Zone 2		Zone 1	Zone 2
		Standard Incentive	Low Income		
Wood stove	\$3,500	\$1,500	\$3,500	\$5,000	\$3,500
Pellet Stove, Propane, or Kerosene	\$4,500	\$3,000	\$4,500	\$6,500	\$4,500
Heat Pump	\$10,700	\$10,700	\$13,500	\$13,500	\$13,500

The new U.S. EPA certified wood stoves installed in the Portola Nonattainment Area may not have been as low emitting as the certification values indicated. The U.S. EPA is responsible for certifying wood burning devices to ensure they meet the NSPS. Recent work done by the Northeast States for Coordinated Air Use Management (NESCAUM) revealed significant problems with the U.S. EPA wood stove certification program. The program allows testing to be directed by manufacturers and testing laboratories to achieve desired results below NSPS certification values. Tests conducted by NESCAUM revealed emissions significantly above the reported certification levels. In response to these concerns, the U.S. EPA Office of Inspector General is conducting an internal investigation of the wood stove certification program.

Effective February 23, 2022, U.S. EPA revoked the two alternative test methods commonly used to certify wood stoves to NSPS standards, ALT-125 and ALT-127. By allowing significant flexibility in these testing protocols, the methods made it easier for manufacturers to meet NSPS emission limits without changing the wood stove design. Since the replacement wood stove certification values are used as the basis for modeling future air quality, the improvement in air quality would fall short of projections if replacement wood stoves do not perform in accordance with their certification values. The U.S. EPA wood stove certification program in its current framework lacks the integrity needed to ensure that new residential wood stoves provide health benefits by meeting NSPS emission standards. This is especially critical considering the recent recommendation by the Clean Air Scientific Advisory Committee to lower both the 24 hour and annual PM_{2.5} NAAQS levels.

The other two variables important for the overall success of a wood stove change-out program are user education on optimal device operation and the use of properly seasoned wood. However, for these two variables to make a significant impact, the device must still be able to perform in a manner consistent with the certification values.

Operator usage contributes greatly to the success of achieving emission reductions from wood-to-wood replacement. To ensure optimal emission reductions, District made outreach and education a top priority. All Program participants were trained in the use of their new wood stove at the time of installation. In addition to manufacturer operation manuals, installers provide Program participants with District-developed literature addressing operations, maintenance, and fuel quality and dimensions. The Covid 19 pandemic negatively impacted the implementation of the wood stove change-out program and the air quality progress. Social distancing restrictions prevented District from holding outreach and education events and limited new installations by restricting in-home visits. Furthermore, remote work and study increased the demand for home heating. The in-home follow-up visits by District staff were discontinued during the pandemic, but with the easing of social distancing restrictions, the District renewed follow-up visits.

PM_{2.5} pollution from certified wood stoves, even under optimal operating conditions, is still much higher than pollution from other heat sources. The reductions achieved by replacing a wood burning device with a non-wood burning device are more certain as emissions are less influenced by fuel quality, operator error, and lack of regular maintenance. While the

non-wood replacements were prominently featured in the outreach campaign, the focus was to help households select the best device for their home and budget. Switching households to unaffordable fuels would result in inability to maintain a comfortable temperature in the house leading to Program dissatisfaction. In a small community, like Portola, positive testimonies were critical to the Program success. In addition to offering higher incentives for switching to non-wood home heating, starting in March of 2022, removal of a wood-burning device was no longer required to qualify for a heat pump installation. This significantly increased the number of households interested in switching their primary source of heat to a heat pump because it will alleviate concerns about the ability to heat their homes during a power outage. This new provision applied only to households residing in the City of Portola where the population is denser than the surrounding areas and the residents are subject to the City's mandatory woodburning curtailment program. Only eight heat pumps were installed with 2015 TAG, four as a replacement for the old device and four as combos (heat pump installed in addition to the existing wood burning device). Combos are very popular as part of the 2018 and 2020 TAGs.

Appendix L

STI - Portola End of Season Curtailment Summary

Portola End of Season Report | Nov 2022 - Apr 2023

Sonoma Technology forecasts wintertime fine particle (PM_{2.5}) Air Quality Index (AQI) levels for the city of Portola to support the Northern Sierra Air Quality Management District's (NSAQMD) wood stove curtailment (WSC) program. Each weekday from November to April, Sonoma Technology issues same-day and next-day forecasts of 24-hour average PM_{2.5} concentrations with a 5-day outlook.

PM_{2.5} concentrations are typically higher during winter months because colder temperatures can lead to strong overnight temperature inversions, trapping pollutants near the surface. In addition, increased residential wood burning during winter months can contribute to higher levels of PM_{2.5} locally and regionally. As a significant fraction of wintertime PM_{2.5} pollution can be attributed to residential wood smoke, the WSC program aims to reduce burning on days when meteorological conditions are conducive to pollutant accumulation in the Portola region. The forecast threshold for 24-hour average PM_{2.5} concentrations for NSAQMD to issue a WSC day for November through March was at or above 30 µg/m³ (89 AQI value), and above 20 µg/m³ (68 AQI value) for April.

This report summarizes the meteorological and air quality conditions in Portola during the period from November 1, 2022, through April 31, 2023, and provides an analysis of air quality forecast accuracy. Air quality data are sourced from the U.S. Environmental Protection Agency's (EPA) AirNow-Tech platform.

Summary

- Observed air quality in the Portola region during the 2022-23 WSC season was in the Good AQI category on 31% of days, the Moderate category on 65% of days, and the Unhealthy for Sensitive Groups (USG) category on 4% of days.
- The highest AQI levels of the season typically occurred when upper-level high pressure over the Portola region limited vertical mixing and cold temperatures at the surface produced strong temperature inversions, trapping pollutants near the surface. Particle levels were further increased by periods of calm winds, which allowed pollutants to accumulate in the region.
- High AQI levels were also observed on a few days toward the end of December 2022 with calm winds and above-normal temperatures. On these days, excess moisture from snowmelt increased relative humidity levels, promoting particle formation.
- A total of 42 WSC day forecasts were issued during the 2022-23 WSC season. The average observed daily PM_{2.5} concentration on WSC days was 27.0 µg/m³. Further details are provided on page 6.
- The Percent Correct next-day forecast score was 80%. Percent Correct and other forecast statistics are defined on page 6 of this report.



Highest AQI Days
Nov. 2022-Apr. 2023

142 February 2
Portola
PM_{2.5}

114 December 20
Portola
PM_{2.5}

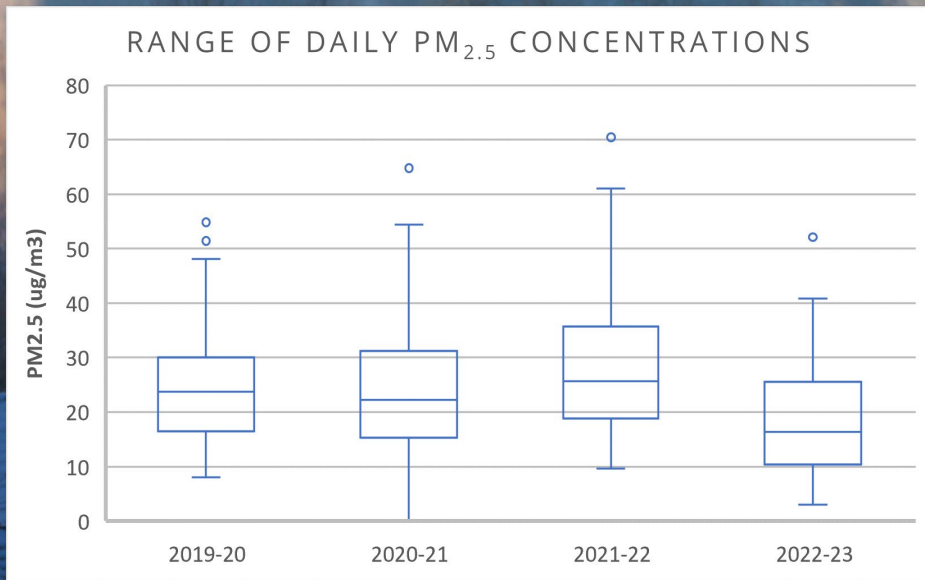
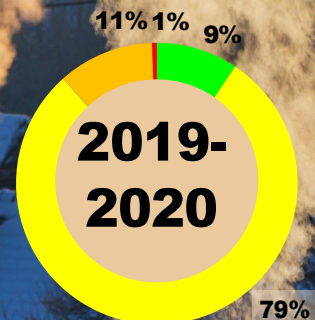
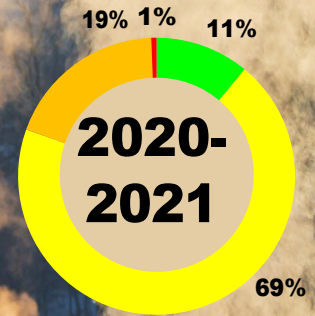
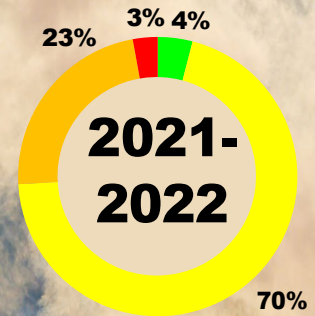
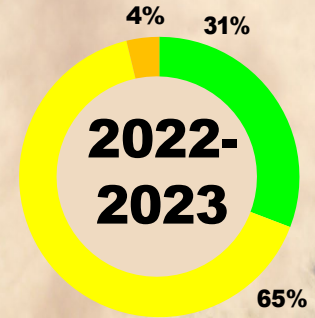
111 December 21
Portola
PM_{2.5}

106 December 23
Portola
PM_{2.5}

Yearly AQI Comparison | November - April (2019-2023)

Air quality in Portola during the 2022-23 WSC season was better than the previous three seasons, partially due to an active weather pattern enhancing mixing and dispersion across the northern Sierra. The pie charts show the percentage breakdown of observations in each AQI category for each season. These charts show a substantial increase in Good AQI levels, and a substantial decrease in USG AQI levels in Portola this season.

In addition to an active weather pattern improving air quality in Portola this season, the WSC program also appeared to be effective in improving AQI levels. As shown in the box and whisker plot below, the top whisker this season was 8-20 ug/m³ lower than the previous three seasons, indicating the potential effectiveness of curtailments at reducing the highest concentrations.



Missing | Good | Moderate | Unhealthy For Sensitive Groups | Unhealthy | Very Unhealthy | Hazardous

Seasonal Weather Summary

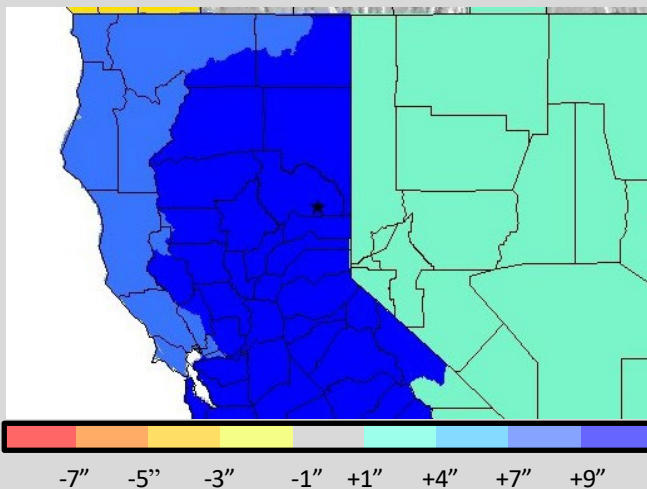
Outside of wildfire season, PM_{2.5} concentrations in the Portola region are typically higher during the winter months because strong overnight temperature inversions limit vertical mixing as emissions of PM_{2.5} increase due to residential wood burning. These inversions are strengthened by the high terrain surrounding Portola, which acts as a barrier to wind and allows inversions to become more stable as cold air flows downslope into the valley, trapping pollutants near the surface. Temperature inversions were common in Portola throughout winter and into spring, with below-normal temperatures observed from November through April. Temperatures on days with PM_{2.5} concentrations above the WSC threshold averaged 7°F below normal, with average lows below 15°F.

Thankfully, the cold temperatures this season were accompanied by a very active weather pattern, with significant precipitation and snowfall across the northern Sierra. Liquid precipitation was 13.97” above normal in Portola from November 2022 through April 2023, as numerous low-pressure systems traversed the region. Moderate-to-heavy precipitation and periods of gusty winds associated with the frequent storm systems enhanced dispersion and shortened the potential duration of high AQI levels. Just one exceedance of the WSC threshold was observed during the wettest months of the season, January and March. The majority of WSC threshold exceedances occurred in November and December before the extended stormy pattern developed. A few additional exceedances occurred in February as a break in the active weather pattern allowed pollutants to accumulate in Portola.

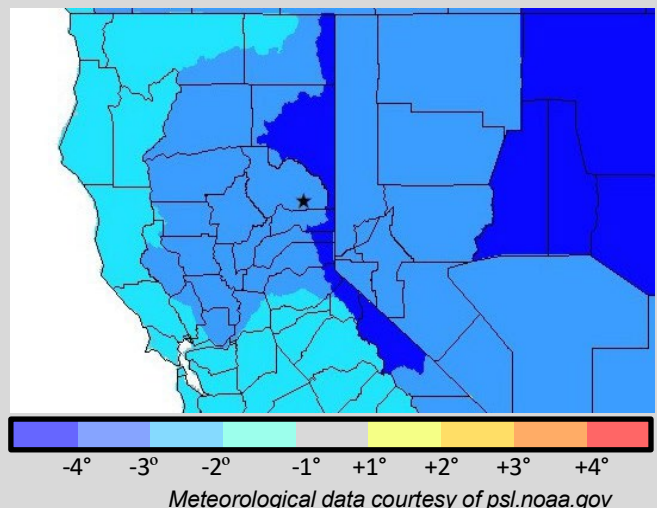
Month	Portola temperature departure from normal (°F)	Portola precipitation departure from normal (inches)	Curtailments Issued	Days with 24-hour PM _{2.5} above WSC threshold
November	-6.2	-0.07	14	6
December	-6.2	2.82	13	7
January	-5	6.37	4	1
February	-6.8	-1.03	9	3
March	-8.9	6.81	1	0
April	-0.2	-0.93	1	0

Source: Weather data - xmacis.rcc-acis.org. Air quality data - www.airnowtech.org

Precipitation Anomalies (inches)
November 2022-April 2023
Versus 1991-2020 Average



Temperature Anomalies (°F)
November 2022-April 2023
Versus 1991-2020 Average



Highest Observed and Forecasted AQI Days

Observed AQI levels in the Portola region met or exceeded the WSC threshold (89 AQI value) on 17 days this season. WSC days—when PM_{2.5} AQI levels were forecast to meet or exceed 89 (30 µg/m³ in Nov. - Mar.) or 68 (20 µg/m³ in Apr.)—were issued on 42 days. The table below shows the dates when AQI levels met or exceeded the WSC threshold in the Portola region. Days are ranked from highest to lowest by observed AQI levels, and forecast WSC days are bold. A meteorological summary of the high-AQI-level events on February 2, 2023, and December 20-23, 2022, is included on page 5.

Date	Monitoring Site	Observed AQI	Next-Day Forecast	Same-Day Forecast
2/2/2023	Portola (061131003)	142	89	99
12/20/2022	Portola (061131003)	114	82	87
12/21/2022	Portola (061131003)	111	89	102
12/23/2022	Portola (061131003)	106	89	91
11/26/2022	Portola (061131003)	101	89	89
12/22/2022	Portola (061131003)	101	93	93
12/13/2022	Portola (061131003)	100	91	91
12/7/2022	Portola (061131003)	99	91	91
1/28/2023	Portola (061131003)	98	78	N/A*
11/4/2022	Portola (061131003)	97	91	91
12/16/2022	Portola (061131003)	96	84	84
2/3/2023	Portola (061131003)	95	78	78
11/11/2022	Portola (061131003)	91	102	102
11/17/2022	Portola (061131003)	91	102	95
11/22/2022	Portola (061131003)	91	95	95
11/27/2022	Portola (061131003)	89	84	84
2/9/2023	Portola (061131003)	89	91	93

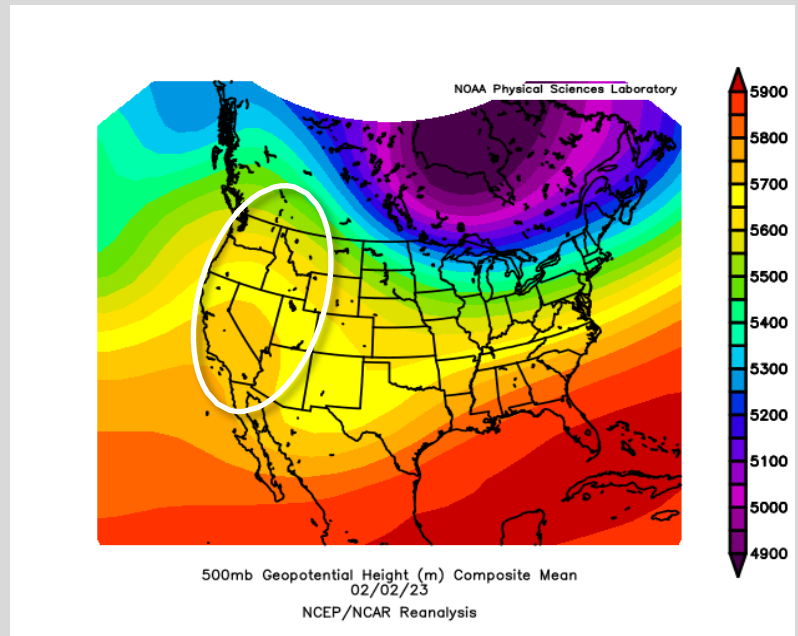
* Forecasts not issued on weekends.



Highlighted Days

February 2, 2023: 142 AQI

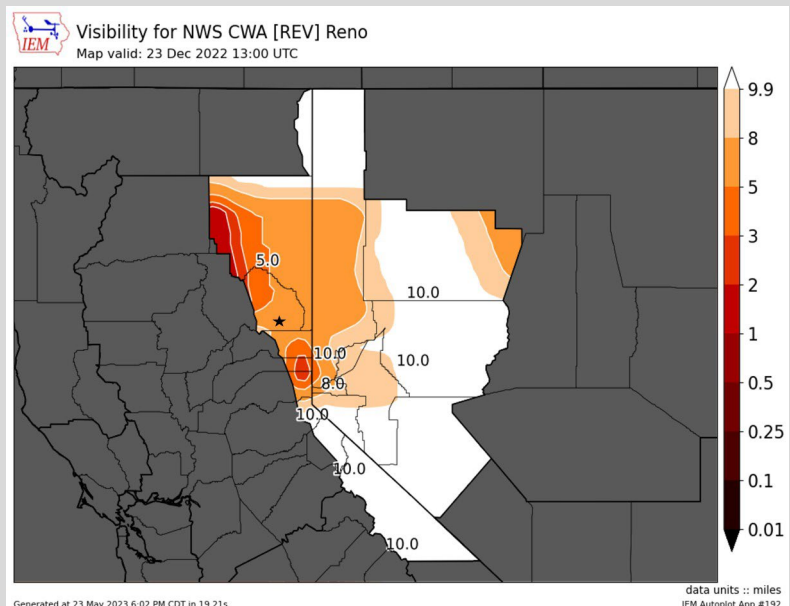
The highest AQI levels of the season were observed on February 2, 2023, as a strong ridge of high pressure moved across northern California and limited atmospheric mixing. Additionally, clear skies and calm winds overnight allowed temperatures to fall into the single-digits in Portola during the morning hours, strengthening a temperature inversion in lower elevations and trapping pollutants near the surface. Furthermore, calm-to-light southerly winds hindered dispersion throughout the day. With limited mixing and dispersion in the forecast, a WSC day was issued on February 1. However, even with the curtailment in place, the AQI value reached 142 at the Portola PM_{2.5} monitor.



February 2: 500 mb heights from February 2, 2023. A strong upper-level high pressure ridge along the West Coast (circled) inhibited vertical mixing in the Portola region, contributing to USG AQI levels. *Source: NOAA Physical Sciences Laboratory*

December 20-23, 2022: 101-114 AQI

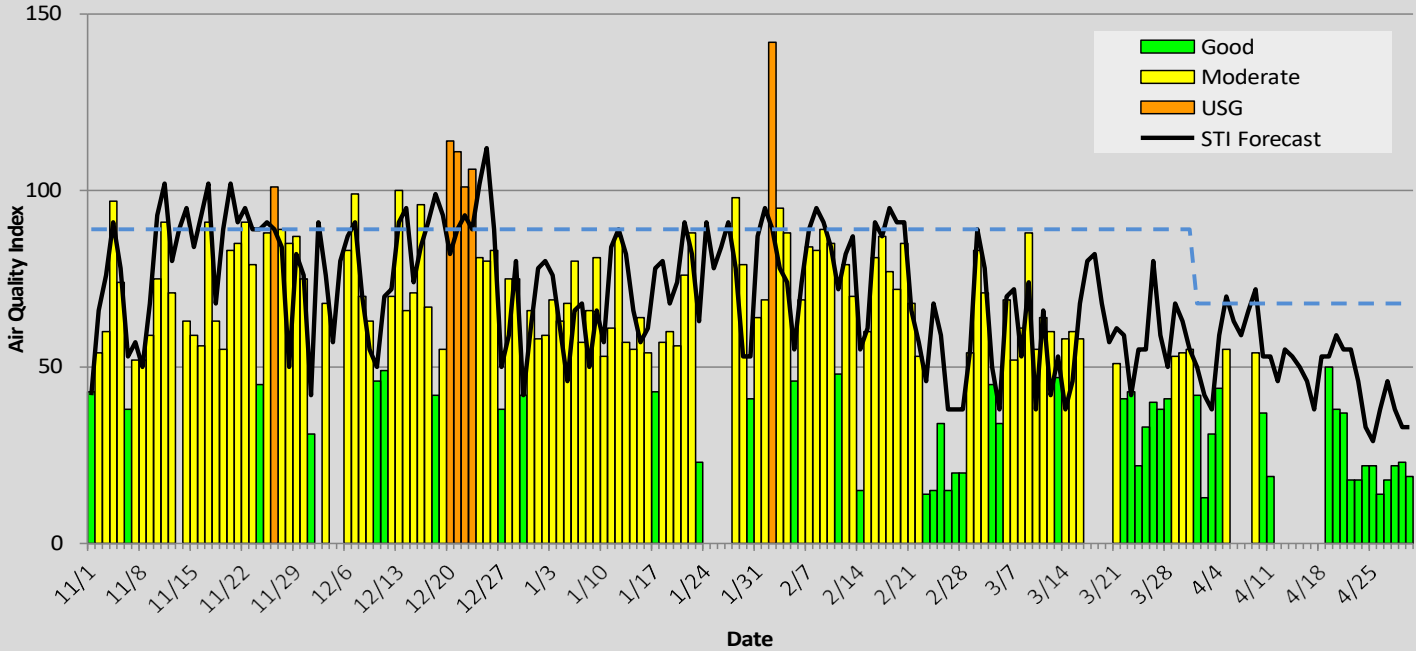
A four-day stretch of USG AQI levels occurred just before the Christmas holiday. This period started with a strong temperature inversion trapping pollutants near the surface, with a low of 5°F recorded in Portola on the morning of December 20. The weather pattern then shifted for the next few days as a ridge of high pressure aloft limited atmospheric mixing and brought warmer temperatures to the northern Sierra. High temperatures climbed above freezing from December 21-23 in Portola, which melted several inches of snow. Added humidity from the melting snow led to periods of fog and enhanced particle formation. In addition, light and variable winds through the period limited dispersion, and allowed pollutants to carryover from day-to-day. Despite WSC days issued from December 21-23, AQI levels reached the USG category each day.



December 23: Visibility (miles) at 5 a.m. Reductions to visibility due to fog, which developed after several days of melting snow and light winds. These conditions enhanced particle formation in Portola, supporting USG AQI levels. *Source: Iowa State University.*

Forecast Performance

Sonoma Technology (STI on the graph) provides same-day, next-day, and extended forecasts for the Portola region. The chart below shows daily observed AQI levels (colored bars) and Sonoma Technology forecasts (black line), along with the WSC threshold (horizontal-dotted blue line). Sonoma Technology forecasts overall track well with the general trend of observed air quality levels in Portola. Next-day and same-day forecast accuracy statistics are below the chart.



Wood-Stove Curtailment Forecast Performance Summary

- Using the WSC threshold, the percent correct was 80% for next-day forecasts and 81% for same-day forecasts.
- The probability of detection for concentrations exceeding the WSC threshold was 71% for next-day forecasts and 75% for same-day forecasts. The false alarm rate was 65% for next-day forecasts and 64% for same-day forecasts.
- The average observed $PM_{2.5}$ concentration on days when WSC day forecasts were issued was $27.0 \mu\text{g}/\text{m}^3$.
- The average observed $PM_{2.5}$ concentration on non-WSC days was $16.8 \mu\text{g}/\text{m}^3$.
- Next-day forecasts were biased by $+1.8 \mu\text{g}/\text{m}^3$, on average, and had a mean absolute error (MAE) of $6.3 \mu\text{g}/\text{m}^3$. Same-day forecasts were biased by $+1.5 \mu\text{g}/\text{m}^3$, on average, and had a MAE of $5.2 \mu\text{g}/\text{m}^3$.

Percent Correct: The percentage of forecasts that correctly predicted whether observations would be above or below the WSC threshold.

Probability of Detection: How often a WSC day forecast was issued when observed conditions exceeded the WSC threshold.

False Alarm Rate: How often a WSC day forecast was issued and observed conditions ended up below the WSC threshold.

Bias: The average difference between forecasted and observed concentrations. A positive bias indicates that the forecasted concentrations tended to be higher than observed concentrations. A negative bias indicates that the forecasted concentrations tended to be lower than observed.

Mean Absolute Error: Indicates the average absolute difference between forecast and observed concentrations. A low MAE suggests that forecasts tend to be fairly accurate.

Although Sonoma Technology, Inc., prepares air quality forecasts using the highest professional standards, forecasting is an inexact science. Therefore, Sonoma Technology, Inc., cannot assume any liability or responsibility for any consequences that might arise due to the accuracy or inaccuracy of forecasts delivered under this contract, or for any decisions or actions taken based on the forecasts provided.