



Appendix D

Stationary and Area Source Control Strategy Evaluation



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Appendix D: Stationary and Area Source Control Strategy Evaluation

The San Joaquin Valley air basin (Valley) faces significant challenges in meeting the National Ambient Air Quality Standards (NAAQS). The San Joaquin Valley Air Pollution Control District (District) has demonstrated leadership in developing and implementing groundbreaking regulatory strategies to reduce emissions. Tough and innovative rules, such as those for indirect source review, residential fireplaces, glass manufacturing, and agricultural burning, have set benchmarks for California and the nation.

The District has adopted many regulatory control measures under the District's air quality attainment plans, including but not limited to the *2007 Ozone Plan* and *2008 PM2.5 Plan*, which serve as control measures under the *2012 PM2.5 Plan*. Under the federal Environmental Protection Agency (EPA) policy, there is a preference for reliance on control measures that have already been adopted. The *2012 PM2.5 Plan* regulatory control measures that have already been adopted are achieving 247.8 tons per day (tpd) of NO_x reductions and 15.7 tpd of PM_{2.5} reductions, and include both stationary and area source control measures as well as California Air Resources Board (ARB) rules for mobile sources. The stationary and area source control measures that the District has already adopted and are contributing to achieving attainment of the 2006 NAAQS as a part of this plan are displayed in Table D-1 below. Refer to Appendix C for the discussion on mobile sources and mobile source regulatory control measures. Also, refer to Chapter 5 for a detailed discussion about the regulatory control measures that have already been adopted and will continue to get emissions reductions.

While the District has adopted numerous rules to reduce emissions from stationary and area sources that will achieve significant emissions reductions in the coming years, the District has invested significant effort in investigating additional potential opportunities for reducing emissions and leaving "no stone unturned," as outlined in the following Guiding Principles adopted by the District's Governing Board:

- *Use sound science as the plan's foundation. This includes efforts to assess public health impacts, predict future air quality, determine the extent of emissions reductions needed, and evaluate the availability, effectiveness, and feasibility of emission control measures.*
- *Consider all opportunities for timely, innovative, and cost-effective emission reductions. Consider traditional regulations, but look beyond traditional regulations to incorporate monetary incentives, policy initiatives, guidance documents, and outreach, including working with cities and counties to incorporate 2012 PM_{2.5} Plan principles into their general plans.*

This appendix reflects the comprehensive evaluation performed by District staff to examine the Valley's various emissions sources, and identify additional potential emission reduction strategies for inclusion in this plan.

Table D-1 District Stationary and Area Source Regulations Contributing to Continued PM_{2.5} Improvement

Adopted District Rules	Emissions Reduced ¹
Rule 4103 Open Burning	0.12 tpd NO _x 0.34 tpd PM _{2.5}
Rule 4106 Prescribed Burning and Hazard Reduction Burning	NQ ²
Rule 4204 Cotton Gins	0.79 tpd PM
Rule 4307 Boilers, Steam Generators, and Process Heaters 2 to 5 MMBtu/hr	3.36 tpd NO _x
Rule 4308 Boilers, Steam Generators, and Process Heaters 0.075 to <2 MMBtu/hr	3.30 tpd NO _x
Rule 4309 Dryers, Dehydrators, and Ovens	0.65 tpd NO _x
Rule 4311 Flares	0.06 tpd SO _x
Rules 4306 & 4320 Boilers, Steam Generators, and Process Heaters >5 MMBtu/hr	3.50 tpd NO _x 3.60 tpd SO _x
Rule 4352 Solid Fuel Fired Boilers, Steam Generators, and Process Heaters >5 MMBtu/hr	NQ ²
Rule 4354 Glass Melting Furnaces	3.37 tpd NO _x 1.70 tpd SO _x 0.11 tpd PM _{2.5}
Rule 4550 Conservation Management Practices	34.2 tpd PM
Rule 4692 Commercial Charbroiling	0.08 tpd PM _{2.5}
Rule 4702 Internal Combustion Engines	22.43 tpd NO _x
Rule 4703 Stationary Gas Turbines	2.20 tpd NO _x
Rule 4901 Wood Burning Fireplaces and Wood Burning Heaters ³	2.40 tpd PM _{2.5}
Rule 4902 Residential Water Heaters	1.03 tpd NO _x
Rule 4905 Natural Gas-Fired, Fan-Type Residential Central Furnaces	2.6 tpd NO _x
Regulation VIII Rules Fugitive PM ₁₀ Prohibitions	20.4 tpd PM

1. Emissions reduced upon full implementation of rule amendments.

2. Not quantified.

3. As an average for November – April; the reductions on any given “No Burn” day are much higher.

Given the significant emissions reductions already achieved through stationary and area source regulatory strategies and the significant investment necessary to achieve emissions reductions, the Valley is at the point of diminishing returns from new regulatory controls on stationary and area sources. Keeping in line with the District Governing Board adopted *Guiding Principles*; staff broadens the search for emission reduction opportunities beyond traditional regulatory strategies and considers other opportunities for timely, innovative, and cost effective emissions reductions, including new incentive programs, policy initiatives, and enhanced education and outreach efforts. Also, where additional research is required to determine if potential opportunities to further reduce emissions of particulate matter and particulate precursors may be feasible for the Valley, the District recommends further study. Further study commitments are another example of the District’s commitment to

continuously pursue emission reduction opportunities, even after an air quality plan has been adopted. The District's long-standing, multi-faceted strategy for attaining air quality standards has produced positive results. The District recognizes that there is no "silver bullet" for attainment, and every sector – from the public through all levels of government, businesses, and industry – must continue to reduce emissions to meet more stringent air quality standards.

This appendix consists of a literature review and evaluation of emission reduction opportunities for a variety of stationary and area source categories. District staff in multiple departments with expertise in these various sectors contributed to this effort. The evaluations in this appendix are intended to capture relevant background information, examine emission reduction opportunities for technological and economic feasibility, make recommendations for appropriate District actions moving forward, and to solicit public input during the plan development process.

Appendix D Organization and Evaluation

The stationary and area source control measure source categories evaluated in this appendix are organized into the following groups: combustion devices, industrial processes, managed burning, agricultural processes, residential and commercial, fugitive particulate matter, and additional source categories. Each control measure source category group discussion includes a summary of incentive programs, policy initiatives, and District rules that are specific to that category. Each individual control measure analyzed in this appendix has its own discussion and source category analysis.

Source Category Analysis

Each control measure source category analysis includes regulatory evaluations including an assessment of Reasonably Available Control Technology (RACT); review of potential opportunities to reduce emissions; an assessment of each source category with respect to the District's Risk-based Strategy; and recommendations for commitments for future actions to be taken by the District.

Regulatory Evaluation

As part of the regulatory evaluation, District rules and source categories are compared to federal air quality regulations and standards, and the regulations and standards in other air districts. The following regulations and guidelines are referenced in the comparisons:

- **Federal Regulations** – Investigation of federal regulations includes literature review of the following regulations and guidance documents:
 - Control Techniques Guidelines (CTG)
 - Alternative Control Techniques (ACT)
 - National Emission Standards for Hazardous Air Pollutants (NESHAP)
 - New Source Performance Standards (NSPS)
 - Best Available Control Technology (BACT)

- Maximum Achievable Control Technology (MACT)
- **Other Air Districts' Rules** – As agreed to by EPA staff for the *2009 RACT SIP Ozone Demonstration*, the rules were also compared to analogous regulations adopted by California's most progressive air districts. Investigation of control strategies and measures in other air districts and agencies includes, but is not limited to the following air districts:
 - South Coast Air Quality Management District (SCAQMD)
 - Sacramento Metropolitan Air Quality Management District (SMAQMD)
 - Bay Area Air Quality Management District (BAAQMD)
 - Ventura County Air Pollution Control District (VCAPCD)
- **Reasonably Available Control Technology (RACT)** –EPA has defined RACT as “*the lowest emission limitation that a particular source is capable of meeting by the application of control technology that is reasonably available considering technological and economic feasibility*” (44 FR 53762; September 17, 1979). Per Sections 182(b)(2) and 182(f) of the federal Clean Air Act, ozone nonattainment areas are required to implement RACT for sources that are subject to CTG documents issued by EPA and for “major sources” of VOCs and oxides of nitrogen (NOx), which are ozone precursors. Each control measure source category subject to RACT is evaluated to determine if each is at least as stringent as established RACT requirements. All source categories subject to RACT requirements have been determined to currently satisfy RACT requirements. Any new prohibitory requirements for these source categories would be more stringent than RACT.

Potential Opportunities to Reduce Emissions

Each control measure source category analysis identifies potential emission reduction opportunities for PM_{2.5} and its precursors, such as NO_x and SO_x. The potential emission reduction opportunities are then thoroughly evaluated using the following key factors:

- **Technological Feasibility** – The technological feasibility analysis determines if a potential opportunity to reduce emissions will physically work for existing facilities and operators in the Valley. District analysis of technological feasibility includes a literature review of BACT guidelines; District permits; environmental and technological studies; EPA and ARB guideline documents; and other air districts' rules, regulations, and guidelines, to identify potential opportunities and determine the technological feasibility of any identified potential opportunities.
- **Cost Effectiveness** – The purpose of conducting a cost effectiveness analysis is to evaluate the economic reasonableness of a pollution control measure or technology as it applies to operators in the Valley. A cost effectiveness analysis examines the added cost, in dollars per year, of the control technology or technique, divided by the emissions reductions achieved, in tons per year.

$$\text{Cost Effectiveness } (\$/\text{ton}) = \frac{\text{Compliance cost } (\$/\text{year})}{\text{Emission Reduction } (\text{ton}/\text{year})}$$

Additionally, a literature review of previous staff reports from District rules, staff reports and studies from other air districts, EPA technical guidance documents, and applicable study data from the scientific community is conducted to determine if any technologically feasible opportunities that were previously not cost effective have changed to become cost effective since the last amendment.

Risk-Based Strategy

The District's Risk-based Strategy (RBS) fits within and effectively supplements EPA's current Clean Air Act (CAA) framework. Through the RBS, the District is maximizing public health improvements resulting from the District's attainment strategies and related initiatives. The District is integrating the RBS into various aspects of the *2012 PM2.5 Plan*, including control measure review and strategy prioritization. As described in Chapter 2 of this plan, the District uses a five-factor exposure assessment methodology to evaluate the PM2.5 attainment strategy under the RBS:

1. Relevance to attainment
2. Toxicity of chemical species
3. Particle size and deposition
4. Proximity to PM 0.1
5. Population intake fraction

Based on this assessment, the District prioritizes regulatory control measures and other strategies that maximize public health. EPA policy directly acknowledges the importance of a Risk-based Strategy to maximize public health benefits within a region's attainment efforts, noting in the March 2012 PM2.5 implementation guidance memo, "...it is likely that SIPs for the 2006 24-hour PM2.5 NAAQS may need to include *greater emphasis on reducing emissions from local sources* [emphasis added] as compared to plans to attain the 1997 PM2.5 NAAQS."^[1] EPA's memo further encourages that states consider evidence from published literature indicating that reductions of direct PM2.5 have a greater health benefit per ton than reductions of other criteria pollutants, such as SO2 and NOx,^[2] and that providing methods local air quality plans can use to maximize health benefits and minimize risk inequality.^[3]

^[1] U.S. Environmental Protection Agency (2012, March 2). Memorandum from the Office of Air Quality Planning and Standards: Implementation Guidance for the 2006 24-Hour Fine Particle (PM2.5) National Ambient Air Quality Standards (NAAQS). Retrieved from http://www.epa.gov/ttn/naaqs/pm/pdfs/20120302_implement_guidance_24-hr_pm2.5_naaqs.pdf

^[2] Fann, N., Fulcher, C.M., & Hubbell, B.J. (2009). The Influence of Location, Source, and Emission Type in Estimates of the Human Health Benefits of Reducing a Ton of Air Pollution. *Air Quality, Atmosphere & Health*, 2(3), 169–176. doi: 10.1007/s11869-009-0044-0

^[3] Fann, N., Roman, H.A., Fulcher, C.M., Gentile, M.A., Hubbell, B.J., Wesson, K., & Levy, J.I. (2011). Maximizing Health Benefits and Minimizing Inequality: Incorporating Local-Scale Data in the Design and Evaluation of Air Quality Policies. *Risk Analysis*, 31(6), 908–922. doi: 10.1111/j.1539-6924.2011.01629.x

Control Measure Commitment Recommendations

District's analysis of all applicable criteria discussed above will result in recommendations for commitments for the District to take to attain the standard as expeditiously as practicable. After the public has had opportunities to contribute to and comment on the evaluations and analyses, the District will determine which control strategies should be included in the plan. Commitments for future control strategies are in the form of the following types of actions:

- Regulatory Action
 - Rule amendments or adoption of new rules
 - Further study for additional opportunities to reduce emissions
- Incentive programs
- Technology advancement programs
- Policy initiatives
- Increased public outreach and education

Regulatory action commitments are summarized in Chapter 5 (Regulatory Control Measures), and all commitments are summarized in Chapter 9 (Progress Toward Attainment of the 2006 PM_{2.5} Standard).

D.1 COMBUSTION DEVICES

Combustion devices are equipment that burn fuel to create power, heat, or other forms of energy. The process of burning fuel via internal or external combustion creates multiple pollutants, including oxides of nitrogen (NO_x), the primary PM_{2.5} precursor, volatile organic compounds (VOC), and oxides of sulfur (SO_x). Establishing effective emission reduction strategies for combustion devices continues to be a key component of the San Joaquin Valley Air Pollution Control District's (District) strategy to reduce emissions and achieve federal air quality standards.

Combustion devices are utilized in numerous applications throughout the private and public sectors. The control measure source categories discussed affect several industries in the San Joaquin Valley air basin (Valley) including, but not limited to: electrical utilities, cogeneration, oil and gas production, petroleum refining, manufacturing processes, industrial activities, and food and agricultural processing.

Existing Control Strategies

Due to the degree of difficulty and enormity of the challenge that the Valley faces in meeting the National Ambient Air Quality Standards (NAAQS), the District recognizes that prohibitory rules alone are not enough to reduce emissions to meet attainment requirements and protect public health. The District's longstanding, progressive strategy for reducing emissions is a multifaceted effort that includes incentive programs and policy initiatives in addition to prohibitory rules. The following discussion summarizes both the existing District efforts to reduce emissions from this source category, and evaluations for potential opportunities for further emissions reductions.

Incentive Programs

Incentive programs are an integral part of the emission reduction efforts of the District, especially where the District lacks direct jurisdiction in establishing emission control requirements. Since the emission units within the Combustion Devices category are typically located at stationary sources and have been subject to several generations of regulations, the opportunities for incentive programs have been minimal. The District currently funds the following incentive programs that directly apply to stationary combustion units.

The stationary agricultural irrigation pump engine program component of the District's *Heavy-Duty Engine Program* was created to assist agricultural stakeholders in replacing old polluting internal combustion engines with new more efficient and less polluting units or with electric units with zero emissions. To date, the program has distributed over \$100 million in grant money and has funded the replacement and/or purchase of 6,094 new engines and electric motors, reducing 47,059 tons of NO_x and 1,738 tons of particulate emissions. Similarly, the District partnered with the Natural Resources Conservation Service (NRCS) Environmental Quality Incentives Program (EQIP) to

replace 15 agricultural pump engines in the Valley. Between 2003 and 2011, NRCS also replaced an additional 547 diesel irrigation engines in the Valley.¹

Incentives have also been available for biomass facilities through state and Federal funded programs independent from the District. Funding or tax credits are available through some short-term programs such as the Existing Renewable Facilities Program through the California Energy Commission (CEC) and federal corporate tax credits from a federal program called the Renewable Electricity Program Tax Credit. In addition to these programs, incentives and funding through Assembly Bill 118 (Núñez Statutes of 2007, Chapter 750), which directs the CEC to develop the *Alternative and Renewable Fuel and Vehicle Technology Program*, are available to identify and promote alternative biomass-based feedstocks, including agricultural waste, for the production of alternative fuels.

Policy Initiatives

The District's policies and Legislative Platform are important components to the District's strategy to attain federal ambient air quality standards. The District utilizes policies and the legislative platform to bring attention to major issues that have a direct impact on the Valley's air quality.

The District supports legislation for the continued operation of biomass facilities, including subsidies and/or preferential utility rates for power produced from biomass to enhance the economic feasibility of this alternative. Adoption of Senate Bill 705 (2003, codified as Health and Safety Code Sections 41855.5 and 41855.6), which phases out the ability to burn certain agricultural material in the field, has underlined the importance of biomass facilities in providing a mechanism to dispose of this agricultural material.

The District also supports legislation that calls for the increased development and use of cleaner-burning fuels. This platform was developed in an effort to accelerate the reduction of NOx emissions from combustion devices and the ability of Valley sources to achieve lower emission limits.

The District has made a diligent effort to support legislation that provides funding for the Carl Moyer Program and other similar incentive programs. The District supports the continuation of air quality funding in the Farm Bill to accelerate the replacement of agricultural equipment. Incentive funds have resulted in the turnover of thousands of irrigation pumps thus far, generating significant emissions reductions for the Valley.

Rules and Regulations

The following is a list of District rules that apply to the Combustion Devices category. Units subject to these rules are subject to some of the most stringent regulations and standards in the nation and have been subject to several generations of rule amendments. Each of the following rules will be evaluated to examine potential opportunities for additional emissions reductions.

¹ The District has also participated in the replacement of various mobile source combustion units (i.e. tractors) through other incentives programs. Please see Chapter 6 for additional information.

Table D-2 District Combustion Devices Rules

Rule		Last Amended/ Adopted
Rule 4203	Particulate Matter Emissions from Incineration of Combustible Refuse	12/17/1992
Rule 4307	Boilers, Steam Generators and Process Heaters–2.0 MMBtu/hr to 5.0 MMBtu/hr	05/19/2011
Rule 4308	Boilers, Steam Generators and Process Heaters–0.075 MMBtu/hr to less than 2.0 MMBtu/hr	12/17/2009
Rule 4309	Dryers, Dehydrators, and Ovens	12/15/2005
Rule 4320	Advanced Emission Reduction Options for Boilers, Steam Generators, and Process Heaters Greater than 5.0 MMBtu/hr	10/16/2008
Rule 4352	Solid Fuel Fired Boilers, Steam Generators, and Process Heaters	12/15/2011
Rule 4702	Internal Combustion Engines	08/18/2011
Rule 4703	Stationary Gas Turbines	09/20/2007

D.1.1 Rule 4203 Particulate Matter Emissions from the Incineration of Combustible Refuse

Source Category

Rule 4203 is applicable to incinerators or other equipment used to dispose of or process combustible refuse by incineration. The rule limits the concentration of particulate matter emissions based on process weight rates, and prohibits the discharge of visible emissions. Rule 4203 was adopted on May 21, 1992 and subsequently amended for District rule number reorganization on December 17, 1992. There are currently 3 facilities in the Valley subject to Rule 4203. These facilities currently implement Best Available Control Technology (BACT) requirements; the facilities are required to mitigate the discharge of air pollutants to the maximum degree achievable. For this source category, examples of emission control technologies include baghouses and lime scrubbers.

Emission Inventory

Pollutant	2007	2012	2014	2015	2016	2017	2018	2019
<i>Annual Average - Tons per day</i>								
PM2.5	0.08	0.10	0.10	0.11	0.11	0.11	0.11	0.12
NOx	0.88	1.12	1.18	1.25	1.29	1.29	1.32	1.33
SOx	0.05	0.04	0.02	0.02	0.02	0.02	0.02	0.02
<i>Winter Average - Tons per day</i>								
PM2.5	0.08	0.10	0.10	0.11	0.11	0.11	0.11	0.12
NOx	0.88	1.12	1.18	1.25	1.29	1.29	1.32	1.33
SOx	0.05	0.04	0.02	0.02	0.02	0.02	0.02	0.02

Regulatory Evaluation

How does District Rule 4203 compare with federal rules and regulations?

There are no specific federal guidelines for particulate matter concentration in terms of New Source Performance Standards (NSPS), Control Techniques Guidelines (CTG), Alternative Control Technology (ACT), Maximum Achievable Control Technology (MACT), and National Emission Standards for Hazardous Air Pollutants (NESHAP).

EPA BACT standards require the use of a fabric filter or baghouse. However, District BACT standards are just as stringent and require the use of natural gas supplemental fuel with a baghouse.

How does District Rule 4203 compare to rules in other air districts?

Rule 4203 was compared to similar rules at other air districts and is at least as stringent, if not more stringent, than other districts' rules. Comparisons to other air district rules included SCAMQD Rule 473 (Disposal of Solid and Liquid Wastes) and SMAQMD Rule 407 (Open Burn). BAAQMD and VCAPCD do not have comparable rules.

In addition to being one of the most stringent rules in the nation for this source category any new unit brought to the Valley, as well as any major modifications to existing units, would trigger BACT requirements. These new or modified units would be required to control emissions beyond that established as being RACT and implement the best available controls for NO_x and PM_{2.5} emissions, as required by District Rule 2201 (New and Modified Stationary Source Review Rule). Additionally, all new or modified units are evaluated under the District's air toxics policy, and are required to not pose a significant health risk to Valley residents.

Emission Reduction Opportunities

Rule 4203 is one of the most stringent rules in the nation for this source category. As mentioned above, units subject to this rule already meet BACT level requirements, which require the mitigation of air pollution to the maximum degree achievable using control technology like baghouses and lime scrubbers. No technologies beyond those established as BACT were identified.

Risk-based Strategy Analysis

The emissions from units subject to Rule 4203 contribute 2.3% of average winter NO_x emitted from stationary and area sources in the 2012 emission inventory. As illustrated in the emission inventory table above, the emissions from this source category are relatively small and consistent throughout the year, with no elevated emission levels in the winter months.

Control Measure Commitments

The following is a summary of recommended commitments for Rule 4203.

Regulatory Action

The District's analysis did not identify any additional technologically feasible and cost effective potential controls. Therefore, there are no recommendations for additional regulatory actions for Rule 4203.

Incentive Action

Units subject to Rule 4203 are regulated stationary sources, and already implement BACT level controls; as such, the opportunities for incentive programs are minimal. No incentive actions are recommended for furnaces and other units used for the incineration of combustible refuse at this time.

Technology Advancement Action

There is no recommendation for a new technology advancement project for units subject to Rule 4203. Through its Technology Advancement Program, the District will continue to seek potential feasible and low-cost technologies that may provide for additional emission reduction opportunities in this category.

Policy Initiatives

The District is not currently supporting any policy initiatives specific to furnaces and other units used for the incineration of combustible refuse. As regulated sources are already implementing BACT level controls, there are no recommendations for new policy initiatives for these sources.

Education and Outreach

The District currently provides a robust education and outreach program for regulated sources through the Small Business Assistance program, Permit Stakeholder Meetings, Compliance Assistance Bulletins, and public notices for public workshops and public hearings. No new education and outreach efforts are recommended for these sources at this time. The District will continue to work closely with affected sources to ensure successful compliance.

D.1.2 Rule 4307 Boilers, Steam Generators and Process Heaters— 2.0 MMBtu/hr to 5.0 MMBtu/hr

Source Category

This rule applies to any gaseous fuel or liquid fuel fired boiler, steam generator, or process heater with a total rated heat input of 2.0 million British thermal units per hour (MMBtu/hr) up to and including 5.0 MMBtu/hr. The purpose of this rule is to limit emissions of NO_x, carbon monoxide (CO), sulfur dioxide (SO₂), and particulates from units subject to this rule. Based on District permits information, there are currently 540 permitted and Permit-Exempt Equipment Registration (PEER) units subject to Rule 4307 requirements.

Rule 4307 was adopted on December 15, 2005 to establish emissions limits and control requirements for these units which were previously exempt because of their size. Since its adoption, the rule has been amended three times. The most recent amendments strengthened the rule by removing some exemptions, imposing NO_x limits of 9 or 12 ppmv for new and replacement units, and adding a menu-approach for particulate matter control that also encompasses SO_x controls. EPA finalized approval of Rule 4307 on January 13, 2010 and deemed this rule as being at least as stringent as established RACT requirements. As a result of this rule, NO_x emissions have been controlled by over 84% for units in this source category.

Emission Inventory

Pollutant	2007	2012	2014	2015	2016	2017	2018	2019
	<i>Annual Average - Tons per day</i>							
PM _{2.5}	0.37	0.33	0.32	0.31	0.31	0.30	0.30	0.29
NO _x	0.70	0.38	0.34	0.31	0.30	0.30	0.29	0.28
SO _x	0.39	0.22	0.09	0.09	0.09	0.08	0.08	0.08
	<i>Winter Average - Tons per day</i>							
PM _{2.5}	0.36	0.32	0.31	0.31	0.30	0.30	0.29	0.29
NO _x	0.67	0.36	0.33	0.30	0.29	0.29	0.28	0.27
SO _x	0.38	0.21	0.09	0.08	0.08	0.08	0.08	0.08

Regulatory Evaluation

How does District Rule 4307 compare with federal rules and regulations?

Rule 4307 is equivalent to the applicable federal standards and guidelines. As confirmed by the June 2009 EPA Technical Support Document (TSD) for Rule 4307, the rule is as stringent as the federal Alternative Control Techniques (ACT) documents (EPA –453/R-94-022 “Alternative Control Techniques Document – NO_x Emissions from Industrial/Commercial/Institutional Boilers”, dated March 1994 and EPA – 452/R-93-008 “Alternative Control Techniques Document—NO_x Emissions from Utility Boilers”, dated March 1994), New Source Performance Standards (NSPS) (40 CFR 60 Subpart D (Standards of Performance for Fossil-Fuel Fired Steam Generators for Which Construction Commenced After August 17, 1971) and 40 CFR 60 Subpart Dc (Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units)), and Maximum Achievable Control Technology (MACT) (40 CFR 63 Subpart DDDDD (NESHAP for Industrial, Commercial, and Institutional Boilers and Process Heaters)). Additionally, there are no EPA Control Technique Guidelines (CTG) or Best Available Control Technology (BACT) requirements listed for this category.

How does District Rule 4307 compare to rules in other air districts?

In comparison to other California air districts’ rules for similar sources, Rule 4307 is at least as stringent as the analogous rules for SCAQMD (Rule 1146.1—Emissions of Oxides of Nitrogen from Small Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters), BAAQMD (Regulation 9 Rule 7—Nitrogen Oxides and Carbon Monoxide from Industrial, Institutional and Commercial Boilers, Steam Generators and Process Heaters and Regulation 9 Rule 10—Nitrogen Oxides and Carbon Monoxide from Boilers, Steam Generators and Process Heaters in Petroleum Refineries), SMAQMD (Rule 411—NO_x from Boilers, Process Heaters, and Steam Generators), and VCAPCD (Rule 74.15.1—Boilers, Steam Generators, and Process Heaters).

No BACT requirements exist for units of this small size. Generally, these smaller units have been exempt from permit requirements. However, the District does require these units to be registered through Rule 2250 (Permit-Exempt Equipment Registration) to ensure compliance with Rule 4307 requirements.

Emission Reduction Opportunities

The District has adopted numerous rule amendments over the years for boilers that have significantly reduced emissions from units subject to Rule 4307. Most units subject to Rule 4307 are fired on Public Utilities Commission (PUC) quality natural gas, and are inherently low-emitters of SO_x and PM_{2.5} emissions. The NO_x limits implemented through Rule 4307 and its amendments will reduce emissions from over 1,000 small (2-5 MMBtu/hr) boilers in the Valley when fully implemented, including from units that were previously exempt. As a result of these regulatory efforts, the emissions inventory for NO_x from these boilers has dropped from 3.81 tpd in 2005 to 0.38 tpd in

2012. Additional emissions reductions are forthcoming with existing Rule 4307 as additional compliance dates are approaching in 2016. Given the significant efforts and investments already made to reduce emissions from this source category, there are little remaining opportunities for obtaining additional emissions reductions.

As discussed above, Rule 4307 is as stringent as or more stringent than federal regulations and requirements and other districts' rules and regulations. Any new or additional requirements would extend well beyond RACT requirements.

EMx as Potential Control

Post-combustion controls such as EMx, the second generation of the SCONOX technology that reduces NO_x, SO_x, CO, and volatile organic compound (VOC) emissions, were researched. This technology has not been achieved in practice (AIP) in the District and there is no available data that indicates that SCONOX or EMx has been installed on boilers, particularly in this size range, even though the manufacturer's website states that the technology is transferrable to industrial boilers. Based on research of the best available controls from EPA and other air districts, the SCONOX and EMx systems have only been utilized by power plants for the control of turbine emissions. In fact, cost effectiveness analyses conducted by the District for the installation of SCONOX/EMx units on large power plant turbine installations within the San Joaquin Valley have been found to not be cost effective. Given the high cost effectiveness demonstrated for turbines and lack of demonstrated practice with boilers, the District does not expect this technology to be feasible or cost effective for reducing emissions from this category.

PM_{2.5} Limits for Alternative Fuels

The majority of boilers (2-5 MMBtu/hr) in the Valley combust PUC-quality natural gas; PUC natural gas contains a very low sulfur content and inherently has low emissions. Few boilers in the Valley use alternative fuels for their combustion processes. Alternative fuels include digester gas, produced gas, and liquid fuel. Units fired on digester gas or produced gas are already required to use inlet gas scrubbers to meet District rule requirements. Current rule language requires that on and after July 1, 2015 liquid fuel shall be used only during a PUC quality natural gas curtailment period provided it contains no more than 15 ppm sulfur. While the currently limited use of liquid fuel will become even more strictly limited by July 2015, the feasibility of reducing PM emissions through adding PM_{2.5} limits for units using liquid fuel was explored as part of the District's comprehensive control measure evaluation.

There are 25 liquid fuel fired units in the Valley (2-5 MMBtu/hr) with a combined emissions inventory of approximately 0.08 tons per year of total PM. The low emissions inventory is attributed to the fact that these units either utilize liquid fuel as a backup if there is a natural gas curtailment or are minimally operated units. The following three technologies were evaluated as potential control options for reducing PM emissions: baghouses, electrostatic precipitators (ESPs), and wet scrubbers. Bagoes control total PM and PM_{2.5} emissions by 90-99%; ESPs control total PM and PM_{2.5} emissions by 90-99%; and wet scrubbers control large particulates (>PM₅) by 99% and PM_{2.5}

emissions by approximately 50%.² However, baghouses are typically not used with liquid-fired boilers due to the potential clogging of the baghouse and are therefore not a recommended technology due to infeasibility and safety issues.³

PM Potential Emissions Reductions for an ESP and Scrubber

For the purposes of these calculations, the following assumptions were made:

1. For simplicity, the analysis will evaluate the cost effectiveness of these technologies for total PM reductions from liquid fuel fired units.
2. The PM control efficiency of an ESP is 99%.
3. The PM control efficiency of a scrubber is 99%.

Potential Emissions Reductions_{ESP} = (Total PM Emissions) x (Control Efficiency)

Potential Emissions Reductions_{ESP} = 0.08 tons/year X 0.99

Potential Emissions Reductions_{ESP} = 0.079 tons/ year (tpy)

Potential Emissions Reductions_{scrubber} = (Total PM Emissions) x (Control Efficiency)

Potential Emissions Reductions_{scrubber} = 0.08 tons/year X 0.99

Potential Emissions Reductions_{scrubber} = 0.079 tons/ year (tpy)

Annualized Cost of an ESP and Wet Scrubber

The capital cost for the installation of an ESP for a 1-5 MMBtu/hr boiler ranges from \$90,000 - \$100,000 and the annual maintenance cost is \$1,000-\$2,000.⁴ For the wet scrubber system, EPA estimated the annualized cost at \$5,300-\$102,000 per sm³/sec at an average air flow rate of 0.7- 47 sm³/sec.⁵ The following assumptions were made for this cost effectiveness calculations:

1. The capital cost of an ESP is assumed to be the median of the range above (\$95,000).
2. The annual maintenance cost of an ESP is assumed to be the median of the range above (\$1,500).
3. The annualized cost of a wet scrubber system is assumed to be the median of the range above (\$53,650 per sm³/sec).
4. The average air flow rate for a wet scrubber system is assumed to be the median of the range above (23.85 sm³/sec).

² Northeast States for Coordinated Air Use Management. (November 2008) *Applicability and Feasibility of NOx, SO2, and PM Emissions Control Technologies for Industrial, Commercial, and Institutional (ICI) Boilers.*

³ Northeast States for Coordinated Air Use Management. (November 2008) *Applicability and Feasibility of NOx, SO2, and PM Emissions Control Technologies for Industrial, Commercial, and Institutional (ICI) Boilers.*

⁴ Catherine Roberts. (March 2009) *Information on Air Pollution Control Technology for Woody Biomass Boilers.* Environmental Protection Agency Office of Air Quality Planning and Standards and Northeast States for Coordinated Air Use Management.

⁵ Environmental Protection Agency. (2002). *Air Pollution Control Technology Fact Sheet: Spray-Chamber/Spray-Tower Wet Scrubber.*

5. The total capital and maintenance cost of an ESP will be calculated by multiplying the cost of 1 unit by the total number of units.
6. The total annualized cost of a wet scrubber will be calculated by multiplying the annualized cost of 1 unit by the total number of units.
7. Lifetime of the ESP is 10 years at 10% interest. To account for this, the annualized capital cost will be calculated by multiplying the total capital cost by the capital recovery factor of 0.1627 and adding the annual maintenance costs.

Annual Cost_{ESP} = (Total Capital Cost) x (0.1627) + (Annual Maintenance Cost)

Annual Cost_{ESP} = (\$95,000 x 25) x (0.1627) + (\$1,500 x 25)

Annual Cost_{ESP} = \$423,913/year

Annual Cost_{scrubber} = (Annualized Cost of 1 unit) x (Number of Units) x
(Average Flow Rate)

Annual Cost_{scrubber} = (\$53,650/ sm³/sec) x (25) x (23.85 sm³/sec)

Annual Cost_{scrubber} = \$31,988,813 year

Cost Effectiveness of an ESP and Wet Scrubber

Cost Effectiveness = Annual Cost / Annual Emissions Reductions

Cost Effectiveness_{ESP} = (\$423,913/year) / (0.079 tons/ year)

Cost Effectiveness_{ESP} = \$5,365,987/ton of PM

Cost Effectiveness_{scrubber} = (\$31,988,813/year) / (0.079 tons/ year)

Cost Effectiveness_{scrubber} = \$404,921,684ton of PM

As illustrated above, neither PM control technology is a cost effective option for this source category. The cost of the ESP technology does not include costs of retrofitting equipment and/or the facility or compliance monitoring costs, which would drive the cost effectiveness up even more. In addition, the annualized costs provided by EPA for the wet scrubber system are in 2002 dollars, which means the value above would be even greater if it were adjusted to 2012 dollars.

At this time, the District's analysis indicates that there are no feasible opportunities for additional emission reduction regulatory strategies for this source category.

Risk-based Strategy Analysis

The emissions from units subject to Rule 4307 contribute 0.7% of average winter NO_x, 2.6% of average winter SO_x, and 0.6% of average winter PM_{2.5} emitted from stationary and area sources in the 2012 emission inventory. These units are primarily fired on PUC-quality natural gas, which is generally considered a clean burning fuel with low SO_x and PM emissions. Overall, Rule 4307 has significantly reduced NO_x and SO_x emissions from these units and has assisted in reducing PM_{2.5} concentrations through reductions of these key precursors.

Control Measure Commitments

The following is a summary of recommended commitments for Rule 4307.

Regulatory Action

The District's analysis did not identify any additional technologically feasible and cost effective potential controls. Therefore, there are no recommendations for additional regulatory actions for Rule 4307.

Incentive Action

Boilers subject to Rule 4307 are regulated units that have been subject to several generations of regulations; as such, the opportunities for incentive programs are minimal. There are no recommendations for incentive actions at this time.

Technology Advancement Action

There is no recommendation for a new technology advancement project for units subject to Rule 4307. Through its Technology Advancement Program, the District will continue to seek potential feasible and low-cost technologies that may provide for additional emission reduction opportunities in this category.

Policy Initiatives

The District's current legislative platform includes support for the increased development and use of cleaner-burning fuels. The recommendation is to continue supporting the current legislative platform. There are no recommendations for new policy initiatives at this time because the rule already requires the most effective emission control technologies.

Education and Outreach

The District currently provides a robust education and outreach program for regulated sources through the Small Business Assistance program, Permit Stakeholder Meetings, Compliance Assistance Bulletins, and public notices for public workshops and public hearings. The District does not have recommendations for new education and outreach efforts for these sources. The District will continue to work closely with affected sources to ensure successful compliance.

D.1.3 Rule 4308 Boilers, Steam Generators and Process Heaters— 0.075 MMBtu/hr to less than 2.0 MMBtu/hr

Source Category

This rule applies to any person who supplies, sells, offers for sale, installs, or solicits the installation of any boiler, steam generator, process heater or water heater with a rated heat input capacity greater than or equal to 0.075 MMBtu/hr and less than 2.0 MMBtu/hr. This rule is a point of sale rule and achieves reductions as units subject to the rule are replaced over time.

Rule 4308 was adopted on October 20, 2005 to establish NO_x emissions limits for these units which were previously exempt because of their size. The rule has been amended once, in December 2009, to lower the NO_x emissions limits to 20 ppmv for units fired on natural gas, with the exception of a few unit types. EPA finalized approval for Rule 4308 on January 31, 2011 and deemed this rule as being at least as stringent as established RACT requirements. This rule has resulted in approximately 93% control of emissions from this source category.

Emission Inventory

Pollutant	2007	2012	2014	2015	2016	2017	2018	2019
<i>Annual Average - Tons per day</i>								
PM _{2.5}	0.70	0.62	0.60	0.59	0.58	0.57	0.56	0.55
NO _x	1.32	0.71	0.64	0.60	0.58	0.56	0.54	0.53
SO _x	0.73	0.42	0.17	0.17	0.16	0.16	0.16	0.15
<i>Winter Average - Tons per day</i>								
PM _{2.5}	0.68	0.61	0.59	0.58	0.57	0.56	0.55	0.54
NO _x	1.27	0.68	0.62	0.57	0.55	0.54	0.52	0.51
SO _x	0.71	0.41	0.17	0.16	0.16	0.16	0.15	0.15

Regulatory Evaluation

How does District Rule 4308 compare with federal rules and regulations?

Rule 4308 is equivalent to the applicable federal standards and guidelines. As confirmed by the July 2010 EPA technical support document (TSD) for the approval of Rule 4308, the rule is as stringent as the federal Alternative Control Techniques (ACT) (EPA –453/R-94-022 “Alternative Control Techniques Document – NO_x Emissions from Industrial/Commercial/ Institutional Boilers”, dated March 1994 and EPA – 452/R-93-008 “Alternative Control Techniques Document—NO_x Emissions from Utility Boilers”, dated March 1994). Federal requirements such as New Source Performance Standards (NSPS), National Emission Standards for Hazardous Air Pollutants (NESHAP), and Maximum Achievable Control Technology (MACT) requirements are not applicable to boilers, steam generators, and process heaters of this size. Additionally, there are no EPA Control Techniques Guidelines (CTG) or Best Available

Control Technology (BACT) requirements listed for this category. The District, SCAQMD, BAAQMD, and EPA do not employ BACT requirements for this source category because BACT is required for new or modified permitted units and these units are exempt from the permitting process.

How does District Rule 4308 compare to rules in other air districts?

Air districts' rules that were evaluated as a part of this control measure effort include BAAQMD Regulation 9 Rule 6 (Nitrogen Oxides Emissions from Natural Gas-Fired Boilers and Water Heaters), SMAQMD Rule 411 (NO_x from Boilers, Process Heaters and Steam Generators), SMAQMD Rule 414 (Water Heaters, Boilers and Process Heaters Rated Less Than 1,000,000 BTU Per Hour), VCAPCD Rule 74.11.1 (Large Water Heaters and Small Boilers), and SCAQMD Rule 1146.2 (Emissions of Oxides of Nitrogen From Large Water Heaters and Small Boilers and Process Heaters).

District Rule 4308 meets RACT standards, which includes a comparison to other air district rules, as confirmed by the previously mentioned 2010 EPA TSD. Rule 4308 was compared to other California air districts' rules for similar sources and cross-referenced with the exemptions in each rule. Multiple air districts do not exempt water heaters in mobile homes like Rule 4308; however, because those air districts have different rule structures with regards to the size of devices regulated, District Rule 4308 requirements are as stringent as the other Districts' rules.

For example, SCAQMD Rule 1146.2 does not regulate mobile home water heaters, per the definition for type 1 units, because they are subject to Rule 1121 (Control of Nitrogen Oxides from Residential Type, Natural Gas-Fired Water Heaters). SCAQMD Rule 1121 regulates units less than 0.075 MMBtu/hr, which is out of the size range of District Rule 4308. Similarly, in SMAQMD Rule 414, mobile home units are regulated in the size range of less than 0.075 MMBtu/hr. District Rule 4902 (Residential Water Heaters) applies to units less than 0.075 MMBtu/hr and currently regulates mobile home water heaters with the same emission limit in SCAQMD and SMAQMD rules. BAAQMD Rule 09-06 regulates all units less than 2 MMBtu/hr, essentially combining the requirements of District Rules 4308 and 4902.

Upon further comparison of District Rule 4308 to other air district rules, it was found that other air districts have more stringent limits for instantaneous water heaters. SCAQMD Rule 1146.2 (amended May 5, 2006) contains a limit of 20 ppmv NO_x for natural gas-fired instantaneous water heaters in the size range of 0.075 – 0.4 MMBtu/hr, effective January 1, 2012 and BAAQMD Rule 09-06 (amended November 7, 2007) also contains a limit of 20 ppmv NO_x effective January 2013. District Rule 4308 contains a limit of 55 ppmv for these same units. Refer to the Instantaneous Water Heaters discussion below for more details.

Emission Reduction Opportunities

The adoption of Rule 4308 and its subsequent amendment in 2009 have significantly reduced NO_x and PM emissions from boilers of this size category, effectively reducing the emissions inventory for NO_x from 3.66 tons per day (tpd) in 2005 to 0.71 tpd in 2012. It is estimated that the rule will effectively reduce emissions from over 17,000 units in the Valley upon full implementation. Additional emissions reductions are forthcoming as consumers continue to replace older units with newer and lower-emitting units. Given the significant regulatory efforts already made to reduce emissions from this source category, the only remaining potential opportunity for obtaining additional emissions reductions from currently regulated units would be to lower the NO_x emission limit for instantaneous water heaters in the size range of 0.075 – 0.4 MMBtu/hr. For thoroughness, the possibility of further reducing emissions from currently exempt sources is also evaluated below.

Instantaneous Water Heaters

The emissions limits for units subject to Rule 4308 are separated based on two size categories: units 0.075-0.4 MMBtu/hr and units 0.4-2.0 MMBtu/hr. The larger category of instantaneous (tankless) water heaters 0.4-2.0 MMBtu/hr are currently regulated with a NO_x emissions limit of 20 ppmv, which is as stringent as the limit in the other air districts' rules. As a result, there is no opportunity to reduce emissions from the larger instantaneous water heaters. However, the emissions limit for instantaneous water heaters 0.075-0.4 MMBtu/hr in Rule 4308 is not equivalent to the other air districts' rules, which creates a potential opportunity for further emissions reductions from this category.

BAAQMD Rule 09-06 and SCAQMD Rule 1146.2 contain a more stringent NO_x limit for instantaneous water heaters. When SCAQMD amended Rule 1146.2 to incorporate a 20 ppmv NO_x limit for instantaneous water heaters, the technology had not been achieved in practice yet; however, manufacturers of instantaneous water heaters were reporting their progress of technology advancements quarterly to SCAQMD and indicated that they were on track to achieve a 20 ppmv NO_x standard for instantaneous units by 2012⁶. Similarly, BAAQMD amended Rule 09-06 in 2007 to incorporate a 20 ppmv NO_x limit for instantaneous water heaters after SCAQMD indicated that the technology was still set to be available in 2012. During that same time, BAAQMD received information that the additional cost of a 20 ppmv instantaneous water heater would be \$100-\$200, in comparison to a 55 ppmv instantaneous unit. Even though these units were not available at the time of the rule amendments, BAAQMD and SCAQMD amended their rules to include a 20 ppmv NO_x limit for instantaneous units in this size range in anticipation of the technology being available by the compliance deadlines and because the cost differential for a 20 ppmv unit would be at most \$200.

SCAQMD has obtained information that six manufacturers now produce instantaneous water heaters in this size range that meet the 20 ppmv limit. Five of the six manufacturers were contacted and four of them sell the identified models to Valley

⁶ Gimlen, Guy A. (October 2007). *Staff Report for BAAQMD Regulation 9, Rule 6: Nitrogen Oxides from Natural Gas-Fired Water Heaters*. San Francisco, CA: Bay Area Air Quality Management District.

sources. Three of the manufacturers distribute their units through planning wholesalers who only sell to licensed contractors, with no direct retail sales. The fourth manufacturer sells units through online retailers.

After confirming the availability of this technology in the Valley, the feasibility of reducing current NO_x limits for instantaneous water heaters to the 20 ppmv limit enforced in SCAQMD and BAAQMD was explored.

Potential Emissions Reductions by Reducing Instantaneous Water Heater NO_x Limit

For purposes of these calculations, the following assumptions were made:

1. A 0.22 capacity factor was assumed based on South Coast Rule 1146.2 information.
2. An average rating was applied to the two size categories since the number of units is assumed to be distributed evenly. Therefore, the average rating is 0.238 MMBtu/hr for units in this size range.
3. The current emissions rate is based on the current rule requirement of 55 ppmv (0.068 lb NO_x/MMBtu).
4. Since instantaneous water heaters heat water only when needed, it was assumed that each household would utilize the unit for an average of 3 hours per day.

Potential Emissions at 55 ppmv

$$\text{Emissions}_1 = (\text{average rating}) \times (\text{emission rate}) \times (\text{capacity factor}) \times (\text{hours/day}) \times (\text{ton/lb})$$

$$\text{Emissions}_1 = (0.238 \text{ MMBtu/hr}) \times (0.068 \text{ lb NO}_x/\text{MMBtu}) \times (0.22) \times (3 \text{ hr/day}) \times (1 \text{ ton}/2,000 \text{ lb})$$

$$\text{Emissions}_1 = 5.34 \times 10^{-6} \text{ tons of NO}_x/\text{day} = 0.0019 \text{ tons of NO}_x/\text{year}$$

Potential Emissions at 20 ppmv

$$\text{Emissions}_2 = (\text{average rating}) \times (\text{emission rate}) \times (\text{capacity factor}) \times (\text{hours/day}) \times (\text{ton/lb})$$

$$\text{Emissions}_2 = (0.238 \text{ MMBtu/hr}) \times (0.024 \text{ lb NO}_x/\text{MMBtu}) \times (0.22) \times (3 \text{ hr/day}) \times (1 \text{ ton}/2,000 \text{ lb})$$

$$\text{Emissions}_2 = 1.88 \times 10^{-6} \text{ tons NO}_x/\text{day} = 0.0007 \text{ tons of NO}_x/\text{year}$$

$$\text{Emissions Reduction} = 0.0019 - 0.0007$$

$$\text{Emissions Reduction} = \mathbf{0.0012 \text{ tons NO}_x/\text{year}}$$

Cost Effectiveness of Reducing the Instantaneous Water Heater Limit

BAAQMD found that water heaters in the size range of 0.075 through 0.4 MMBtu/hr vary in cost from \$2,500 to \$10,000 plus installation. The additional cost for low-NO_x water heaters to achieve 20 ppmv was estimated to be \$200 per unit. The following assumptions were made in the cost effectiveness calculations:

1. Cost differential between a 55 ppmv and 20 ppmv unit was assumed to be \$200.
2. Lifetime of an instantaneous water heater is 10 years at 10% interest. To account for this, the annualized capital equipment cost will be calculated by multiplying the total capital cost by the capital recovery factor of 0.1627.

Annual Cost = (cost differential) x 0.1627

Annual Cost = (\$200) x 0.1627

Annual Cost = \$32.54/year

Cost Effectiveness = Annual Cost / Annual Emissions Reduction

Cost Effectiveness = (\$32.54/year) / (0.0012 tons of NO_x/year)

Cost Effectiveness = \$27,117/ton of NO_x

Although the cost effectiveness for a 20 ppmv instantaneous water heater is slightly above the BACT cost effectiveness threshold for NO_x reductions (\$24,500/ton of NO_x), the cost of the low-NO_x unit is at most an extra \$200 per household. This cost would not be incurred by a specific facility or operator and it represents a small fraction of the total cost of the unit that is estimated to be \$2,500-\$10,000. Also, with an estimated lifetime of at least 10 years for these units, the extra \$200 would be spread out over a 10 year period. Therefore, amending Rule 4308 to lower the limit for instantaneous water heaters is recommended.

Mobile Home Exemption

The possibility of removing the exemption for water heaters used in mobile homes from Rule 4308 was explored as a potential opportunity that could result in gradual emission reductions as existing higher emitting water heaters are replaced by newer low-NO_x models. However, as discussed above, other air districts do not regulate mobile home water heaters within the size range of Rule 4308. In addition, after researching the size of mobile home water heaters, it was found that mobile home water heaters are not available in the 0.075-2.0 MMBtu/hr size range. Four mobile home retailers and three mobile home manufacturers were contacted to inquire about the size of mobile home water heaters. All seven contacts stated that the average size of a mobile home water heater is 30-40 gallons whereas a 0.075 MMBtu/hr water heater is approximately 80 gallons. One manufacturer and one retailer stated that 50 gallon mobile home water heaters are available but rarely used. If the exemption for mobile home water heaters in Rule 4308 were to be removed, it would not result in any additional emissions reductions since units do not exist in this size range.

Recreational Vehicle Exemption

The potential opportunity to reduce emissions by removing the exemption for recreational vehicles (RVs), per EPA's suggestion in the 2011 TSD for the approval of the 2009 amendments to this rule, was explored. While the EPA TSD for Rule 4308 included this recommendation, the recommendation is not a RACT requirement as demonstrated by EPA's approval of the rule into the State Implementation Plan (SIP) as RACT.

During the last rule-amending project, stakeholder input was received indicating that there are very few units in RVs that fall under the size category subject to this rule that also run on Public Utilities Commission (PUC) quality natural gas. As noted in the 2009 staff report, most units in RVs are 12 gallons, which is smaller than the 80 gallon size of a typical 0.075 MMBtu/hr unit⁷. Also, RV units are typically not used on a frequent basis and thus are small contributors to the NO_x emissions of this source category. Air Districts such as SCAQMD and BAAQMD include this exemption in their rules. Removing this exemption would result in little to no emissions reductions because of the lack of availability of these units and the intermittent use of units in RVs. Due to the lack of potential emission reductions, there is no recommendation for amending this rule to remove this exemption.

Risk-based Strategy Analysis

The emissions from units subject to Rule 4308 contribute 1.4% of average winter NO_x, 4.9% of average winter SO_x, and 1.1% of average winter PM_{2.5} emitted from stationary and area sources in the 2012 emission inventory. These units are primarily fired on PUC-quality natural gas, which is generally considered a clean burning fuel with low SO_x and PM emissions. Overall, Rule 4308 has significantly reduced NO_x and SO_x emissions from these units and has assisted in reducing PM_{2.5} concentrations through reductions of these key precursors.

Control Measure Commitments

The following is a summary of recommended commitments for Rule 4308.

Regulatory Action

District analysis identified low-NO_x instantaneous water heaters between 0.075-0.4 MMBtu/hr as an opportunity to reduce emissions from this source category. Units between 0.075-0.4 MMBtu/hr that meet a NO_x emissions limit of 20 ppmv are readily available in the Valley at an additional cost of \$100-\$200 per unit. The District recommends amending Rule 4308 to lower the emissions limit of these units from 55 ppmv to 20 ppmv of NO_x.

⁷ Linebach, Katy. (2009). *Final Staff Report for Amendments to Rule 4308 (Boilers, Steam Generators, and Process Heaters—0.075 MMBtu/hr to less than 2.0 MMBtu/hr)*. Fresno, CA: San Joaquin Valley Air Pollution Control District.

Incentive Action

Boilers, steam generators, and process heaters subject to Rule 4308 are regulated units that have already implemented controls to significantly reduce NOx emissions; as such, opportunities for incentive programs are minimal. There are no recommendations for incentive actions at this time.

Technology Advancement Action

There is no recommendation for a new technology advancement project for units subject to Rule 4308. Through its Technology Advancement Program, the District will continue to seek potential feasible and low-cost technologies that may provide for additional emission reduction opportunities in this category.

Policy Initiatives

The District's current legislative platform includes support for the increased development and use of cleaner-burning fuels. The recommendation is to continue supporting the current legislative platform but there are no recommendations for new policy initiatives at this time.

Education and Outreach

The District currently provides a robust education and outreach program for regulated sources through the Small Business Assistance program, Permit Stakeholder Meetings, Compliance Assistance Bulletins, and public notices for public workshops and public hearings. The District does not have recommendations for new education and outreach efforts for these sources. The District will continue to work closely with affected sources to ensure successful compliance.

D.1.4 Rule 4309 Dryers, Dehydrators, and Ovens

Source Category

Rule 4309 is applicable to any dryer, dehydrator, or oven that is fired on gaseous fuel, liquid fuel, or is fired on gaseous and liquid fuel sequentially, and the total rated heat input for the unit is 5.0 million British thermal units per hour (5.0 MMBtu/hr) or greater. The purpose of this rule is to limit NO_x and carbon monoxide (CO) emissions from these units, which result from the combustion of fuel in the burners. The rule enforces NO_x emission limits between 3.5-12 ppmv for four categories of equipment, achieving approximately 34% control of total NO_x emissions.

Rule 4309 was adopted on December 15, 2005 and has not been amended. EPA finalized approval of Rule 4309 on May 30, 2007 and deemed this rule as being at least as stringent as established RACT requirements.

Emission Inventory

Pollutant	2007	2012	2014	2015	2016	2017	2018	2019
<i>Annual Average - Tons per day</i>								
PM2.5	0.67	0.68	0.72	0.74	0.76	0.78	0.80	0.82
NO _x	0.20	0.17	0.18	0.19	0.19	0.20	0.20	0.21
SO _x	0.39	0.40	0.42	0.43	0.44	0.45	0.47	0.48
<i>Winter Average - Tons per day</i>								
PM2.5	0.65	0.65	0.69	0.71	0.73	0.75	0.77	0.78
NO _x	0.18	0.15	0.16	0.16	0.17	0.17	0.18	0.18
SO _x	0.32	0.32	0.34	0.35	0.36	0.37	0.38	0.39

Regulatory Evaluation

How does District Rule 4309 compare with federal rules and regulations?

Rule 4309 is equivalent to the applicable federal standards and guidelines. Rule 4309 is as stringent as the federal Alternative Control Techniques (ACT) (EPA –453/R-94-004 “Emissions from Cement Manufacturing”, updated September 2000), as determined in the 2005 Rule Consistency Analysis for Rule 4309. Federal requirements such as New Source Performance Standards (NSPS), National Emission Standards for Hazardous Air Pollutants (NESHAP), and Maximum Achievable Control Technology (MACT) requirements are not applicable to this source category; additionally, there are no EPA Control Techniques Guidelines (CTG) or Best Available Control Technology (BACT) requirements listed for this category.

How does District Rule 4309 compare to rules in other air districts?

When comparing Rule 4309 to other California air districts' rules for similar sources, no other air district was found to contain a rule for dryers, dehydrators, and ovens.

BAAQMD (Regulation 12 Rule 3—Asphalt Air Blowing), SCAQMD (Rule 470—Asphalt Air Blowing), and VCAPCD (Rule 69—Asphalt Air Blowing) only regulate asphalt plants and Rule 4309 is more stringent than the requirements in all three rules. SMAQMD does not have an analogous rule to Rule 4309.

Rule 4309 was also compared to SCAQMD and BAAQMD BACT requirements. Since SCAQMD and BAAQMD only regulate asphalt plants, the only differences between District rule requirements and other air districts' BACT requirements apply to requirements for asphalt facilities.

BACT comparisons revealed that the use of Public Utilities Commission (PUC) quality natural gas fuel was part of the NO_x and SO_x BACT requirements for asphalt plants in the District, BAAQMD, and SCAQMD. In addition, the NO_x limit for asphalt plants in BAAQMD BACT guidelines is 3.9 ppmv at an oxygen correction factor of 19% by volume of O₂ (19% O₂), whereas Rule 4309 has a limit of 4.3 ppmv for gaseous fuel and 12 ppmv for liquid fuel @ 19% O₂. These potential opportunities were evaluated and have been included in a discussion of the feasibility of both requirements in the Asphalt Plants section of the emission reduction opportunities discussion.

As previously stated, this rule satisfies RACT requirements; any additional requirements would be more stringent and go beyond RACT. In addition to being one of the most stringent rules in the nation for this source category, any new unit brought to the Valley, as well as any major modifications to existing units, would trigger Best Available Control Technology (BACT) requirements. Subsequently, these new or modified units would be required to use technology and control emissions beyond those established as RACT and implement the best available emission controls, as required by District Rule 2201 (New and Modified Stationary Source Review Rule).

Emission Reduction Opportunities

The adoption of Rule 4309 has considerably reduced NO_x and PM emissions from this source category. The emissions inventory for NO_x from dryers, dehydrators, and ovens has dropped from 1.93 tpd in 2005 to 0.17 tpd in 2012. Although this source category had a relatively small emissions inventory prior to the adoption of Rule 4309, stakeholders have installed control equipment and modified their operations considerably to reduce emissions to ultra-low levels. Given the significant effort already made to reduce emissions from this source category, there are little remaining opportunities for obtaining additional emissions reductions. For the sake of thoroughness, the possibility of further reducing emissions from these units is evaluated in the following discussion.

Asphalt Plants

As mentioned above, PUC-quality natural gas fuel is part of the BACT requirements for asphalt plants for the District, BAAQMD, and SCAQMD. There are currently 11 asphalt plants in the Valley that do not utilize PUC-quality natural gas because some facilities are physically too far removed from natural gas lines to use natural gas. Nine of these asphalt plants use LPG fuel or propane to comply with the same gaseous fuel fired limit as PUC-quality natural gas-fired facilities. The other two facilities utilize diesel gas; however, neither facility operates full time and their combined NO_x emissions are less than 2 tons per year. Therefore, requiring natural gas for all asphalt facilities is not a feasible opportunity that would generate significant emission reduction benefit.

The potential opportunity for emission reductions by lowering the emissions limits for asphalt plants from the current NO_x limits of 4.3 ppmv (gaseous fuel) and 12 ppmv (liquid fuel) to make them closer or equivalent to the BAAQMD BACT limit of 3.9 ppmv @ 19% O₂ was also evaluated. To meet this limit, operators would need to install low-NO_x burners or modify existing burners to comply with lower limits; however, all of the asphalt plants have already installed new low-NO_x burners or modified their units to meet the 4.3 ppmv @ 19% O₂ and 12 ppmv @ 19% O₂ emissions limits in Rule 4309.

Based on District permit records, a good portion of the asphalt units fired on gaseous fuel would be in compliance with a 3.9 ppmv @ 19% O₂ NO_x limit. However, reducing the limit to 3.9 ppmv @ 19% O₂ would reduce the margin of compliance the facility has, and would make it more difficult for the facility to show continued compliance. In addition, reducing the limit from 4.3 ppmv to 3.9 ppmv would be an administrative change in nature, since it would not require any additional control equipment or changes in operating techniques or practices to comply, and it would not generate additional emissions reductions from these units.

A higher NO_x limit is required for the liquid fuel fired facilities due to the characteristics of liquid fuels. In BAAQMD's BACT guideline for hot mix asphalt facilities, there is a clause that states, *"For remote locations where natural gas is not available, liquefied petroleum gas may be permitted up to 38 ppmvd NO_x @ 15% O₂ and fuel oil < 0.05 wt. % sulfur may be permitted up to 55 ppmvd NO_x @ 15% O₂."* This equates to 12.24 ppmv @ 19% O₂ for liquefied petroleum gas and 17.73 ppmv @ 19% O₂ for fuel oil. The District's Permits department enforces a limit of 4.3 ppmv @ 19% O₂ for liquefied petroleum gas and 12 ppmv for other liquid fuels. Therefore, the District's requirements are more stringent than both limits in the BAAQMD BACT guideline.

Dehydrators

Rule 4309 requires dehydrators be fired on PUC-quality natural gas. The potential opportunity to further reduce emissions by requiring the use of low-NO_x burners during the 2005 rule adoption was evaluated; however, this option was deemed infeasible due to the potential negative effects on product quality. Additionally, enforcing the emissions limits was found to be potentially infeasible because monitoring and source testing of dehydrators is difficult to perform, if not impossible.

In the 2005 staff report for Rule 4309, a cost effectiveness analysis was conducted that compared the use of PUC-quality natural gas and the installation of low-NO_x burners on dehydrators.

The costs in the staff report included not only replacements of all of the burners in the current units with low-NO_x burners, but also an additional dryer that would need to be installed to keep a facility's throughput the same. This evaluation yielded the following results:

- Cost (\$/year): \$2,885,925
- Potential Emissions Reductions (tons per year): 58.57
- Cost Effectiveness (\$/ton): \$49,273

At a cost effectiveness of approximately \$50,000/ton of NO_x reduced, requiring low-NO_x burners for dehydrators is not a cost effective option for dehydrators in the Valley. If the figure was adjusted to today's value, low-NO_x burners would be even less cost effective.

Dryers

The potential opportunity to add a requirement for the use of dust collection devices, such as baghouses, was considered for the reduction of PM_{2.5}. Through the District's New Source Review Rule (Rule 2201), dust collection devices are already in place in the permit requirements for units that create PM emissions from handling the products they are drying. These facilities install baghouses or cyclones because they do not want to blow their product out of their stack. While baghouses can foster PM_{2.5} reductions, cyclones are generally not as effective in removing fine particulate matter.⁸

The potential installation of baghouses on dryers was researched. However, it is technologically infeasible to install a baghouse for some of the dryers subject to Rule 4309. The purpose of a dryer is to remove moisture from a product, which means that the exhaust from dryers have a high humidity. Baghouses can have problems with high humidity exhaust streams because the bags become caked. The air stream would have to be dried somehow before entering the baghouse. As a result, this is not a feasible opportunity at this time.

The potential opportunity to reduce emissions by removing the exemption for column dryers and dryers with no stack and one or more sides open to the atmosphere was also considered. However, as was true during the 2005 rule adoption, compliance with the proposed limits would be difficult to determine reliably given the design of these units. Column dryers have large fans to move the warm air through the material and air escapes through screens that cover the side of the dryer. Similarly, dryers with no stack and at least one side open deal with air escape, which makes monitoring and testing emissions difficult, if not impossible. Since source testing of these types of dryers is

⁸ Northeast States for Coordinated Air Use Management. (November 2008) *Applicability and Feasibility of NO_x, SO₂, and PM Emissions Control Technologies for Industrial, Commercial, and Institutional (ICI) Boilers.*

difficult due to the fact that there is not a stack where all emissions are exhausted, this is not a technologically feasible opportunity at this time.

At this time, the District's analysis indicates that there are no feasible opportunities for additional emission reduction regulatory strategies for this source category.

Risk-based Strategy Analysis

The emissions from units subject to Rule 4309 contribute 3.9% of average winter SO_x and 1.2% of average winter PM_{2.5} emitted from stationary and area sources in the 2012 emission inventory. These units are primarily fired on PUC-quality natural gas, which is generally considered a clean burning fuel with low SO_x and PM emissions. Overall, Rule 4309 has significantly reduced NO_x and SO_x emissions from these units and has assisted in reducing PM_{2.5} concentrations through reductions of these key precursors.

Control Measure Commitments

The following is a summary of recommended commitments for Rule 4309.

Regulatory Action

The District's analysis did not identify any additional technologically feasible and cost effective potential controls. Therefore, there are no recommendations for additional regulatory actions for Rule 4309.

Incentive Action

Dryers, dehydrators, and ovens subject to Rule 4309 are regulated units, which makes the opportunities for incentive programs minimal. There are no recommendations for incentive actions at this time.

Technology Advancement Action

There is no recommendation for a new technology advancement project for units subject to Rule 4309. Through its Technology Advancement Program, the District will continue to seek potential feasible and low-cost technologies that may provide for additional emission reduction opportunities in this category.

Policy Initiatives

The District's current legislative platform includes support for the increased development and use of cleaner-burning fuels. The recommendation is to continue supporting the current legislative platform but there are no recommendations for new policy initiatives at this time because the rule already requires effective emission control technologies.

Education and Outreach

The District currently provides a robust education and outreach program for regulated sources through the Small Business Assistance program, Permit Stakeholder Meetings, Compliance Assistance Bulletins, and public notices for public workshops and public hearings. There are no recommendations for new education and outreach efforts for these sources. The District will continue to work closely with affected sources to ensure successful compliance.

D.1.5 Rule 4320 Advanced Emission Reduction Options for Boilers, Steam Generators, and Process Heaters Greater than 5.0 MMBtu/hr

Source Category

This rule applies to any gaseous fuel or liquid fuel fired boiler, steam generator, or process heater with a total rated heat input greater than 5 million British thermal units per hour (MMBtu/hr). The purpose of Rule 4320 is to limit NO_x and carbon monoxide (CO) emissions from boilers, steam generators, and process heaters of this size range.

Rule 4320 is the third generation rule for this source category. The first District rule for this source category, Rule 4305 (Boilers, Steam Generators, and Process Heaters) was adopted on December 16, 1993. Rule 4305 was superseded by Rule 4306 (Boilers, Steam Generators, and Process Heaters – Phase 3) on September 18, 2003 to implement a NO_x control measure from the District's ozone and PM₁₀ attainment plans lowering the NO_x emissions limits in Rule 4305. Since adoption, Rule 4306 has been amended twice.

The most recent rule amendment in October 2008 was initially proposed to lower the NO_x limit from 9 ppmv to 6 ppmv for units greater than 20 MMBtu/hr. It was determined that the proposed NO_x limits could be accomplished by using selective catalytic reduction (SCR) or a combination of SCR and ultra-low NO_x burners (ULNBs), thus making the lower limits technologically feasible. However, through the public workshop process and additional research it was also determined that most of the units subject to Rule 4306 have undergone several generations of NO_x controls, and consequently, certain applications of SCR may not be feasible due cost effectiveness and/or technological infeasibility because of physical limitations. Therefore, the lower NO_x limits were included in new Rule 4320 and an option was provided in the rule that allows for the payment of an annual emissions fee based on total actual emissions, rather than installation of additional NO_x controls. These fees are used by the District to achieve cost effective NO_x reductions through District incentive programs, the District's Technology Advancement Program, and other routes. The previous versions of Rule 4305 and 4306 combined with the implementation of Rule 4320 results in approximately 96% control of NO_x emissions from this source category, once all of the compliance deadlines are in effect in 2014. EPA finalized approval for Rule 4320 on March 25, 2011 and deemed this rule as being at least as stringent as established RACT requirements.

Emission Inventory

Pollutant	2007	2012	2014	2015	2016	2017	2018	2019
Annual Average - Tons per day								
PM2.5	1.46	1.31	1.26	1.24	1.22	1.20	1.18	1.16
NOx	2.76	1.49	1.34	1.25	1.21	1.17	1.14	1.10
SOx	1.53	0.87	0.35	0.35	0.34	0.34	0.33	0.32
Winter Average - Tons per day								
PM2.5	1.43	1.28	1.24	1.22	1.20	1.18	1.16	1.14
NOx	2.66	1.43	1.29	1.20	1.16	1.13	1.09	1.06
SOx	1.49	0.85	0.35	0.34	0.34	0.33	0.32	0.32

Regulatory Evaluation**How does District Rule 4320 compare with federal rules and regulations?**

Rule 4320 is equivalent to the applicable federal standards and guidelines. Rule 4320 is as stringent as the EPA Best Available Control Technology (BACT) requirements, Alternative Control Techniques (ACT) (EPA –453/R-94-022 “Alternative Control Techniques Document – NOx Emissions from Industrial/Commercial/Institutional Boilers”, dated March 1994 and EPA – 452/R-93-008 “Alternative Control Techniques Document—NOx Emissions from Utility Boilers”, dated March 1994), New Source Performance Standards (NSPS) (40 CFR 60 Subpart D (Standards of Performance for Fossil-Fuel Fired Steam Generators for Which Construction Commenced After August 17, 1971) and 40 CFR 60 Subpart Dc (Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units)), and Maximum Achievable Control Technology (MACT) (40 CFR 63 Subpart DDDDD (NESHAP for Industrial, Commercial, and Institutional Boilers and Process Heaters)) requirements. There are no EPA Control Techniques Guidelines (CTGs) for this category.

How does District Rule 4320 compare to rules in other air districts?

Rule 4320 was compared to other California air districts’ rules for similar sources and was found to be at least as stringent as the analogous rules for SCAQMD (Rule 1146—Emissions of Nitrogen from Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters), BAAQMD (Regulation 9 Rule 7—Nitrogen Oxides and Carbon Monoxide from Industrial, Institutional and Commercial Boilers, Steam Generators and Process Heaters and Regulation 9 Rule 10—Nitrogen Oxides and Carbon Monoxide from Boilers, Steam Generators and Process Heaters in Petroleum Refineries), SMAQMD (Rule 411—NOx from Boilers, Process Heaters and Steam Generators), and VCAPCD (Rule 74.15—Boilers, Steam Generators and Process Heaters). Rule 4320 also meets or exceeds the established BACT requirements for these units at BAAQMD and SCAQMD. Rule 4320 currently dictates SJVAPCD BACT requirements for Valley sources.

Emission Reduction Opportunities

Over the years, the District has adopted numerous generations of rules and rule amendments for boilers greater than 5 MMBtu/hr that have significantly reduced NO_x and PM emissions from this source category. The emissions inventory for NO_x from these boilers has dropped from 40.2 tpd in 1993 to 1.49 tpd in 2012. As part of these regulatory efforts, hundreds of boilers in the Valley have been equipped with the best available NO_x and PM control technologies. Additional emissions reductions are forthcoming with existing Rule 4320 as more compliance dates approach in the next couple of years. Given the significant effort already made to reduce emissions from this source category, there are little remaining opportunities for obtaining additional emissions reductions. For thoroughness, the possibility of further reducing emissions from boilers greater than 5 MMBtu/hr is evaluated in the following discussion.

Low Temperature Oxidation

Emerging technologies that may have the potential to reduce emissions were researched. A Low Temperature Oxidation (LTO) System was installed at a dairy in the SCAQMD and was able to reach NO_x limits between 1.0 - 3.2 ppmv for loads 4.1 - 13 MMBtu/hr. The LTO system utilizes ozone to oxidize and control various pollutants, including NO_x. According to the SCAQMD BACT database information, capital and installation costs ranged from \$360,000 - \$400,000 for the LTO system when it was installed in 1997⁹. Installation within the South Coast region was heavily subsidized with government funding and the installation costs appear cost prohibitive for an installation that is not subsidized. In addition, the LTO system is classified as "Other Technologies" in the SCAQMD BACT guidelines, which means that the technology has not met the achieved in practice (AIP) criteria of six months of continuous operation at a minimum of 50% operating capacity and does not qualify as the lowest achievable emission rate (LAER). Since the technology has not been achieved in practice and cost prohibitive without significant subsidies, this is not a feasible opportunity at this time.

EMx

The potential for emissions reductions through EMx, the second generation of the SCONO_x technology that is a post-combustion control that reduces NO_x, SO_x, CO, and volatile organic compound (VOC) emissions, was researched. This technology has not been AIP in the District and there is no available data that indicates that SCONO_x or EMx has been installed on boilers even though the manufacturer's website states that the technology is transferrable to industrial boilers. Based on research of the best available controls from EPA and other air districts, the SCONO_x and EMx systems have only been utilized by power plants for control of turbine emissions. In fact, cost effectiveness analyses conducted by the District for the installation of SCONO_x/EMx units on large power plant turbine installations within the San Joaquin Valley have been found to not be cost effective. Given the high cost effectiveness demonstrated for turbines and lack of demonstrated practice with boilers, the District does not expect this technology to be feasible or cost effective for reducing emissions from this category.

⁹ (2012). *SCAQMD Best Available Control Technology (BACT) Database*. Diamond Bar, CA: South Coast Air Quality Management District.

PM2.5 Limits for Alternative Fuels

The majority of boilers (>5 MMBtu/hr) in the Valley combust Public Utilities Commission (PUC) quality natural gas, which contains a very low sulfur content and inherently has low emissions. Few boilers in the Valley use alternative fuels for their combustion processes. Alternative fuels include digester gas, produced gas, and liquid fuel. Units fired on digester gas or produced gas are already required to use inlet gas scrubbers to meet District rule requirements. Current rule language requires that liquid fuel shall be used only during a PUC-quality natural gas curtailment period provided it contains no more than 15 ppm sulfur. While the use of liquid fuel is strictly limited, the feasibility of reducing PM emissions through adding PM2.5 limits for units using liquid fuel was explored as part of the District's comprehensive control measure evaluation.

There are 62 units that utilize liquid fuel in the Valley (>5 MMBtu/hr) with a combined emissions inventory of approximately 0.02 tons per year of total PM. The low emissions inventory is attributed to the fact that these units either utilize liquid fuel as a backup if there is a natural gas curtailment or are minimally operated units. The following three technologies were researched as potential opportunities to reduce PM emissions: baghouses, electrostatic precipitators (ESPs), and wet scrubbers. Baggouses control total PM and PM2.5 emissions by 90-99%; ESPs control total PM and PM2.5 emissions by 90-99%; and wet scrubbers control large particulates (>PM5) by 99% and PM2.5 emissions by approximately 50%¹⁰. Currently, there are a few crude oil-fired or field gas-fired steam generators operating in crude oil production facilities that are required by their permits to operate SOx scrubbers and ESPs. However, baghouses are typically not used with liquid-fired boilers due to the potential clogging of the baghouse¹¹ and are therefore not a recommended technology due to infeasibility and safety issues.

PM Potential Emissions Reductions for an ESP and Scrubber

For the purposes of these calculations, the following assumptions were made:

1. For simplicity, the analysis will evaluate the cost effectiveness of these technologies for total PM reductions from liquid fuel fired units.
2. The PM control efficiency of an ESP is 99%.
3. The PM control efficiency of a scrubber is 99%.

Potential Emissions Reductions_{ESP} = (Total PM Emissions) x (Control Efficiency)

Potential Emissions Reduction_{ESP} = 0.02 tons/year X 0.99

Potential Emissions Reduction_{ESP} = 0.0198 tons/ year (tpy)

Potential Emissions Reductions_{scrubber} = (Total PM Emissions) x (Control Efficiency)

Potential Emissions Reduction_{scrubber} = 0.02 tons/year X 0.99

Potential Emissions Reduction_{scrubber} = 0.0198 tons/ year (tpy)

¹⁰ Northeast States for Coordinated Air Use Management. (November 2008) *Applicability and Feasibility of NOx, SO2, and PM Emissions Control Technologies for Industrial, Commercial, and Institutional (ICI) Boilers.*

¹¹ Northeast States for Coordinated Air Use Management. (November 2008) *Applicability and Feasibility of NOx, SO2, and PM Emissions Control Technologies for Industrial, Commercial, and Institutional (ICI) Boilers.*

Annualized Cost of an ESP and Wet Scrubber

The capital cost for the installation of an ESP for a 1-5 MMBtu/hr boiler ranges from \$90,000 - \$100,000 and the annual maintenance cost is \$1,000-\$2,000.¹² For the wet scrubber system, EPA estimated the annualized cost at \$5,300-\$102,000 per sm^3/sec at an average air flow rate of 0.7- 47 sm^3/sec .¹³ The following assumptions in the cost effectiveness calculations:

1. The capital cost of an ESP for a 5 MMBtu/hr boiler is assumed to be \$100,000.
2. The annual maintenance cost of an ESP for a 5 MMBtu/hr boiler is assumed to be \$2,000.
3. The annualized cost of a wet scrubber system is assumed to be the median of the range above (\$53,650 per sm^3/sec).
4. The average air flow rate for a wet scrubber system is assumed to be the median of the range above (23.85 sm^3/sec).
5. The total capital and maintenance cost of an ESP will be calculated by multiplying the cost of 1 unit by the total number of units.
6. The total annualized cost of a wet scrubber will be calculated by multiplying the annualized cost of 1 unit by the total number of units.
7. Lifetime of the ESP is 10 years at 10% interest. To account for this, the annualized capital cost will be calculated by multiplying the total capital cost by the capital recovery factor of 0.1627 and adding the annual maintenance costs.

$$\text{Annual Cost}_{\text{ESP}} = (\text{Total Capital Cost}) \times (0.1627) + (\text{Annual Maintenance Cost} \times 62)$$

$$\text{Annual Cost}_{\text{ESP}} = (\$100,000 \times 62) \times (0.1627) + (\$2,000 \times 62)$$

$$\text{Annual Cost}_{\text{ESP}} = \mathbf{\$1,132,740/\text{year}}$$

$$\text{Annual Cost}_{\text{scrubber}} = (\text{Annualized Cost of 1 unit}) \times (\text{Number of Units}) \times (\text{Average Flow Rate})$$

$$\text{Annual Cost}_{\text{scrubber}} = (\$53,650/\text{sm}^3/\text{sec}) \times (62) \times (23.85 \text{sm}^3/\text{sec})$$

$$\text{Annual Cost}_{\text{scrubber}} = \mathbf{\$79,332,255 \text{ year}}$$

Cost Effectiveness of an ESP and Wet Scrubber

$$\text{Cost Effectiveness} = \text{Annual Cost} / \text{Annual Emissions Reductions}$$

$$\text{Cost Effectiveness}_{\text{ESP}} = (\$1,132,740/\text{year}) / (0.0198 \text{ tons/ year})$$

$$\text{Cost Effectiveness}_{\text{ESP}} = \mathbf{\$57,209,091/\text{ton of PM}}$$

$$\text{Cost Effectiveness}_{\text{scrubber}} = (\$79,332,255/\text{year}) / (0.0198 \text{ tons/ year})$$

$$\text{Cost Effectiveness}_{\text{scrubber}} = \mathbf{\$4,006,679,545/\text{ton of PM}}$$

¹² Catherine Roberts. (March 2009) *Information on Air Pollution Control Technology for Woody Biomass Boilers*. Environmental Protection Agency Office of Air Quality Planning and Standards and Northeast States for Coordinated Air Use Management.

¹³ (2002). *Air Pollution Control Technology Fact Sheet: Spray-Chamber/Spray-Tower Wet Scrubber*. Environmental Protection Agency.

As illustrated above, neither PM control technology is a cost effective option for this source category. The cost of the ESP technology does not include costs of retrofitting equipment and/or the facility or compliance monitoring costs, which would drive the cost effectiveness up even more. In addition, the annualized costs provided by EPA for the wet scrubber system are in 2002 dollars, which means the value above would be even greater if it were adjusted to 2012 dollars.

At this time, the District's analysis indicates that there are no feasible opportunities for additional emission reduction regulatory strategies for this source category.

Risk-based Strategy Analysis

The emissions from units subject to Rule 4320 contribute 3.0% of average winter NO_x, 10.3% of average winter SO_x, and 2.3% of average winter PM_{2.5} emitted from stationary and area sources in the 2012 emission inventory. These units are also fired on PUC-quality natural gas, which is generally considered a clean burning fuel with low SO_x and PM emissions. Overall, Rule 4320 has significantly reduced NO_x and SO_x emissions from these units and has assisted in reducing PM_{2.5} concentrations through reductions of these key precursors.

Control Measure Commitments

The following is a summary of recommended commitments for Rule 4320.

Regulatory Action

The District's analysis did not identify any additional technologically feasible and cost effective potential controls. Therefore, there are no recommendations for additional regulatory actions for Rule 4320.

Incentive Action

Boilers subject to Rule 4320 are regulated units that have been subject to several generations of regulations; as such, the opportunities for incentive programs are minimal. There are no recommendations for incentive actions at this time.

Technology Advancement Action

There is no recommendation for a new technology advancement project for units subject to Rule 4320. Through its Technology Advancement Program, the District will continue to seek potential feasible and low-cost technologies that may provide for additional emission reduction opportunities in this category.

Policy Initiatives

The District's current legislative platform includes support for the increased development and use of cleaner-burning fuels. The recommendation is to continue supporting the current legislative platform but there are no recommendations for new policy initiatives at this time because the rule already requires the most effective emission control technologies.

Education and Outreach

The District currently provides a robust education and outreach program for regulated sources through the Small Business Assistance program, Permit Stakeholder Meetings, Compliance Assistance Bulletins, and public notices for public workshops and public hearings. The District does not have recommendations for new education and outreach efforts for these sources. The District will continue to work closely with affected sources to ensure successful compliance.

D.1.6 Rule 4352 Solid Fuel Fired Boilers, Steam Generators, and Process Heaters

Source Category

The purpose of Rule 4352 is to limit NO_x and carbon monoxide (CO) emissions from any boiler, steam generator or process heater fired on solid fuel. Prior to September 14, 1994 solid fuel fired units were exempt from the requirements of District Rule 4305. The adoption of Rule 4352 established NO_x limits of 200 parts per million volume (ppmv) for municipal solid waste facilities (MSW), 0.35 pounds per million British thermal units per hour (lb/MMBtu) for biomass facilities, and 0.20 lb/MMBtu for all other solid fuel fired units. Since its adoption, the rule has been amended three times. The recent December 2011 amendments strengthened the rule by lowering NO_x emissions limits for all three source categories. However, no emissions reductions were quantified because the rule amendments were meant to satisfy EPA RACT requirements and all units were determined to be operating at the proposed emission limits. EPA finalized approval of Rule 4352 on November 6, 2012 and deemed this rule as being at least as stringent as established RACT requirements.

While previous rule-amending projects for Rule 4352 have not quantified specific emissions reductions, the increasing presence of biomass facilities in the Valley is fostering emissions reductions. As an energy source, biomass can either be used directly or converted into other energy products such as biofuel. Biomass facilities in the Valley reduce the amount of pollutants created by open burning practices and the landfilling of potential biofuels such as agricultural materials, and urban and forest wood waste products by utilizing these materials. To date, agricultural burning has been reduced by 70% and approximately 90% of agricultural burning is projected to be eliminated in the coming years.

Emission Inventory

Pollutant	2007	2012	2014	2015	2016	2017	2018	2019
	<i>Annual Average - Tons per day</i>							
PM2.5	0.54	0.64	0.69	0.74	0.79	0.81	0.85	0.87
NO _x	3.98	4.38	4.59	4.77	4.97	5.07	5.18	5.26
SO _x	1.34	1.25	1.25	1.28	1.32	1.36	1.38	1.40
<i>Winter Average - Tons per day</i>								
PM2.5	0.56	0.67	0.72	0.76	0.81	0.84	0.87	0.90
NO _x	4.05	4.46	4.67	4.86	5.06	5.16	5.28	5.35
SO _x	1.35	1.26	1.27	1.29	1.34	1.37	1.40	1.41

Regulatory Evaluation

How does District Rule 4352 compare with federal rules and regulations?

Rule 4352 is equivalent to the applicable federal standards and guidelines. Rule 4352 is as stringent as the federal Alternative Control Techniques (ACT) (EPA –453/R-94-022 “Alternative Control Techniques Document – NOx Emissions from Industrial/Commercial/Institutional Boilers”, dated March 1994 and EPA – 452/R-93-008 “Alternative Control Techniques Document—NOx Emissions from Utility Boilers”, dated March 1994), New Source Performance Standards (NSPS) (40 CFR 60 Subpart D (Standards of Performance for Fossil-Fuel Fired Steam Generators for Which Construction Commenced After August 17, 1971) and 40 CFR 60 Subpart Db (Standards of Performance for Industrial-Commercial-Institutional Steam Generating Units)), and Maximum Achievable Control Technology (MACT) requirements (40 CFR 63 Subpart DDDDD (NESHAP for Industrial, Commercial, and Institutional Boilers and Process Heaters)). Additionally, there are no EPA Control Techniques Guidelines (CTG) listed for this category.

Rule 4352 was also compared to EPA Best Available Control Technology (BACT) standards and it was noted that Selective Catalytic Reduction (SCR) systems, scrubbers, electrostatic precipitators, and baghouses are amongst the technologies considered to be BACT for this source category. See the Emission Reduction Opportunities section for a discussion regarding these technologies.

How does District Rule 4352 compare to rules in other air districts?

Rule 4352 was compared to several other air districts’ rules. Per the 2011 Staff Report¹⁴, it was determined there are currently no solid fuel fired units subject to the NOx emission limits in the following rules in other air districts:

- BAAQMD Regulation 9 Rule 7 (Nitrogen Oxides and Carbon Monoxide from Industrial, Institutional and Commercial Boilers, Steam Generators and Process Heaters),
- BAAQMD Regulation 9 Rule 11 (Nitrogen Oxides and Carbon Monoxide from Electric Power Generating Steam Boilers),
- VCAPCD Rule 74.15 (Boilers, Steam Generators and Process Heaters),
- SCAQMD Rule 1146 (Emissions of Oxides of Nitrogen from Industrial, Institutional, and Commercial Boilers, Steam Generators and Process Heaters),
- SMAQMD Rule 411 (NOx from Boilers, Process Heaters and Steam Generators).

¹⁴ Corless, N., DeMaris, F. (2011). *Revised Proposed Amendments to Rule 4352 (Solid Fuel Fired Boilers, Steam Generators and Process Heaters)*. Fresno, CA: San Joaquin Valley Air Pollution Control District.

Units subject to District Rule 4352 would be exempt from the following rules in other air districts:

- VCAPCD Rule 59 (Electrical Power Generating Equipment—Oxides of Nitrogen Emissions),
- VCAPCD Rule 74.15 (Boilers, Steam Generators and Process Heaters), and
- SCAQMD Rule 1135 (Emissions of Oxide of Nitrogen from Electric Power Generating Systems) exempt sources burning solid fuels.

In addition to being one of the most stringent rules in the nation for this source category, any new unit brought to the Valley, as well as any major modifications to existing units, would trigger BACT requirements. Subsequently, these new or modified units would be required to use technology and control emissions beyond those established as RACT and implement the best available emission controls as required by District Rule 2201 (New and Modified Stationary Source Review Rule).

Emission Reduction Opportunities

Rule 4352 has been amended numerous times making it one of the most stringent rules in the country for this source category. Facilities subject to this rule have invested millions of dollars to implement innovative control technologies and have significantly reduced emissions from solid fuel fired boilers. The increased presence of biomass facilities in the Valley, from either new facilities or other solid fuel fired boilers that have converted to biomass, continues to significantly reduce NO_x and PM emissions from open burning practices. Given the significant efforts and investments already made to reduce emissions from this source category, there are little remaining feasible opportunities for obtaining additional cost effective emissions reductions. For thoroughness, the possibility of further reducing emissions from these units was evaluated and cost effectiveness analyses were still performed as part of the District's comprehensive control measure evaluation.

Selective Catalytic Reduction

When comparing Rule 4352 to EPA and other air districts' BACT requirements, it was noted that SCR systems are considered BACT. A SCR system reduces NO_x emissions by converting the emissions to water and elemental nitrogen. The staff report for the December 2011 amendment of this rule demonstrated that this technology is not cost effective as either a retrofit or new system. The following potential emissions reductions and cost effectiveness figures were included in the 2011 Staff Report:

Table D-3 Emissions Reductions and Cost Effectiveness of Solid Fuel Fired Boilers by Fuel Type

Fuel Type	Baseline Emissions (tons/yr)	Controlled Emissions (tons/yr)	Emissions Reduced (tons/yr)	Adjusted Annualized Cost (\$/yr)	Cost Effectiveness (\$/ton)
MSW	438	124	314	3,672,939	30,806
Biomass	337.26	67.46	269.8	14,661,434	54,342
Other	306.6	61.3	245.3	14,661,434	59,769

While these calculations were based off of a new installation of SCR, a retrofit system would include additional expenses and present even higher cost effectiveness figures.

Controls for Direct PM2.5 Emissions

The potential opportunity of specifying required controls for direct PM2.5 emissions, per EPA's suggestion in the 2009 and 2012 TSD for the rule, was researched. Three technologies were recognized as being able to potentially reduce direct PM2.5 emissions: electrostatic precipitators (ESPs), baghouses, and cyclones.

An ESP is a particulate collection device that removes particles from a flowing gas using the force of an electrostatic charge with a 90 - 99.9% control efficiency of PM2.5 for solid-fuel fired boilers within the 100-500 MMBtu/hr size range of District units¹⁵. A baghouse, on the other hand, is a technology in which particulates are removed from a stream of exhaust gases as the stream passes through a large cloth bag. Baghouses have a PM2.5 removal effectiveness of 90-99.9% for solid fuel fired boilers in the size range of District units¹⁶. Coal and coke-fired units generally use baghouses, but biomass boilers usually use ESPs because of the health and safety risk of the burning embers causing a fire in the baghouse. However, when cyclones are combined with the use of a baghouse, the burning embers are extinguished and allow for the use of a baghouse in a biomass facility¹⁷. This also reduces acid gases and some PM2.5 compared to the use of a baghouse alone.

All of the facilities subject to Rule 4352 have installed either a baghouse or ESP particulate matter removal system due to permitting requirements. Since the control efficiency ranges for both technologies are equivalent, there are currently no other PM controls more effective than current practices.

Controls for SOx Emissions

Potential opportunities to reduce SOx emissions from this source category were also researched. Most facilities subject to Rule 4352 currently inject limestone into the combustion chamber to react with fuel sulfur and produce various sulfate compounds, which can then be removed by the ESP or baghouse. This control technology typically achieves around 50% control of SOx emissions¹⁸; however, the emissions reduced are less for a low sulfuric fuel due to the lower concentration of sulfur dioxide (SO2) initially in the combustion products.

¹⁵ Senior, C., Afonso, R. (January 2009). *Applicability and Feasibility of NOx, SO2, and PM Emissions Control Technologies for Industrial, Commercial, and Institutional (ICI) Boilers*. Northeast States for Coordinated Air Use Management.

¹⁶ Senior, C., Afonso, R. (January 2009). *Applicability and Feasibility of NOx, SO2, and PM Emissions Control Technologies for Industrial, Commercial, and Institutional (ICI) Boilers*. Northeast States for Coordinated Air Use Management.

¹⁷ Roberts, C. (2009). *Information on Air Pollution Control Technology for Woody Biomass Boilers*. Northeast States for Coordinated Air Use Management and the EPA Office of Air Quality Planning and Standards.

¹⁸ (2001). *Technical Advice on Air Pollution Control Technologies for Coal-fired Power Plants*. Edmonton, AB: Alberta Research Council Inc.

Scrubbers are an add-on control technology that can achieve 70-95% control of SO_x emissions for solid fuel fired boilers¹⁹. The only MSW facility in the Valley currently utilizes a semi-dry scrubber system to control SO_x emissions. Therefore, the District calculated the average cost effectiveness of a scrubber system for biomass and coal/coke facilities.

The District conducted a SO_x BACT evaluation for a local power generation facility that was installing a biomass boiler and determined the capital costs for a wet scrubber system are approximately \$5.8 million. The annualized capital equipment cost is calculated by multiplying the installed equipment cost by the capital recovery factor of 0.1627.

Annual Capital Costs (AC_{capital})

$$AC_{\text{capital}} = \$5,800,000 \times 0.1627$$

$$AC_{\text{capital}} = \mathbf{\$943,660/\text{year}}$$

In addition, this system has additional costs for the sodium hydroxide reagent used in the scrubber which are estimated to be an additional \$642,000 per year. Thus, the total annual cost would be:

Total Annual Costs (AC_{total})

$$AC_{\text{total}} = \text{Capital Costs} + \text{Reagent Costs} = (\$943,660/\text{year}) + (\$642,000/\text{year})$$

$$AC_{\text{total}} = \mathbf{\$1,585,660/\text{year}}$$

Cost effectiveness is calculated by dividing the annual cost by the annual emissions reductions from District standard emissions. One cost effectiveness analysis was conducted for the biomass and coal/coke fired units in the Valley because the four coal/coke fired units are fired on biomass part of the time.

The average SO_x emissions limit of these units, based on District Permits SO_x emissions limits, is 0.044 lb/MMBtu and the average heat input is 341 MMBtu/hr. An emissions factor of 0.27 lb/MMbtu at 24 hours per year is assumed to reflect the time needed for the startup and shutdown period, when the exhaust temperature is not high enough for controls to be fully effective. Therefore, those numbers were utilized to calculate annual standard emissions as follows:

¹⁹ Senior, C., Afonso, R. (January 2009). *Applicability and Feasibility of NO_x, SO₂, and PM Emissions Control Technologies for Industrial, Commercial, and Institutional (ICI) Boilers*. Northeast States for Coordinated Air Use Management.

Annual Standard Emissions (AE_{standard})

$$AE_{\text{standard}} = [(0.044 \text{ lb/MMBtu}) \times (341 \text{ MMBtu/hour}) \times (8,760 \text{ hour/year})] + [(0.27 \text{ lb/MMBtu}) \times (24 \text{ hour/year}) \times (341 \text{ MMBtu/hr})]$$

$$AE_{\text{standard}} = 133,644.7 \text{ lb/year}$$

Potential emissions, using the technologically feasible emission limit of 0.012 lb/MMBtu that is achieved by the use of a wet scrubber system, can be calculated as follows:

Annual Emissions with Wet Scrubber System (AE_{scrubber})

$$AE_{\text{scrubber}} = [(0.012 \text{ lb/MMBtu}) \times (341 \text{ MMBtu/hour}) \times (8,760 \text{ hour/year})] + [(0.27 \text{ lb/MMBtu}) \times (24 \text{ hour/year}) \times (341 \text{ MMBtu/hour})]$$

$$AE_{\text{scrubber}} = 38,055.6 \text{ lb/year}$$

Therefore, the cost effectiveness would be:

Cost Effectiveness (CE)

$$CE = (\$1,585,660/\text{year}) \div [(133,644.7 \text{ lb/year} - 38,055.6 \text{ lb/year}) \times (1 \text{ ton}/2,000 \text{ lb})]$$
$$CE = \$33,177/\text{ton}$$

It is important to note that the cost effectiveness analysis above does not reflect the costs of additional electricity consumption, additional labor costs, additional solid waste disposal, and other operational changes or additions that would be required to comply with the lower limit. The option of scrubbers is not a cost effective option, and therefore, is not feasible.

There are no additional technologies available to reduce SO_x emissions from solid fuel fired units.

Start-up Periods

The possibility of reducing the allowed start-up period of solid fuel fired boilers was considered, since facilities are exempt from emissions limits during this period. Facilities subject to Rule 4352 are currently subject to a start-up limit of 96 hours. Operators currently limit their start-up and shut-down times as much as possible since down time results in reduced productivity and profits. However, facilities periodically perform "cold repairs" on their solid fuel fired boilers for maintenance or trouble-shooting purposes. This requires operators to completely shut down the boilers, which in turn requires a longer start-up period to return to correct operating temperature. When the solid fuel fired boilers are starting up, the units are not operating with a full load which reduces emissions. Therefore, this is not a technologically feasible option for solid fuel fired facilities given the needs of current work practices.

At this time, the District's analysis indicates that there are no feasible opportunities for additional emission reduction regulatory strategies for this source category.

Risk-based Strategy Analysis

The emissions from units subject to Rule 4352 contribute 9.2% of average winter NOx and 15.3% of average winter SOx emitted from stationary and area sources in the 2012 emission inventory. Overall, Rule 4352 has significantly reduced NOx and SOx emissions from these units and has assisted in reducing PM2.5 concentrations through reductions of these key precursors.

Control Measure Commitments

The following is a summary of recommended commitments for Rule 4352.

Regulatory Action

The District's analysis did not identify any additional technologically feasible and cost effective potential controls. Therefore, there are no recommendations for additional regulatory actions for Rule 4352.

Incentive Action

Boilers subject to Rule 4352 are regulated units that have been subject to several generations of regulations; as such, the opportunities for incentive programs are minimal. As discussed above, funding or tax credits aimed at reducing emissions from biomass facilities in the Valley are available through some short-term programs such as the Existing Renewable Facilities Program through the California Energy Commission (CEC) and federal corporate tax credits from a federal program called the Renewable Electricity Program Tax Credit. Although there are no recommendations for new incentive actions at this time, the recommendation is to support agencies to continue the funding of existing incentive programs.

Technology Advancement Action

There are no recommendations for any specific technology advancement actions to reduce emissions from solid fuel fired boilers at this time. Through its Technology Advancement Program, the District will continue to seek potential feasible and low-cost technologies that may provide for additional emission reduction opportunities in this category.

Policy Initiatives

The District's current legislative platform includes support for the continued operation of biomass facilities and increased development and use of cleaner-burning fuels. The recommendation is to continue supporting the current legislative platform but there are no recommendations for new policy initiatives at this time because the rule already requires the use of effective emission control technologies.

Education and Outreach

The District currently provides a robust education and outreach program for regulated sources through the Small Business Assistance program, Permit Stakeholder Meetings, Compliance Assistance Bulletins, and public notices for public workshops and public hearings. There are no recommendations for new education and outreach efforts for these sources. The District will continue to work closely with affected sources to ensure successful compliance.

D.1.7 Rule 4702 Internal Combustion Engines

Source Category

This rule applies to any internal combustion (IC) engine rated at 25 brake horsepower (bhp) or greater. The purpose of this rule is to limit NO_x, carbon monoxide (CO), volatile organic compounds (VOC), and SO_x emissions from units subject to this rule.

The District's original IC rule, Rule 4701 (Internal Combustion Engines – Phase 1), was adopted on May 21, 1992, superseded by newly adopted Rule 4702 on August 21, 2003, and has subsequently been amended four times. The rule established NO_x limits between 25-50 ppmv with 90-96% control for non-agricultural operations rich-burn engines and 65-75 ppmv with 85-90% control for non-agricultural operations lean-burn engines. Amendments have strengthened the rule by regulating emissions from agricultural operations sources and achieving approximately 84% control of agricultural operations emissions from this source category. The most recent rule amendment in August 2011 added reporting and point-of-sale requirements for engines 25-50 bhp, which were previously unregulated, and implemented more stringent NO_x limits for non-agricultural operations spark-ignited engines, further reducing emissions from this source category. EPA finalized approval for Rule 4702 on January 10, 2008 and deemed this rule as being at least as stringent as established RACT requirements.

Emission Inventory

Pollutant	2007	2012	2014	2015	2016	2017	2018	2019
Annual Average - Tons per day								
PM2.5	0.81	0.53	0.51	0.44	0.34	0.33	0.32	0.31
NO _x	20.18	12.53	11.93	8.63	6.67	6.24	5.99	5.80
SO _x	0.19	0.15	0.15	0.13	0.12	0.11	0.11	0.11
Winter Average - Tons per day								
PM2.5	0.58	0.39	0.38	0.33	0.27	0.26	0.26	0.25
NO _x	14.03	8.85	8.41	6.18	4.87	4.61	4.45	4.32
SO _x	0.15	0.13	0.13	0.11	0.10	0.10	0.10	0.10

Regulatory Evaluation

How does District Rule 4702 compare with federal rules and regulations?

Rule 4702 is equivalent to the applicable federal standards and guidelines. Rule 4702 is as stringent as the federal Alternative Control Techniques (ACT) documents (EPA – 453/R-93-032 “Alternative Control Techniques (ACT) Document – NO_x Emissions from Stationary Reciprocating Internal Combustion Engines”, dated July 1993), New Source Performance Standards (NSPS) (40 CFR 60 Subpart IIII (Standards of Performance for Stationary Compression Ignition Internal Combustion Engines) and 40 CFR 60 Subpart JJJJ (Standards of Performance for Stationary Spark Ignition Internal Combustion Engines)), Maximum Achievable Control Technology (MACT) NO_x limits (40 CFR 63

Subpart ZZZZ (NESHAP for Stationary Reciprocating Internal Combustion Engines)), and EPA Best Available Control Technology (BACT) requirements. Additionally, there are no EPA Control Techniques Guidelines (CTG) listed for this category.

How does District Rule 4702 compare to rules in other air districts?

Upon comparing Rule 4702 to other California air districts' rules for similar sources, the rule was found to be at least as stringent as the analogous rules for BAAQMD (Regulation 9 Rule 8—Nitrogen Oxides and Carbon Monoxide from Stationary Internal Combustion Engines), SMAQMD (Rule 412—Stationary Internal Combustion Engines Located at Major Stationary Sources of NO_x), and VCAPCD (Rule 74.9—Stationary Internal Combustion Engines). Rule 4702 also meets or exceeds the BACT requirements for BAAQMD.

SCAQMD Rule 1110.2 (Emissions from Gaseous and Liquid-Fueled Engines) specifies a NO_x limit of 11 ppmv for all units. Due to the large inventory of agricultural engines in the Valley that have only recently been required to install emission control devices and the difficulties of implementing a lower NO_x standard for agricultural engines, as discussed below in "Further NO_x Limitations", an 11 ppmv NO_x limit is not feasible for agricultural engines at this time. The SCAQMD 11 ppmv limit for non-agricultural operations engines fired on landfill gas or digester gas engines stated as being effective July 1, 2012, was based on a provision to complete a technology assessment by July 2010. The limit will only be implemented if the result of SCAQMD's technology assessment confirms that 11 ppmv is achievable. During a 2011 telephone conversation with SCAQMD during the rule development process of Rule 4702, District staff confirmed that the technology assessment would not be completed until 2012. Therefore, the District did not propose changes to the current limit for non-agricultural waste gas fueled rich-burn engines of Rule 4702 until such time that South Coast AQMD's technology assessment confirmed that it is technologically and economically feasible to achieve 11 ppmv for that category of non-agricultural units.

In addition to being one of the most stringent rules in the nation for this source category, any new unit brought to the Valley, except rare instances where the new unit has a low bhp rating or if the applicant agrees to limit the daily hours of operation, as well as any major modifications to existing units, would trigger District BACT requirements. Subsequently, these new or modified units would be required to use technology and control emissions beyond those established as RACT and implement the best available emission controls, as required by District Rule 2201 (New and Modified Stationary Source Review Rule).

Emission Reduction Opportunities

In its continuous effort to improve air quality in the Valley, the District has adopted numerous amendments to the IC engine rule that have significantly reduced NO_x and PM emissions from this source category. The emissions inventory for NO_x from IC engines will be reduced by 71% over from 20.18 tons of NO_x per day in 2007, to 5.8 tons of NO_x per day in 2019. . Significant emission reductions from agricultural IC

engines have been achieved through a combination of regulatory efforts and incentive actions, including the replacement of over 2,000 diesel irrigation pumps with electric motors since 2007. Additional emissions reductions are forthcoming with the existing Rule 4702 as compliance dates approach over the next six years. Given the significant efforts and investments already made to reduce emissions from this source category, there are little remaining feasible opportunities for obtaining additional emissions reductions. While no significant additional opportunities have been identified, the District evaluated several potential additional areas based on comments received during development of this plan.

Further SO_x and Particulate Matter Limitations

Most non-agricultural engines and many agricultural engines are fired on Public Utilities Commission (PUC) quality natural gas, and are inherently low-emitters of SO_x and PM_{2.5} emissions. Current Rule 4702 contains stringent requirements requiring the combustion of PUC-quality natural gas, or other equivalent ultra-low sulfur fuels, and diesel engines subject to Rule 4702 are required to be EPA Tier 3 or Tier 4 certified, depending on the size of the engine and the annual operating hours. EPA Tier 3 and 4 certifications require the units to meet low PM limits and Tier 4 engines are required to meet even lower PM limited through the use of particulate filters. Given the low PM_{2.5} and SO_x emissions from IC engines and existing rule requirements, no further requirements are needed to address PM_{2.5} and SO_x emissions.

Further NO_x Limitations

With regard to non-agricultural engines, new more stringent NO_x limits were recently adopted in August 2011. The District conducted a thorough analysis in support of this recent rule amendment that considered all available control technologies, including their feasibility and cost effectiveness. The District subsequently adopted stringent limits with compliance dates ranging from 2014 through 2017. Based on this recent action and ongoing rule requirements, there are no additional emission reduction opportunities for non-agricultural engines at this time.

The District adopted requirements in 2005 that established stringent requirements for reducing emissions from PUC-quality natural gas (spark-ignited) and diesel-fired (compression-ignited) agricultural engines. These requirements were the first of their kind in the nation, and established a timetable for phasing in new engine and control technologies for a previously unregulated source category. Overall, these requirements reduce emissions from agricultural engines by 84% when fully implemented, with significant investments being made by the affected stakeholders to comply with the rule. Additionally, the District and United States Department of Agriculture – Natural Resources Conservation Service (USDA-NRCS) have also made significant investments to provide incentives to accelerate the transition to cleaner engine technologies. One prime example of this effort was the collaborative public/private partnership involving the District, USDA-NRCS, agricultural stakeholders, and public utilities to incentivize the replacement of diesel irrigation pump engines with electric motors. This effort resulted in the conversion of over 2,000 diesel irrigation engines to electric motors. Agricultural operations are still in the process of implementing the new

standards or have only recently come into compliance with the stringent standards under Rule 4702. Compliance dates for agricultural operations engines range from 2009 to 2010 for spark-ignited engines and 2010 through 2018 for compression-ignited engines.

The District considered the possibility of reducing the NO_x emissions limit for spark-ignited agricultural operations engines to 11 ppmv; however, as previously mentioned, these engines have only recently been required to install emission control devices and comply with the current NO_x limits in Rule 4702. As discussed in the *2011 Final Staff Report for the Revised Proposed Amendments to Rule 4702*, the District is still evaluating the effectiveness and implementation issues associated with the control systems currently in place for agricultural spark-ignited engines, which include a 3-way catalytic converter, air/fuel ratio controller, and oxygen sensor. These systems have faced challenges due to the nature of agricultural engine installations, including remote locations, fluctuations in gas pressures, and unattended operations. While the technologies are capable of meeting the 150 ppmv and 90 ppmv NO_x emissions limits currently in place for agricultural spark-ignited engines, additional time is needed to fully evaluate the effectiveness of these control devices and determine if it is technologically feasible to reach 11 ppmv with these controls.

Additionally, the current emissions limits are appropriate for agricultural spark-ignited engines considering the potential economic impacts that more stringent NO_x limits could create for Valley agriculture. Agriculture is economically depressed as evidenced by continued economic assistance from the federal government in the form of subsidies/grants to even the economic playing field resulting from increased importation of cheaper cost products from foreign countries into the U.S. Unlike agricultural diesel (compression-ignited) engines, agricultural spark-ignited engines are not eligible for Moyer incentive funding which has helped reduce the economic impacts associated with compliance costs for diesel engines. Furthermore, agriculture's inability to pass the increased production costs on to consumers make it difficult for agriculture to absorb the compliance costs associated with more stringent limits for agricultural spark-ignited engines.

Another important consideration is that the NO_x limits in place prevent operators from replacing agricultural spark-ignited engines with diesel engines. In light of the different requirements, and related compliance costs, for spark-ignited engines and diesel engines, the District was made aware during the 2005 amendment of Rule 4702 that operators would likely replace an agricultural spark-ignited engine with a diesel engine if the emission limits for spark-ignited engines were too stringent. To prevent, or minimize, these instances, the District made the requirements for spark-ignited engines and compression-ignited engines as comparable as reasonable; as supported by the rule limits and compliance dates. Agricultural spark-ignited engines with higher NO_x emissions limits have sooner compliance dates (2009-2010) and agricultural diesel engines with more stringent NO_x limits have a longer compliance timeline (2010-2018). Reducing the spark-ignited NO_x emissions limits could potentially prompt agricultural

operators to switch to diesel engines and thus increase PM_{2.5} emissions for this source category.

The potential for changing the exemption requirements for emergency standby engines and low-use engines was evaluated during the 2011 rule amendment process, it was determined that the existing requirements are consistent with ARB RACT/BARCT Determination for Spark-Ignited Engines and ARB Airborne Toxics Control Measures (ATCM). The emissions from these units are relatively minor, and controlling these emissions is subsequently cost ineffective.

The level of stringency associated with existing Rule 4702 requirements is further supported by EPA's full approval of Rule 4702. In the technical support document (TSD) published in August 2007 for the approval of Rule 4702, EPA determined that the requirements are, *"consistent with EPA regulations, and relevant policy and guidance regarding enforceability, BACM/BACT, RACM/RACT, and SIP relaxations."*²⁰ Additionally, EPA stated that, *"Submitted Rule 4702 continues to implement BACM/BACT and other SIP approval criteria for stationary internal combustion engines...Because the criteria for BACM/BACT are stricter than for RACT, by meeting BACT requirements submitted Rule 4702 also fulfills RACT."*²¹

Given the significant emissions reductions that have been achieved and will continue to be achieved under the existing rule, significant costs associated with these requirements, and the District's analysis and related EPA findings, there are no feasible opportunities for additional emission reduction regulatory strategies for this source category.

Risk-based Strategy Analysis

The emissions from units subject to Rule 4702 contribute 18.2% of average winter NO_x emitted from stationary and area sources in the 2012 emission inventory. These units are primarily fired on PUC-quality natural gas, which is generally considered a clean burning fuel with low SO_x and PM emissions. While many agricultural diesel engines have been replaced with electric motors over recent years, remaining engines have been replaced, or will soon be replaced, with new, certified, cleaner diesel engines. Given the rural nature of the emissions, District health risk assessments of these newer diesel engines have concluded that the toxic health risk associated with the new engines are generally not significant. Overall, Rule 4702 has significantly reduced NO_x and SO_x emissions from these units and has assisted in reducing PM_{2.5} concentrations through reductions of these key precursors.

²⁰ (2008, January 10). *Revisions to the California State Implementation Plan, San Joaquin Valley Air Pollution Control District and*

Sacramento Metropolitan Air Quality management District. 73 Fed. Reg. 7, pp. 1818 – 1822.

²¹ Donez, F. (August 2007). *Technical Support Document for EPA's Notice of Proposed Rulemaking and Direct Final Rule for the California State Implementation Plan San Joaquin Valley Unified Air Pollution Control District Rule 4702, Internal Combustion Engines – Phase 2.* San Francisco, CA: Environmental Protection Agency, Region IX Air Division.

Control Measure Commitments

The following is a summary of recommended commitments for Rule 4702.

Regulatory Action

The District's analysis did not identify any additional technologically feasible and cost effective potential controls. Therefore, there are no recommendations for additional regulatory actions for Rule 4702. Existing sources are in the process of complying with new standards in current rule language thus continuing to reduce emissions from these sources.

Incentive Action

As discussed above, the District implements the stationary agricultural irrigation pump engine program component of the *Heavy-Duty Engine Program*. This program provides incentives for both the conversion of Tier 1 and Tier 2 engines to lower NOx and PM-emitting Tier 4 engines and for the electrification of diesel engines, as the District highly prioritizes electrification efforts to achieve zero and near-zero emissions from engines. The following incentives are offered through this program:

- Prior to the January 1, 2015 (or 12 years from installation) Rule 4702 compliance deadline for the conversion of Tier 1 and Tier 2 engines to Tier 4 engines, the program will offer incentive funding for the replacement of Tier 1 and Tier 2 engines with the latest tier certified engine technology or electric motors.
- The District will continue to offer incentive funding for the replacement of Tier 3 certified engines with electric motors.
- The District will also continue to offer incentive funding for the installation of electric motors, rather than diesel engines, on new wells.

The District will consider the possibility of providing further incentives to further promote the replacement of agricultural IC engines with electric motors, including, but not limited to providing additional incentives for the high cost associated with utility line extensions to remote irrigation pump installations.

Technology Advancement Action

One of the 11 projects selected in 2011 for the District's Technology Advancement Program is aimed at demonstrating that a compact Selective Catalytic Reduction (SCR) device on a biogas-powered engine can reduce NOx emissions to ultra-low levels. This new technology has the potential of providing a low cost option for reducing emissions from biogas-powered engines, particularly for dairy and other digester applications. Through its Technology Advancement Program, the District will continue to seek potential feasible and low-cost technologies that may provide for additional emission reduction opportunities in this category.

Policy Initiatives

The District's current legislative platform includes support for the increased development and use of cleaner-burning fuels, incentive funding through the Carl Moyer Program, and the continuation of air quality funding in the Farm Bill. The District

recommends continued support of these funding streams to continue providing incentives for accelerated reductions from engines in this category. The District will also consider pursuing a renewed public/private collaborative partnership similar to the previously discussed partnership to provide further incentives for replacing remaining agricultural IC engines with electric motors.

Education and Outreach

The District currently provides a robust education and outreach program for regulated sources through the Small Business Assistance program, Permit Stakeholder Meetings, Compliance Assistance Bulletins, and public notices for public workshops and public hearings. The District does not have recommendations for new education and outreach efforts for these sources. The District will continue to work closely with affected sources to ensure successful compliance.

D.1.8 Rule 4703 Stationary Gas Turbines

Source Category

The provisions of this rule are applicable to all stationary gas turbine systems, which are subject to District permitting requirements, and with electrical generation ratings equal to or greater than 0.3 megawatt (MW) or a maximum heat input rating of more than 3 million British Thermal Units per hour (MMBtu/hr), and that are used for the generation of electrical power. The purpose of this rule is to limit NOx emissions from these stationary gas turbines.

Rule 4703 was adopted on August 18, 1994. Since its adoption, the rule has been amended six times. The latest rule amendment in September 2007 strengthened the rule by establishing more stringent NOx limits for existing stationary gas turbines. EPA finalized approval for Rule 4703 on October 21, 2009 and deemed this rule as being at least as stringent as established RACT requirements. NOx emissions have been controlled by over 86% for this source category.

Emission Inventory

Pollutant	2007	2012	2014	2015	2016	2017	2018	2019
Annual Average - Tons per day								
PM2.5	1.75	1.60	1.51	1.45	1.48	1.52	1.52	1.53
NOx	6.87	3.24	3.09	3.00	3.05	3.11	3.12	3.13
SOx	0.48	0.43	0.40	0.38	0.38	0.39	0.40	0.40
Winter Average - Tons per day								
PM2.5	1.72	1.58	1.49	1.43	1.46	1.49	1.50	1.50
NOx	6.82	3.21	3.07	2.98	3.03	3.08	3.10	3.11
SOx	0.47	0.42	0.39	0.37	0.37	0.38	0.39	0.39

Regulatory Evaluation

How does District Rule 4703 compare with federal rules and regulations?

Rule 4703 is equivalent to the applicable federal standards and guidelines. Rule 4703 is as stringent as the federal Alternative Control Techniques (ACT) (EPA –453/R-93-007 “NOx Emissions from Stationary Combustion Turbines”, dated January 1993), New Source Performance Standards (NSPS) (40 CFR 60 Subpart GG (Standards of Performance for Stationary Gas Turbines) & Subpart KKKK(Standards of Performance for Stationary Combustion Turbines)), and Maximum Achievable Control Technology (MACT) requirements (40 CFR 63 Subpart YYYY (NESHAP for Stationary Combustion Turbines)); additionally, there are no EPA Control Techniques Guidelines (CTG) listed for this category.

How does District Rule 4703 compare to rules in other air districts?

When comparing Rule 4703 to SCAQMD (Rule 1134—Emissions of Oxides of Nitrogen from Stationary Gas Turbines), BAAQMD (Regulation 9 Rule 9—Nitrogen Oxides from Stationary Gas Turbines), SMAQMD (Rule 413—Stationary Gas Turbines), and VCAPCD (Rule 74.23—Stationary Gas Turbines), the rule was found to be at least as stringent as these other rules.

In addition to being one of the most stringent rules in the nation for this source category, any new unit brought to the Valley, as well as any major modifications to existing units, would trigger Best Available Control Technology (BACT) requirements. Subsequently, these new or modified units would be required to use technology and control emissions beyond those established as RACT and implement the best available emission controls, as required by District Rule 2201 (New and Modified Stationary Source Review Rule).

Emission Reduction Opportunities

The District has adopted numerous rule amendments to the turbine rule that have successfully and significantly reduced emissions from this source category. The emissions inventory for NO_x from turbines has been reduced from 31.9 tons per day (tpd) in 1994 to 3.24 tpd in 2012. Significant emission reductions have been achieved through the implementation of the most stringent regulations in the nation for this source category and significant investments by stakeholders to implement effective and innovative emission control technologies. The District has achieved substantial NO_x emissions reductions in the past year as compliance dates went into effect at the beginning of 2012. Given the significant efforts and investments already made to reduce emissions from this source category, there are little remaining feasible opportunities for obtaining additional emissions reductions. For the sake of thoroughness, the possibility of further reducing emissions from turbines is evaluated in the following discussion.

BACT Comparisons

Comparisons of this rule with the District, BAAQMD, and SCAQMD BACT requirements showed that some BACT emissions limits are more stringent than Rule 4703 limits. For units greater than 3 MW, some of the District's NO_x limits ranged from 3-5 ppmv, whereas the BACT limits ranged from 2-3 ppmv. For units less than 3 MW, the District's NO_x limit was 9 ppmv, whereas the BACT limit was 5 ppmv. The BACT guidelines list Selective Catalytic Reduction (SCR) and SCONO_x as the emissions control technologies used to achieve emission limits in the range of 2-5 ppmv. Although lower emission limits are potentially achievable for this source category, BACT requirements are imposed on new or modified turbine installations where ultra-low NO_x controls can be installed and the equipment and the facility can be designed to function with this new technology. Rule 4703 is a prohibitory rule that has undergone several generations of NO_x limits for existing units in the Valley; facilities comply with these limits by retrofitting their existing equipment. Requiring the installation of entirely new turbine systems is extremely expensive and not cost effective, and therefore not required of facilities.

Selective Catalytic Reduction

Many of the larger units (> 3MW) have already employed SCR to achieve the 5 ppmv limits in place. Therefore, the District evaluated the potential opportunity to employ SCR for units less than 3 MW.

A SCR system reduces NO_x emissions by converting the emissions to water and elemental nitrogen. Ammonia is generally injected into the exhaust stream and reacts with the nitrogen. Due to the high cost of SCR systems, they are typically used for controlling emissions from larger units, greater than 3 MW, that generally create more emissions. The cost effectiveness of an SCR system for a 1 MW unit was calculated based on the cost effectiveness methodologies in the 2007 Staff Report for Rule 4703 and some of the newer methodologies used to calculate the cost effectiveness of SCR in the August 2011 Staff Report for Rule 4702. The tables below present the total annual costs for a new SCR system and a retrofit system.

Table D-4 SCR Annual Costs for a New Installation on a 1 MW Turbine

ITEM		SOURCE	COST
Turbine Rating	1 MW		
SCR Cost/KW	\$125/KW	Middle point between high and low estimate from R4703 analysis	
Operating Hours	7884 hrs/year		
Direct Capital Costs			
Total Purchased Equip Cost	\$125/KW x 1000 KW		\$125,000
Freight	5% Purchased Equip. Cost (PEC)	Rule 4702	\$6,250
Sales Tax	8.25% PEC	Rule 4702	\$10,313
Direct Installation Costs	25% PEC	Rule 4702	\$31,250
Total Direct Capital Costs			\$172,813
Indirect Capital Costs			
Facilities	5% PEC	Rule 4702	\$6,250
Engineering	10% PEC	Rule 4702	\$12,500
Process Contingency	5% PEC	Rule 4702	\$6,250
Total Indirect Capital Costs			\$25,000
Project Contingency	20% PEC	R4702	\$25,000
Total Capital Costs (TCC)	Direct Capital + Indirect Capital + Project Contingency	R4702	\$222,813
Annualized Capital Costs (10 years @ 10%)	0.1627*TCC	R4702	\$36,252
Direct Annual Costs			
<i>Operating Costs</i>			
Operator	0.5 hr/shift, \$25/hr	OAQPS	\$13,688
Supervisor	15% of operator	OAQPS	\$2,053
<i>Maintenance Costs</i>			
Labor	0.5 hr/shift, \$25/hr	OAQPS	\$13,688
Material	100% of labor cost	OAQPS	\$13,688
<i>Utility Costs</i>			
Electricity Costs		Variable	\$5,747
Cat. Replacement		MHIA	\$5,621
Cat. Disposal		OAQPS	\$211
Ammonia		Variable	\$1,008
NH3 Inject Skid		MHIA	\$2,916
Total Direct Annual Costs			\$58,620
Indirect Annual Costs			
Overhead	60% of Operating and Maintenance	OAQPS	\$25,870
Administrative	0.02 x PEC	OAQPS	\$2,500
Insurance	0.01 x PEC	OAQPS	\$1,250
Property Tax	0.01 x PEC	OAQPS	\$1,250
Capital Recovery	0.13 x PEC (10% int. rate, 15 yr period)	OAQPS	\$16,250
Total Indirect Annual Costs			\$47,120
Total Annual Costs	Annualized capital + Direct Annual + Indirect Annual		\$141,992

Table D-5 SCR Annual Costs for a Retrofit on a 1 MW Turbine

ITEM		SOURCE	COST
Turbine Rating	1 MW		
SCR Cost/KW	\$325/KW	Middle point between high and low estimate from R4703 analysis	
Operating Hours	7884 hrs/year		
Direct Capital Costs			
Total Purchased Equip Cost	\$325/KW x 1000 KW		\$325,000
Freight	5% Purchased Equip. Cost (PEC)	Rule 4702	\$16,250
Sales Tax	8.25% PEC	Rule 4702	\$26,813
Direct Installation Costs	25% PEC	Rule 4702	\$81,250
Total Direct Capital Costs			\$449,313
Indirect Capital Costs			
Facilities	5% PEC	Rule 4702	\$16,250
Engineering	10% PEC	Rule 4702	\$32,500
Process Contingency	5% PEC	Rule 4702	\$16,250
Total Indirect Capital Costs			\$65,000
Project Contingency	20% PEC	R4702	\$65,000
Total Capital Costs (TCC)	Direct Capital + Indirect Capital + Project Contingency	R4702	\$579,313
Annualized Capital Costs (10 years @ 10%)	0.1627*TCC	R4702	\$94,254
Direct Annual Costs			
<i>Operating Costs</i>			
Operator	0.5 hr/shift, \$25/hr	OAQPS	\$13,688
Supervisor	15% of operator	OAQPS	\$2,053
<i>Maintenance Costs</i>			
Labor	0.5 hr/shift, \$25/hr	OAQPS	\$13,688
Material	100% of labor cost	OAQPS	\$13,688
<i>Utility Costs</i>			
Electricity Costs		Variable	\$5,747
Cat. Replacement		MHIA	\$5,621
Cat. Disposal		OAQPS	\$211
Ammonia		Variable	\$1,008
NH3 Inject Skid		MHIA	\$2,916
Total Direct Annual Costs			\$58,620
Indirect Annual Costs			
Overhead	60% of Operating and Maintenance	OAQPS	\$25,870
Administrative	0.02 x PEC	OAQPS	\$6,500
Insurance	0.01 x PEC	OAQPS	\$3,250
Property Tax	0.01 x PEC	OAQPS	\$3,250
Capital Recovery	0.13 x PEC (10% int. rate, 15 yr period)	OAQPS	\$42,250
Total Indirect Annual Costs			\$81,120
Total Annual Costs	Annualized capital + Direct Annual + Indirect Annual		\$233,994

Potential Emissions Reduction Methodology

The estimated current annual NO_x emissions and the estimated potential annual NO_x emissions were calculated using the following equation:

$$\text{NO}_x = \text{LF} \times \text{MMBtu/hr} \times \text{HR} \times \text{EF} / 2,000 \text{ lb/ton}$$

Where:

NO _x	=	Current annual NO _x emissions or potential annual NO _x emissions in tons/year
LF	=	turbine load factor
MMBtu/HR	=	heat input rating
HR	=	annual hours of operation
EF	=	NO _x emission factor in pounds per MMBtu

Where:

EF	=	NO _x emission factor in ppmv x 0.00366
ppmv	=	NO _x emissions in parts per million corrected to 15% oxygen
0.00366	=	Conversion factor used: 0.00366 lb/MMBtu per ppmv NO _x

The estimated annual NO_x emissions reduction was calculated using the following equation:

$$\text{NO}_x \text{ Emissions Reduction} = \text{Current annual NO}_x \text{ emissions} - \text{Potential annual NO}_x \text{ emissions.}$$

Potential Emissions Reduction Calculation

The emissions reduction calculations below utilized the following information:

Loading factor = 0.75

Heat input rating for a 1 MW unit = 15 MMBtu/hr

Annual Hours of Operation = 7884 hours

Current Emission Factor in Rule 4703 = 9 ppmv

Potential Emissions Factor through the use of SCR = 5 ppmv

$$\begin{aligned} \text{Current NO}_x &= \text{LF} \times \text{MMBtu/hr} \times \text{HR} \times \text{EF} / 2,000 \text{ lb/ton} \\ &= 0.75 \times 15 \times 7884 \times (9 \times 0.00366) / 2000 \\ &= 1.46 \text{ tons/year} \end{aligned}$$

$$\begin{aligned} \text{Potential NO}_x &= \text{LF} \times \text{MMBtu/hr} \times \text{HR} \times \text{EF} / 2,000 \text{ lb/ton} \\ &= 0.75 \times 15 \times 7884 \times (5 \times 0.00366) / 2000 \\ &= 0.81 \text{ tons/year} \end{aligned}$$

$$\begin{aligned} \text{Emissions Reduction} &= \text{Current NO}_x \text{ emissions} - \text{Potential NO}_x \text{ emissions} \\ &= 0.65 \text{ tons/year} \end{aligned}$$

Table D-6 SCR Cost Effectiveness

Type of Installation	MW	MMBtu/hr	Current NOx Emission Factor (EF), ppmv	Potential NOx EF, ppmv	NOx Reduction (Tons/Year)	Total Annual Cost (\$)	Cost Effectiveness (\$/ton)
New	1	15	9	5	0.65	\$141,992	\$218,449
Retrofit	1	15	9	5	0.65	\$233,994	\$359,991

Therefore, even though some of the BACT emissions limits for units less than 3 MW are more stringent than the current limit of 9 ppmv, this is not a cost effective option.

EMx

Certain BACT limits for simple cycle plants were achieved through the use of SCONOX. This multifaceted technology reduces NOx, SOx, carbon monoxide (CO), and volatile organic compound (VOC) emissions and is stated as achieving NOx levels less than 1.5 ppmv by its manufacturer. One issue with the use of SCONOX is that it requires steam to operate and simple cycle plants do not generate steam. Therefore, a simple cycle facility would have to add a boiler to their facility to generate steam for the SCONOX system, making the addition of this technology more costly. The District is not aware of any SCONOX applications on simple cycle plants.²² While SCONOX is better suited for combined cycle turbines, this technology has not been achieved in practice (AIP) yet in the District.

BAAQMD evaluated SCONOX, now known as the EMx system, for turbines in a recent Final Determination of Compliance (FDOC) for the Oakley Generating Station. The FDOC states that EMx could potentially be an improvement over SCR as an add-on control device for achieving NOx reductions – assuming it can achieve the same level of NOx control – because it does not use ammonia. Ammonia has the potential, under certain atmospheric conditions, to react with nitric acid in the atmosphere to form ammonium nitrate, which can be a form of PM2.5. However, based on the implementation of EMx at a facility in Shasta County, BAAQMD voiced some concerns for its use.

EMx has never been used on a large utility-scale turbine and so there is no data on which to make a direct evaluation of how well the technology would work on larger turbines. EMx has been used on a smaller aeroderivative turbine at the Redding Power Plant Unit No. 5, a 45-MW combined-cycle facility in Shasta County, CA. The Shasta County Air Quality Management District evaluated EMx at the Redding facility under a demonstration NOx limit of 2.0 ppm, which SCR can consistently achieve. After three years of operation, the Shasta County AQMD evaluated whether the facility was meeting this demonstration limit with EMx, and concluded that “*Redding Power is not*

²² Brian K. Lusher. (June 2010). *Final Determination of Compliance: Marsh Landing Generating Station*. San Francisco, CA: Bay Area Air Quality Management District.

able to reliably and continuously operate while maintaining the NO_x demonstration limit of 2.0 ppmvd @ 15% O₂.”²³

The FDOC states that although the EMx manufacturer maintains that such problems have been overcome, concerns remain about how consistently the technology would be able to perform. Recent communications between BAAQMD and Shasta County Air District confirmed that the earlier conclusions about the achievability of a lower limit remain valid.²⁴ In addition, monthly reports of Continuous Emissions Monitoring System (CEMS) data submitted by Redding Power Plant to Shasta County Air District during 2007 and 2008 indicated that emissions have often been substantially higher.²⁵ Furthermore, the data from Redding is from a smaller aeroderivative turbine, and there is no guarantee that if it were scaled up for uses on utility-size turbines that it would even be able to achieve the performance required from larger turbines. For these reasons, BAAQMD concluded that EMx is not as developed as SCR at this time and cannot achieve the same level of emissions performance that SCR is capable of.

SCAQMD is currently funding a research project that will study and demonstrate the feasibility of control technologies to reduce PM_{2.5} and ultrafine particulate emissions from natural gas-fired turbine power plants. EMx is one of the two technologies that were selected for demonstration and the project is expected to be completed by the end of 2012. The findings of this report could potentially be beneficial for evaluating the feasibility of EMx applications for turbines in the future.

SO_x

The implementation of sulfur dioxide (SO₂) limits at least as stringent as the requirements in 40 CFR 60 Subpart KKKK (Standards of Performance for Stationary Combustion Turbines) was considered for Rule 4703. Fuel treatment sulfur removal systems were recognized as being able to reduce SO_x emissions from turbines, other than those fired on Public Utilities Commission (PUC) quality natural gas. One Valley facility is in the process of installing SCR onto their digester gas-fired turbine to meet the Rule 4703 limit. To do this, they must install a fuel pretreatment system that removes H₂S and siloxanes, as they can damage the SCR catalyst if not removed. Other landfill and digester-gas turbines outside the District are also using these systems.

There are only 5 facilities in the Valley that utilized a fuel other than natural gas for their turbines in 2011. Each of those facilities operates on natural gas the majority of the time and operates on an alternate fuel part-time. Three of those facilities fired on diesel gas, while the other two operated on digester gas. Due to California Diesel Fuel requirements, the diesel facilities in the Valley are limited to a sulfur content of 0.0016 lb-SO₂/MMBtu. PUC-quality natural gas typically has a sulfur content of 0.00285 lb-

²³ Letter from R. Bell, Air Quality District Manager, Shasta County Air Quality Management District, to R. Bennett, Safety & Environmental Coordinator, Redding Electric Utility, June 23, 2005.

²⁴ Kathleen Truesdell. (January 2011). *Final Determination of Compliance: Oakley Generating Station*. San Francisco, CA: Bay Area Air Quality Management District.

²⁵ Kathleen Truesdell. (January 2011). *Final Determination of Compliance: Oakley Generating Station*. San Francisco, CA: Bay Area Air Quality Management District.

SO₂/MMBtu and digester turbines are limited to 0.016 lb-SO₂/MMBtu per District permits' requirements. By comparison, the Subpart KKKK limit is much higher at 0.060 lb-SO₂/MMBtu and all of the units in the Valley are achieving much lower SO₂ limits. Adding a SO₂ limit similar to Subpart KKKK to the rule will not foster additional emissions reductions for Valley facilities.

PM_{2.5}

PM_{2.5} reduction technologies for turbines were also researched in an effort to conduct a PM_{2.5} technology cost effectiveness analysis. Post-combustion controls, including baghouses, electrostatic precipitators, and scrubbers were examined since these technologies can be used to remove PM_{2.5} emissions from exhaust gas streams

As previously mentioned, every unit in the Valley subject to Rule 4703 operated on strictly natural gas, with the exception of 5 facilities that operated on an alternate fuel part-time in 2011. Based on District Permits records and information in the BAAQMD FDOC for the Oakley Generating Station, electrostatic precipitators, baghouses, and scrubbers have not been achieved-in-practice for natural gas-fired turbines. These devices are normally used on solid fuel fired sources or others with high PM emissions, and are not used in natural gas-fired applications, which have inherently low PM emissions. The District is not aware of any gas turbine that has ever been required to use add-on controls such as these. BAAQMD reviewed the EPA BACT/LAER Clearinghouse and confirmed that EPA has no record of any post-combustion particulate controls that have been required for natural gas-fired gas turbines.²⁶

Furthermore, these devices would not be technologically feasible to implement for certain facilities. As noted in the BAAQMD FDOC, if add-on control equipment were installed, it would create significant backpressure that would significantly reduce the efficiency of a power plant and would cause more emissions per unit power produced. Moreover, these devices are designed to be applied to emissions streams with far higher particulate emissions, and they would have very little effect on the low-PM emissions streams from natural gas-fired facilities in further reducing PM emissions.²⁷ It takes an emissions stream with a much higher grain loading for these types of abatement devices to operate efficiently. This low level of abatement efficiency (if any) also means that these types of control devices would not be cost effective, even if they could feasibly be applied to this type of source. For these reasons, post-combustion particulate control equipment is not technologically feasible for units subject to Rule 4703.

²⁶ Kathleen Truesdell. (January 2011). *Final Determination of Compliance: Oakley Generating Station*. San Francisco, CA: Bay Area Air Quality Management District.

²⁷ Kathleen Truesdell. (January 2011). *Final Determination of Compliance: Oakley Generating Station*. San Francisco, CA: Bay Area Air Quality Management District.

As previously mentioned, SCAQMD is currently funding a research project that will study and demonstrate the feasibility of control technologies to reduce PM_{2.5} and ultrafine particulate emissions from natural gas-fired turbine power plants. Sulfur removal and the EMx multi-pollutant control system are the two technologies which were selected for demonstration. The findings of this report could potentially be beneficial for evaluating the cost effectiveness and feasibility of applying these emerging technologies to turbines in future rule-amending projects.

At this time, the District's analysis indicates that there are no feasible opportunities for additional emission reduction regulatory strategies for this source category.

Risk-based Strategy Analysis

The emissions from units subject to Rule 4703 contribute 6.6% of average winter NO_x, 5.1% of average winter SO_x, and 2.8% of average winter PM_{2.5} emitted from stationary and area sources in the 2012 emission inventory. These units are primarily fired on PUC-quality natural gas, which is generally considered a clean burning fuel with low SO_x and PM emissions. Overall, Rule 4703 has significantly reduced NO_x and SO_x emissions from these units and has assisted in reducing PM_{2.5} concentrations through reductions of these key precursors.

Control Measure Commitments

The following is a summary of recommended commitments for Rule 4703.

Regulatory Action

The District's analysis did not identify any additional technologically feasible and cost effective potential controls. Therefore, there are no recommendations for additional regulatory actions for Rule 4703.

Incentive Action

Stationary gas turbines subject to Rule 4703 are regulated units that have been subject to several generations of regulations; as such, the opportunities for incentive programs are minimal. There are no recommendations for incentive actions at this time.

Technology Advancement Action

There are no recommendations for a new technology advancement project specific to units subject to Rule 4703. Through its Technology Advancement Program, the District will continue to seek potential feasible and low-cost technologies that may provide for additional emission reduction opportunities in this category.

Policy Initiatives

The District's current legislative platform includes support for the increased development and use of cleaner-burning fuels. The recommendation is to continue supporting the current legislative platform but there are no recommendations for new policy initiatives at this time because the rule already requires the use of the most effective emission control technologies.

Education and Outreach

The District currently provides a robust education and outreach program for regulated sources through the Small Business Assistance program, Permit Stakeholder Meetings, Compliance Assistance Bulletins, and public notices for public workshops and public hearings. The District does not have recommendations for new education and outreach efforts for these sources. The District will continue to work closely with affected sources to ensure successful compliance.

D.2 INDUSTRIAL PROCESSES

The San Joaquin Valley air basin (Valley) is home to a wide range of industries and industrial processes. The industrial sector is a vital contributor to the health of the Valley's economy, and has made important contributions to air quality improvement. Whether coming under regulation for the first time or having undergone several generations of retrofit rules, the reductions achieved represent significant investments of finances and energy.

While the broad category of Industrial Processes includes many source categories, for the purposes of this appendix, this discussion is limited to the reduction of animal matter, flares, lime kilns, activities involving sulfur, and glass melting furnaces. Other industry groups and technologies addressed in this plan but not addressed in this section are discussed in other parts of this appendix.

The control measure source categories discussed in this section affect several industries in the Valley including, but not limited to the glass and related products, manufacturing, food and agricultural material processing, acid plants, oil and gas production, sewage treatment, landfills, incinerators, and petroleum refining industries.

Existing Control Strategies

Due to the degree of difficulty and enormity of the challenge that the Valley faces in meeting the National Ambient Air Quality Standards (NAAQS), the District recognizes that prohibitory rules alone are not enough to reduce emissions to meet attainment requirements and protect public health. The District's longstanding, progressive strategy for reducing emissions is a multifaceted effort that includes incentive programs and policy initiatives in addition to prohibitory rules. The following discussion summarizes both the existing District efforts to reduce emissions from this source category, and evaluations for potential opportunities for further emissions reductions.

Incentive Programs

Incentive programs are an integral part of the emission reduction efforts of the District, especially where the District lacks direct jurisdiction in establishing emission control requirements. The emission units within the Industrial Processes category are located at stationary sources and are subject to rules that have undergone several amendments and continue to be some of the most stringent rules in the nation; opportunities for incentive programs for units subject to these rules are minimal. The District is not currently implementing incentive programs specific to units used in industrial processes subject to rules in this category.

Policy Initiatives

Similar to the Incentive Programs, the District's policies and Legislative Platform are important components to the District's strategy to attain federal ambient air quality standards. The District utilizes policies and the legislative platform to bring attention to major issues that have a direct impact on the Valley's air quality. The District does not

currently have a portion of the legislative platform dedicated specifically to this control measure source category.

Rules and Regulations

The following is a list of rules specific to the Industrial Processes category. Each of the following rules will be evaluated to examine potential opportunities for additional emissions reductions.

Table D-7 Current Industrial Process Rules

Rule	Last Amended/ Adopted
Rule 4104 Reduction of Animal Matter	12/17/1992
Rule 4311 Flares	06/18/2009
Rule 4313 Lime Kilns	03/27/2003
Rule 4354 Glass Melting Furnaces	05/15/2011
Rule 4802 Sulfuric Acid Mist	12/17/1992

D.2.1 Rule 4104 Reduction of Animal Matter

Source Category

Rule 4104 is applicable to any source operation used for the reduction of animal matter, including rendering, cooking, drying, dehydration, digesting, evaporating, and protein concentration. Adopted on May 21, 1992 and amended for District rule number reorganization on December 17, 1992, Rule 4104 requires 100% VOC capture and a high level of destruction (1,200 degree for 0.3 seconds). Rule 4104 was adopted primarily to control pathogens.

Emission Inventory

Pollutant	2007	2012	2014	2015	2016	2017	2018	2019
<i>Annual Average - Tons per day</i>								
PM2.5	0.05	0.05	0.06	0.06	0.06	0.06	0.06	0.06
NOx	0	0	0	0	0	0	0	0
SOx	0.05	0.06	0.06	0.06	0.06	0.06	0.07	0.07
<i>Winter Average - Tons per day</i>								
PM2.5	0.05	0.05	0.06	0.06	0.06	0.06	0.06	0.06
NOx	0	0	0	0	0	0	0	0
SOx	0.05	0.06	0.06	0.06	0.06	0.06	0.07	0.07

Regulatory Evaluation

How does District Rule 4104 compare with federal rules and regulations?

No applicable federal standards and guidelines, such as Control Techniques Guidelines (CTG), Alternative Control Techniques (ACT), New Source Performance Standards (NSPS), National Emission Standards for Hazardous Air Pollutants (NESHAP), and Maximum Achievable Control Technology (MACT) requirements have been identified for this source category.

How does District Rule 4104 compare to rules in other air districts?

Rule 4104 is as stringent or more stringent than the following similar regulations in other air districts in California: SCAQMD Rule 472 (Reduction of Animal Matter); BAAQMD Regulation 12 Rule 2 (Rendering Plants); SMAQMD Rule 410 (Reduction of Animal Matter); and VCAPCD Rule 58 (Reduction of Animal Matter).

EPA finalized approval for Rule 4104 on March 9, 2010 and deemed this rule RACT. There are no animal rendering Best Available Control Technology (BACT) guidelines that include any additional control technologies.

Emission Reduction Opportunities

Facilities generally use steam from a boiler (indirect-fired) or a rotary dryer (direct-fired) for their operations; NO_x emissions are generated from these combustion units. Combustion units are regulated by other District rules; as such, those emissions are accounted for as a part of, and controlled by other District rules.

Rule 4104 effectively controls emissions from units subject to this rule, this effectiveness limits opportunities for additional emission reduction opportunities. The emission control equipment generally includes a condenser for VOC control, and a venturi scrubber or cyclone, followed by either a packed bed scrubber or a thermal oxidizer. Blood drying facilities have additional processes controlled by cyclones and a baghouse. For the sake of thoroughness, the District analyzed the potential of packed bed scrubbers and regenerative thermal oxidizers to further reduce emissions from units subject to Rule 4104.

Packed Bed Scrubbers

The potential opportunity to reduce emissions if facilities were to replace their thermal oxidizers with packed bed scrubbers is analyzed in the following discussion. In certain installations, packed bed scrubbers may be more efficient at removing PM from the exhaust and additionally do not create NO_x or SO_x. However, determining the scrubber medium may take some experimenting to ensure it does not cause an increase in emissions or violate other District rules. It would also need to be replaced periodically, adding to the cost of upkeep. Thermal oxidizers do not present similar issues. Also, facilities subject to Rule 4104 produce only a very small amount of directly emitted PM_{2.5} and are otherwise already required to have a high level of control for emissions. Therefore, the current requirements are as stringent as possible for these types of facilities.

Regenerative Thermal Oxidizers

The potential opportunity to reduce emissions from facilities by replacing thermal oxidizers with regenerative thermal oxidizers (RTO) with heat recovery, which is a current practice in place at some facilities in the Valley, is also considered for this analysis. RTO devices use less supplementary fuel. While using less fuel may reduce NO_x emissions, this is not necessarily the case. The PM control efficiency is nearly the same for both thermal oxidizers and RTOs and the total NO_x emissions from this category is relatively small given that there are only a few units subject to this rule that are not already subject to other combustion rules limiting NO_x emissions. Any new units would be evaluated through the District's Best Available Control Technology New Source Review requirements.

There are no feasible opportunities for additional emission reduction regulatory strategies for this source category. The District will continue to evaluate the potential for additional emissions reductions from this source category through future plan development projects.

Risk-based Strategy Analysis

The emissions from this source category contribute 0.7% of average winter SO_x, and 0.1% of average winter PM_{2.5} emitted from stationary and area sources in the 2012 emission inventory. The emissions from this source category are relatively small contributors to the Valley inventory throughout the year; the emissions are consistent and have no elevated emission levels in the winter months.

Control Measure Commitments

The following is a summary of recommended commitments for Rule 4104.

Regulatory Action

The District's analysis did not identify any additional technologically feasible and cost effective potential controls. Therefore, there are no recommendations for additional regulatory actions for Rule 4104.

Incentive Action

There are no recommendations for incentive actions for this source category at this time.

Technology Advancement Action

There is no recommendation for a new technology advancement project for units subject to Rule 4104. Through its Technology Advancement Program, the District will continue to seek potential feasible and low-cost technologies that may provide for additional emission reduction opportunities in this category.

Policy Initiatives

The District does not currently have any policy initiatives specific to units subject to this rule. There are no recommendations for new policy initiatives specific to these units.

Education and Outreach

The District currently provides a robust education and outreach program for regulated sources through the Small Business Assistance program, Permit Stakeholder Meetings, Compliance Assistance Bulletins, and public notices for public workshops and public hearings. There are no recommendations for additional education and outreach efforts for these sources. The District will continue to work closely with affected sources to ensure successful compliance.

D.2.2 Rule 4311 Flares

Source Category

The purpose of Rule 4311 is to limit volatile organic compounds (VOC), NO_x, and SO_x emissions from any operation involving the use of flares, with the exception of a few types of sources identified in the rule. Flaring is a high temperature oxidation process used to burn combustible components, mostly hydrocarbons, of waste gases from industrial operations. The majority of waste gases flared are natural gas, propane, ethylene, propylene, butadiene and butane. During combustion, gaseous hydrocarbons react with atmospheric oxygen to form carbon dioxide (CO₂) and water. In some waste gases, carbon monoxide (CO) is the major combustible component. Flares generate air pollutants such as NO_x, sulfur dioxide, carbon monoxide, and particulate matter. Additionally, there is a possibility of release of hydrocarbons if they have not been completely combusted, seen by the naked eye as smoke. Complete combustion requires proper mixing of air and waste gas. There are two general types of flares, open and enclosed flares. Flares are further categorized by the height of the flare tip, and by the method of enhancing combustion by mixing at the flare tip (i.e., steam-assisted, air-assisted, pressure assisted, or non-assisted). Elevated flares are more common and have larger capacity than ground flares. Flares are normally used to dispose of low volume continuous emissions, but are designed to handle large quantities of waste gases associated with plant emergencies. Flare gas volumes can vary from a few cubic meters per hour during regular operations up to several thousand cubic meters per hour during major upsets.

This rule was originally adopted June 2002 to establish flaring requirements and reduce emissions from flares, and has been amended twice since then. The most recent amendment was made in September 2009 to incorporate requirements for flare minimization plans and to make existing requirements for sulfur emissions more stringent. EPA finalized approval for the most recent amendments to Rule 4311 on November 3, 2011 and deemed this rule as meeting established RACT standard requirements.

Emission Inventory

Pollutant	2007	2012	2014	2015	2016	2017	2018	2019
Annual Average - Tons per day								
PM2.5	0.12	0.13	0.13	0.13	0.14	0.14	0.14	0.14
NOx	0.38	0.38	0.39	0.39	0.39	0.39	0.39	0.39
SOx	0.24	0.25	0.26	0.26	0.26	0.26	0.26	0.27
Winter Average - Tons per day								
PM2.5	0.12	0.13	0.13	0.13	0.14	0.14	0.14	0.14
NOx	0.38	0.38	0.39	0.39	0.39	0.39	0.39	0.39
SOx	0.24	0.25	0.26	0.26	0.26	0.26	0.26	0.27

Regulatory Evaluation**How does District Rule 4311 compare with federal rules and regulations?**

Rule 4311 is as stringent as or more stringent than the two New Source Performance Standards (NSPS) that are applicable to this source category, (40 CFR 60.18 – General Control Device Requirements and 40 CFR 65.147 – Flares). There are no applicable Control Techniques Guidelines (CTG), Alternative Control Techniques (ACT), National Emission Standards for Hazardous Air Pollutants (NESHAP) or Maximum Achievable Control Technology (MACT) requirements for this source category.

How does District Rule 4311 compare to rules in other air districts?

The standards of Rule 4311 were compared to rules for similar source categories in other air districts in California, and determined to be as stringent, or more stringent, than other air districts' rules for flaring activities. Specifically, this rule was compared to the following rules: SCAQMD Rule 1118 (Emissions from Refinery Flares); BAAQMD Regulation 12 Rule 11 (Flare Monitoring at Petroleum Refineries); BAAQMD Regulation 12 Rule 12 (Flares at Petroleum Refineries); and Santa Barbara County Air Pollution Control District Rule 4359 (Flares and Thermal Oxidizers). SMAQMD and VCAPCD do not have flare specific prohibitory rules.

Rule 4311 was found to be more stringent than the flare rules in other districts in that Rule 4311 is applicable to any operation that uses flares, while other districts limit applicability to oil and gas production, petroleum refineries, natural gas services, and similar industries. Additionally, Rule 4311 does not have as many exemptions as other air districts, for example Santa Barbara's rule has exemptions for the burning of sulfur in the manufacturing of sulfur compounds while District Rule 4311 does not contain these exemptions. Similarities between Rule 4311 and the flare rules in other districts include the requirement to submit and maintain flare minimization plans, monitoring, recordkeeping, and reporting requirements, and NOx and VOC emissions standards for ground-level enclosed flares.

Emission Reduction Opportunities

Rule 4311 is one of the most stringent rules in the nation for flaring activities, and was approved by EPA into the California State Implementation Plan (SIP) as meeting RACT requirements in November 2011. Overall, additional opportunities to further reduce emissions from flares and flaring activities in the Valley were not identified. The November 2011 EPA technical support document (TSD) for the approval of the 2009 amendments to Rule 4311 includes recommendations by EPA for exploring additional recordkeeping and monitoring requirements. A thorough analysis was performed of the recordkeeping and monitoring requirements during the rule-amending project, as discussed in the final draft staff report for the adopted rule. Existing recordkeeping and monitoring requirements are appropriate for facilities in the Valley to demonstrate compliance with rule requirements. No emission reductions, or other benefits to air quality, would result from amending the recordkeeping and monitoring requirements. Additionally, the EPA recommendations are not RACT requirements as demonstrated by EPA's approval of the rule into the SIP as RACT. The 2011 EPA TSD also recommended the District consider creating a separate rule for refinery and non-refinery flare rules. Both types of flares are included in the current version of District Rule 4311. No emission reductions would be gained by the bifurcation of the existing rule; therefore, bifurcation is not recommended as a part of this plan.

Sections 6.2.2 and 6.2.3 of Rule 4311 require facilities subject to flare minimization plans (FMP) to submit annual reports to the District with "Reportable Flaring Event" and "Annual Monitoring Report" data by a July 31, 2012 deadline. Analysis of the submitted data and comparisons of that data against the submitted FMPs will provide an opportunity to evaluate potential emission reduction opportunities from this category.

Risk-based Strategy Analysis

The emissions from units subject to Rule 4311 contribute 0.8% of average winter NO_x, and 3.0% of average winter SO_x emitted from stationary and area sources in the 2012 emission inventory. The emissions from this source category are a relatively small contributor to overall Valley emissions throughout the year, with no elevated emission levels in the winter months. Emissions from this category are well-controlled through existing Rule 4311 requirements.

Control Measure Commitments

The following is a summary of recommended commitments for Rule 4311.

Regulatory Action

The District's analysis did not identify any additional technologically feasible and cost effective potential controls. Therefore, there are no recommendations for additional regulatory actions for Rule 4311. EPA comments presented in the November 2011 TSD regarding additional recordkeeping and monitoring requirements will be re-evaluated as appropriate the next time that Rule 4311 is amended.

Further study of the FMPs and annual reportable flaring event data and the annual monitoring report data to determine if there are any opportunities to reduce additional emissions from facilities subject to Rule 4311 is recommended.

Incentive Action

Facilities that use flares are regulated sources that have been subject to several generations of rules, and Rule 4311 is one of the most stringent rules in the nation for flaring activities, which minimizes opportunities for incentive actions. There are no recommendations for incentive actions at this time.

Technology Advancement Action

There is no recommendation for a new technology advancement project for units subject to Rule 4311. Through its Technology Advancement Program, the District will continue to seek potential feasible and low-cost technologies that may provide for additional emission reduction opportunities in this category.

Policy Initiatives

The District is not currently supporting any policy initiatives specific to flares, and there are no recommendations for new policy initiatives for these sources.

Education and Outreach

The District currently provides a robust education and outreach program for regulated sources through the Small Business Assistance program, Permit Stakeholder Meetings, Compliance Assistance Bulletins, and public notices for public workshops and public hearings. No new education and outreach efforts are recommended for these sources at this time. The District will continue to work closely with affected sources to ensure successful compliance.

D.2.3 Rule 4313 Lime Kilns

Source Category

Rule 4313 limits NOx emissions from the operation of lime kilns. Lime kilns are used in a variety of manufacturing and processing operations, including food and agriculture. There are currently no lime kilns currently operating in the Valley. There were a total of three lime kilns in the Valley, used at two sugar processing plants; however, these plants have been non-operational since 2008.

Emission Inventory

Pollutant	2007	2012	2014	2015	2016	2017	2018	2019
<i>Annual Average - Tons per day</i>								
PM2.5	0	0	0	0	0	0	0	0
NOx	0	0	0	0	0	0	0	0
SOx	0	0	0	0	0	0	0	0
<i>Winter Average - Tons per day</i>								
PM2.5	0	0	0	0	0	0	0	0
NOx	0	0	0	0	0	0	0	0
SOx	0	0	0	0	0	0	0	0

Regulatory Evaluation

There are no opportunities for reduced emissions in the Valley from this source category; there are no lime kilns operating in the Valley.

Emission Reduction Opportunities

There are no opportunities for reducing emissions in the Valley from this source category. If an operator were to bring a lime kiln to the Valley with the intention of operating it, that lime kiln would be subject to District Rules 2201 (New and Modified Stationary Source Review Rule), and 4001 (New Source Performance Standards), among others, and would be required to meet District Best Available Control Technology (BACT) requirements.

Risk-based Strategy Analysis

No health risks are associated with lime kilns in the Valley.

Control Measure Commitments

There are no recommendations for future control measure commitments for Rule 4313.

D.2.4 Rule 4354 Glass Melting Furnaces

Source Category

The provisions of Rule 4354 are applicable to glass melting furnaces in the Valley. There are seven glass-making facilities with a total of 13 glass-melting furnaces subject to Rule 4354 in the Valley. Industrial glass making is a continuous process with raw materials supplied to the furnace at the front end, and product taken off the line at the back end of the process. The raw materials for making glass are silica sand and soda ash. Melting these basic materials and forming them into the desired product geometry creates the final glass product. The different end products vary widely in raw material additives, processing equipment and conditions, and product quality requirements.

Rule 4354 was adopted September 14, 1994 and has been subsequently amended six times. This rule is one of the most stringent rules of its kind in the nation, and is successful in limiting NO_x, SO_x, volatile organic compounds (VOC), carbon monoxide (CO), and PM emissions from glass melting furnaces. Rule 4354 was amended September 16, 2010 to strengthen NO_x limits in the rule; EPA finalized approval for these amendments on August 29, 2011 and deemed this rule as RACT. Rule 4354 was subsequently amended again in May 19, 2011 to implement updated start-up requirements; EPA proposed approval of these amendments on November 5, 2012. As a result of this stringent prohibitory rule and continuing efforts on behalf of this industry to reduce emissions, the Valley is home to glass-making facilities with glass melting furnaces that utilize the most advanced low-NO_x firing technology.

Emission Inventory

Pollutant	2007	2012	2014	2015	2016	2017	2018	2019
<i>Annual Average - Tons per day</i>								
PM2.5	0.60	0.45	0.47	0.48	0.49	0.50	0.51	0.51
NO _x	7.75	6.13	4.02	4.12	4.22	4.31	4.35	4.39
SO _x	3.04	1.86	1.80	1.82	1.85	1.87	1.88	1.89
<i>Winter Average - Tons per day</i>								
PM2.5	0.60	0.45	0.47	0.48	0.49	0.50	0.51	0.51
NO _x	7.75	6.12	4.02	4.12	4.21	4.31	4.35	4.39
SO _x	3.04	1.85	1.80	1.82	1.85	1.87	1.88	1.89

Regulatory Evaluation

How does District Rule 4354 compare with federal rules and regulations?

This rule is more stringent than federal rules and regulations. This rule was compared to the following federal rules and regulations: federal Alternative Control Techniques (ACT) (EPA-435/R-94-037 – Alternative Control Techniques Document – NO_x Emissions from Glass Manufacturing); the one National Emission Standard for Hazardous Air Pollutants (NESHAP) that is applicable to glass melting furnaces (40

CFR 61 Subpart N (National Emission Standard for Inorganic Arsenic Emissions from Glass Manufacturing Plants); the following two Maximum Achievable Control Technology (MACT) standards, 40 CFR 63 Subpart NNN (National Emission Standards for Hazardous Air Pollutants for Wool Fiberglass Manufacturing Plants), and 40 CFR 63 Subpart SSSSSS (National Emission Standards for Hazardous Air Pollutants for Glass Manufacturing Area Sources). There is no Control Techniques Guidelines (CTG) for this source category.

How does District Rule 4354 compare to rules in other air districts?

The emission limits of Rule 4354 depend on the type of glass produced, furnace firing technology and the emission-averaging period. Evaluation of glass melting prohibitory rules in other air districts in California revealed that this rule is more stringent than equivalent rules in other air districts. Rules evaluated include SCAQMD Rule 1117 (Emissions of Oxides of Nitrogen from Glass Melting Furnaces) and BAAQMD Regulation 9 Rule 12 (Nitrogen Oxide Emissions from Glass Melting Furnaces). VCAPCD and SMAQMD do not have a specific prohibitory rule for this source category.

Emission Reduction Opportunities

Rule 4354 is among the most stringent rules in the nation for glass melting furnaces. The NO_x emission limits contained within Rule 4354 require the installation of the best available NO_x technology (i.e. oxy-fuel firing or SCR systems), with a compliance deadline of January 1, 2014; there are no feasible opportunities to further reduce NO_x emissions from glass melting furnaces at this time.

District staff considered lowering the existing SO_x limits for container plants from current limits of 0.9 and 1.1 lbs of SO_x per ton of glass depending on cullet content to the District Best Available Control Technology (BACT) limit of 0.8 lbs/ton. The analysis below indicates that it is not reasonably feasible to reduce SO_x limits from RACT levels to BACT levels.

The glass container industry is mandated by the State of California to use a minimum quantity of recycled glass (cullet) as part of the production process. The quantity of clear glass cullet available to glass manufacturers is very limited; therefore, cullet with a large portion of colored glass is included in each batch. The continued use of mixed color cullet is critically important to meeting California's recycling goals. Due to the variable quality of mixed color cullet, SO_x emissions produced by the melting of recycled cullet are also variable. Container glass manufacturers control multiple furnaces as a single unit, meaning that the exhaust from multiple furnaces are ducted together and the total emissions are averaged over the total amount of glass pulled from all furnaces. Because emissions are averaged across furnaces, EPA requires that there be a 10% air quality benefit, meaning that the overall limit for multiple furnaces be 10% less than the limit for a single furnace. This imposes the lowest SO_x emission limit on container glass furnaces, but allows operators to install one control device per facility rather than one add-on control device per furnace. SO_x emissions limits for container glass were adopted at 1.1 pounds per ton of glass produced if the operator uses at least

25% by weight of mixed color cullet and a limit of 0.9 pounds per ton of glass produced for all other container glass manufacturing. If the District were to lower the limits in the rule to the BACT limit of 0.8 lbs/ton, then the 10% required air quality benefit for multiple furnaces extend beyond BACT, which is not feasible. The 0.8 lbs/ton BACT limit is equivalent to the 0.9 lbs/ton limit with the additional EPA required 10% air quality benefit.

At this time, the District's analysis indicates that there are no feasible opportunities for additional emission reduction regulatory strategies for this source category.

Risk-based Strategy Analysis

The emissions from units subject to Rule 4354 contribute 12.6% of average winter NO_x, and 22.5% of average winter SO_x emitted from stationary and area sources in the 2012 emission inventory. Emissions from this source are consistently emitted throughout the year with no peak emission in winter months. NO_x emissions from these sources have been significantly reduced through this rule, which is one of the most stringent rules in the nation.

Control Measure Commitments

The following is a summary of recommended commitments for Rule 4354.

Regulatory Action

The District's analysis did not identify any additional technologically feasible and cost effective potential controls. Therefore, there are no recommendations for additional regulatory actions for Rule 4354.

Incentive Action

There are no technologies that could reduce emissions beyond that already required in the rule and achieved by facilities; therefore, there are no recommendations for incentive actions for glass melting furnaces.

Technology Advancement Action

There is no recommendation for a new technology advancement project for units subject to Rule 4354. Through its Technology Advancement Program, the District will continue to seek potential feasible and low-cost technologies that may provide for additional emission reduction opportunities in this category.

Policy Initiatives

The District does not currently support any legislative activities specific to glass melting operations; there are no recommendations for new policy initiatives at this time.

Education and Outreach

The District currently provides a robust education and outreach program for regulated sources through the Small Business Assistance program, Permit Stakeholder Meetings, Compliance Assistance Bulletins, and public notices for public workshops and public hearings. The District does not have recommendations for new education and outreach efforts for these sources. The District will continue to work closely with affected sources to ensure successful compliance.

D.2.5 Rule 4802 Sulfuric Acid Mist

Source Category

The purpose of Rule 4802 is to limit sulfuric acid emissions from any sulfuric acid production unit that was constructed or modified before August 17, 1971. The rule was adopted on May 21, 1992 and applies to only one facility in the Valley. The EPA approved Rule 4802 into the SIP on June 8, 1999.²⁸ District Rule 4802 limits sulfuric acid mist to 0.30 pounds per short ton of acid produced.

Emission Inventory

Pollutant	2007	2012	2014	2015	2016	2017	2018	2019
<i>Annual Average - Tons per day</i>								
PM2.5	0.0004	0.0003	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004
NOx	0.027	0.022	0.022	0.022	0.023	0.023	0.023	0.024
SOx	0.95	0.76	0.78	0.79	0.79	0.81	0.81	0.83
<i>Winter Average - Tons per day</i>								
PM2.5	0.0004	0.0003	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004
NOx	0.027	0.022	0.022	0.022	0.023	0.023	0.023	0.024
SOx	0.95	0.76	0.77	0.78	0.79	0.80	0.81	0.83

Regulatory Evaluation

How does District Rule 4802 compare with federal rules and regulations?

The rule reflects conformance with 40 CFR Part 60.30d Subpart Cd—Emissions Guidelines and Compliance Times for Sulfuric Acid Production Units (Part 60 of the CFS is Standards of Performance for New Stationary Sources (NSPS)), which sets emission limits for sulfuric acid mist at 0.5 pounds per ton of acid produced for sulfuric acid production plants operating before August 17, 1971.

There is one sulfuric acid plant in the Valley; this plant has been in operation since before August 17, 1971, and it is subject to the requirements of District Rule 4802. 40 CFR Part 60.30d Subpart Cd—Emissions Guidelines and Compliance Times for Sulfuric Acid Production Units establishes emission limits for such sulfuric acid plants. 40 CFR Part 60.80 Subpart H—Standards of Performance for Sulfuric Acid Plants, sets emission limits for sulfuric acid plants constructed or modified after August 17, 1971. There are no other federal guidelines, including Control Techniques Guidelines (CTG), Alternative Control Technology (ACT), Maximum Achievable Control Technology (MACT), and National Emission Standards for Hazardous Air Pollutants (NESHAP), that apply to the control of sulfuric acid mist. The Best Available Control Technology (BACT)

²⁸ (1999, June 8). *Approval and Promulgation of Implementation Plans; California State Implementation Plan Revision, South Coast Air Quality Management District, San Joaquin Valley Unified Air Pollution Control District, Siskiyou County Air Pollution Control District, and Bay Area Air Quality Management District*, 64 Fed. Reg. 109, pp. 30396–30398. (to be codified at 40 CFR Part 52)

determination for controlling sulfuric acid mist involves the use of candle filters (fiber bed mist eliminators), which reduce emissions to 0.10 pounds per ton of 100% sulfuric acid when measured as a three-hour average.

How does District Rule 4802 compare to rules in other air districts?

BAAQMD Regulation 9, Rule 1 (Sulfur Dioxide), regulates all sulfur dioxide emissions including sulfuric acid mist plants constructed or modified after August 17, 1971; the rule limits emissions from any source in the sulfuric acid plant effluent process gas containing sulfur dioxide in excess of 300 ppm by volume calculated at 12% oxygen. BAAQMD's Regulation 12, Rule 6 (Acid Mist from Sulfuric Acid Plants) requires that an operator not emit from a sulfuric acid production unit gases which contain acid mist expressed as H₂SO₄ in excess of 0.15 g per kg (0.3 lb/T) of acid produced. No other district-specific rules were indicated. SCAQMD Rule 469 (Sulfuric Acid Units) has the same limit as District Rule 4802. Both SMAQMD and VCAPCD regulate sulfuric acid mist through their new source review process, but do not have specific sulfuric acid mist rules.

Emission Reduction Opportunities

Only one facility in the Valley—a sulfuric acid plant—is subject to Rule 4802 (Sulfuric Acid Mist). This facility was in operation before 1971 and is limited by this rule to 0.30 pounds of acid mist per ton of acid produced. The facility uses a mist eliminator to remove fine particles from the acid gas stream, which has been determined to meet BACT requirements. By definition of Rule 4802, no new facility within the Valley will be subject to this rule. Instead, all new facilities would be subject to Rule 2201 (New and Modified Stationary Source Review Rule) and would be required to implement BACT level controls.

An identified potential opportunity to reduce emissions from this source category would be to reduce the allowed limit for sulfur emissions from 0.30 pounds per ton produced to 0.1 pound per ton produced, consistent with EPA's BACT determination. Source tests conducted in 2010 and 2011 at the single facility permitted under Rule 4802, showed an actual sulfuric acid mist emission rate of 0.09 pound per ton using existing technology. Hence, the facility is meeting the current national BACT standard with the most advanced technology currently available and enforced through existing permit requirements, despite the fact that their current permit and Rule 4802 do not set that requirement. Therefore, the District has determined that there are no potential opportunities to further reduce emissions from this source category.

Risk-based Strategy Analysis

The emissions from this source category contribute 9.2% of average winter SO_x emitted from stationary and area sources in the 2012 emission inventory. As demonstrated in the emission inventory table above, these emissions are consistent throughout the year with no elevated emission levels in winter months.

Control Measure Commitments

The following is a summary of recommended commitments for Rule 4802.

Regulatory Action

The District's analysis did not identify any additional technologically feasible and cost effective potential controls. Therefore, there are no recommendations for additional regulatory actions for Rule 4802.

Incentive Action

The one unit subject to Rule 4802 is currently a regulated source that has been subject to this rule since 1992 and no new technologies were identified to further reduce emissions. There are no recommendations for incentive actions at this time.

Technology Advancement Action

There is no recommendation for a new technology advancement project for units subject to Rule 4802. Through its Technology Advancement Program, the District will continue to seek potential feasible and low-cost technologies that may provide for additional emission reduction opportunities in this category.

Policy Initiatives

The District is not currently supporting any policy initiatives specific to sulfuric acid mist operation and there are no recommendations for new policy initiatives for these sources.

Education and Outreach

The District currently provides a robust education and outreach program for regulated sources through the Small Business Assistance program, Permit Stakeholder Meetings, Compliance Assistance Bulletins, and public notices for public workshops and public hearings. No new education and outreach efforts are recommended for these sources at this time. The District will continue to work closely with affected sources to ensure successful compliance.

D.3 MANAGED BURNING

Managed burning is the controlled burning of materials. There are three types of managed burning that occur in the Valley including open burning of agricultural materials, hazard reduction burning, and prescribed burning. This managed burning control measure source category affects burning and disposal activities conducted by the agricultural industry, residents in the wildland/urban interface, and land management agencies operating on the San Joaquin Valley floor and within the National Parks and Forests.

For many years, the District managed the smoke impacts from the open burning of agricultural materials through a system of county-wide burn/no burn days. In 2004, the District established the Smoke Management System (SMS), a more refined method of authorizing or prohibiting individual burns, based on modeled smoke impacts. The SMS user considers projected meteorological conditions and air quality forecasts to determine the allowable amount and location of agricultural burning. Properly managed burning allocations under the existing District SMS ensures that air quality and health impacts of open burning of agricultural materials are minimized to the fullest extent, reducing public exposure to smoke and contributing to improvements to general air quality in the Valley. Under the SMS, agricultural burning is prohibited on days when an exceedance of a federal standard is forecast to occur. The implementation of the District's SMS, District Rule 4103 (Open Burning), and the use of sustainable agricultural practices have reduced the amount of materials being burned, thus resulting in reduced PM_{2.5} emissions.

Until recently, Land Management Agencies (LMAs) operated under a policy where naturally ignited wildfires (i.e. lightning strikes) were viewed as unhealthy and destructive for the ecosystem, and therefore were actively suppressed upon discovery. As this policy continued through the decades, the amount of fuel (dead plant materials, etc.) in the Sierra Nevada Mountains grew, which increased the likelihood of uncontrollable wildfires. It was later determined that fire is a natural part of the ecosystem, and that fire is necessary to reduce fuels on the forest floors to give space and a chance for new trees to grow, thus ensuring the health and continuity of the ecosystem. To achieve this, LMAs within the Valley currently conduct prescribed burning to reduce fuels in areas that are determined to be overgrown. Through these efforts, LMAs are able to burn on days when it is favorable from both meteorological and air quality considerations. Through District Rule 4106, a LMA must request authorization from the District before beginning a prescribed burn operation. This gives the District the discretion to not allow prescribed burning on days when dispersion and/or air quality is poor. This reduces emissions and protects public health by only allowing prescribed burning on days when smoke dispersion is favorable, thus reducing the chance for high concentrations of smoke to occur in nearby communities.

Similarly, hazard reduction burning occurs in communities that are within the wildland/urban interface, where homes and businesses in the foothills are often surrounded by dry brush. This fuel must be disposed of each year to ensure a barrier of fire protection of 100 feet in all directions, per Section 4291 of the California Public Resources Code. This disposal is usually in the form of burning, and as with prescribed burning, this is only allowed if the District forecasts favorable meteorological and air quality conditions.

Existing Control Strategies

Due to the degree of difficulty and enormity of the challenge that the Valley faces in meeting the National Ambient Air Quality Standards (NAAQS), the District recognizes that prohibitory rules alone are not enough to reduce emissions to meet attainment requirements and protect public health. The District's longstanding, progressive strategy for reducing emissions is a multifaceted effort that includes incentive programs and policy initiatives in addition to prohibitory rules. The following discussion summarizes both the existing District efforts to reduce emissions from this source category, and evaluations for potential opportunities for further emissions reductions.

Incentive Programs

Incentive programs are an integral part of the emission reduction efforts of the District, especially where the District lacks direct jurisdiction in establishing emission control requirements. The District is not currently implementing any incentive programs specific to this category. However, the District is actively seeking technology advancement projects to further develop low-emissions options for the handling of the wide variety of organic materials in the Valley.

Policy Initiatives

Similar to the Incentive Programs, the District's policies and Legislative Platform are important components to the District's strategy to attain federal ambient air quality standards. The District utilizes policies and the legislative platform to bring attention to major issues that have a direct impact on the Valley's air quality. The District's legislative platform currently includes the following items that are applicable to managed burning categories.

The biomass industry utilizes agricultural materials that would otherwise be burned using open burning methods. To maintain the viability of biomass power-generating plants, the District supports legislation that would provide for the continued operation of strategically located biomass facilities to provide disposal options for agricultural, urban, and forest wood materials. Subsidies and/or preferential utility rates for power produced from biomass can serve as measures to enhance the economic feasibility of this alternative.

Reducing wildfires and the resulting air pollutants requires a sustained and multi-faceted approach that employs effective measures to reduce fuel supplies and adequate resources to manage fires when they occur. Towards that end, the District supports

policies and initiatives that would encourage rapid disposal of the fuel supply, including the following:

- Additional financial and staffing resources for public and private land managers to conduct prescribed burning as an effective means for reducing fuel supplies that lead to large and uncontrollable wildfires.
- Additional resources to manage wildfires when they occur.
- Lessening or removal of contradictory environmental protection policies that prohibit the use of mechanized methods, or prescribed burning to reduce fuels when those are the only feasible methods available.
- Changes in the federal policies that better incorporate air quality concerns by shifting focus to prescribed burning and employing fire management techniques that reduce air quality impacts when wildfires occur.

Rules and Regulations

The following is a list of rules specific to the Managed Burning category. Each of the following rules will be evaluated to examine potential opportunities for additional emissions reductions.

Table D-8 Current Managed Burning Rules

Rule		Last Amended/ Adopted
Rule 4103	Open Burning	04/15/2010
Rule 4106	Prescribed Burning and Hazard Reduction Burning	06/21/2001

D.3.1 Rule 4103 Open Burning

Source Category

This source category includes the open burning of materials such as agricultural materials, diseased materials, and contraband materials, as well as fires set for fire department training purposes. Rule 4103 was originally adopted on June 18, 1992 and it has since been amended several times to incorporate state law requirements. The provisions of Rule 4103 apply to open burning conducted in the Valley, with the exception of prescribed burning and hazard reduction burning, as defined in Rule 4106 (Prescribed Burning and Hazard Reduction Burning).

Rule 4103 and the District's Smoke Management System (SMS) have reduced the total acreage of agricultural materials burned in the Valley by 80% since 2002. California Senate Bill (SB) 705 (2003, Florez; California Health and Safety Code Section (CH&SC) 41855.5 and 41855.6) established a schedule for specific types of agricultural materials to no longer be burned, but allowed some postponement of the phase-out where justified by technical and economic impediments. In an effort to implement SB 705 and enhance the procedures for open burn requests, in 2004 the District established the SMS, a more refined method of authorizing or prohibiting individual burns, based on modeled smoke impacts. Under the SMS, agricultural burning is prohibited on days when an exceedance of a federal standard is forecast to occur.

In 2010, the District evaluated each crop category identified in CH&SC Section 41855.5 to determine any technologically and economically feasible alternatives to open burning. After working extensively with stakeholders to understand viable alternatives to burning and associated costs, the District provided recommendations for allowing or prohibiting the open burning of agricultural material categories in the District's *2010 Final Staff Report and Recommendations on Agricultural Burning*. The District amended Rule 4103 in April 2010 to incorporate CH&SC requirements and require the District to review its determinations for any postponed crops and materials at least once every five years. EPA finalized approval for Rule 4103 on January 4, 2012 and deemed this rule as at least meeting RACT requirements. The District most recently re-evaluated the availability of alternatives to open burning in May 2012. The District found the recommendations for postponement of certain crop categories are still valid and submitted a report of those findings to ARB, of which they concurred.

Emission Inventory

Pollutant	2007	2012	2014	2015	2016	2017	2018	2019
Annual Average - Tons per day								
PM2.5	5.87	4.54	4.51	4.50	4.49	4.47	4.46	4.45
NOx	4.30	3.46	3.44	3.43	3.42	3.41	3.40	3.38
SOx	0.11	0.09	0.09	0.09	0.09	0.09	0.09	0.09
Winter Average - Tons per day								
PM2.5	9.32	6.67	6.63	6.61	6.59	6.57	6.55	6.53
NOx	6.84	5.07	5.04	5.02	5.01	4.99	4.97	4.96
SOx	0.17	0.13	0.13	0.13	0.13	0.13	0.13	0.13

Regulatory Evaluation**How does District Rule 4103 compare with federal rules and regulations?**

There are no specific federal guidelines for Open Burning in terms of New Source Performance Standards (NSPS), Control Techniques Guidelines (CTG), Maximum Achievable Control Technology (MACT) and National Emission Standards for Hazardous Air Pollutants (NESHAP).

How does District Rule 4103 compare to rules in other air districts?

No rules or Best Available Control Technology (BACT) guidelines in other California air districts are more stringent than the current Rule 4103. Rule 4103 sets the standard for agricultural burning programs, with extensive resources dedicated to implementing the District's smoke management program. Under Rule 4103 and the SMS, potential burning is evaluated and authorized only when the burning will not cause a significant impact on air quality.

The analogous rules of other California air districts evaluated for this plan include SCAQMD Rule 444 (Open Burning); BAAQMD Regulation 5 (Open Burning); SMAQMD Rule 407 (Open Burning); and VCAPCD Rule 56 (Open Burning).

Emission Reduction Opportunities

The District evaluated the feasibility and cost effectiveness of alternatives to burning in the *2010 Final Staff Report and Recommendations for Agricultural Burning (2010 Report)*. The District determined, and ARB concurred, that there were no economically feasible alternatives to open burning of certain crop categories as outlined in the 2010 Report; this conclusion was reaffirmed in the *2012 Update: Recommendations on Agricultural Burning (2012 Report)*.

Citrus Orchard Removal Threshold

The District has determined that citrus orchard removals less than 3,500 acres, under certain circumstances should still be allowed to burn when no other cost effective and feasible alternatives are available based on factors identified and discussed in length in the *2010 and 2012 Reports*. For the largest citrus growers (>3,500 acres), the District determined that it is economically feasible to send citrus orchard removal matter to biomass plants, as described in June 27, 2011 and October 12, 2012 letters to EPA that provided further clarification on this issue. Therefore, open burning of citrus orchard removals for large citrus growers (>3,500 acres) is not allowed. These determinations are based on the ability of large growers to provide a steady demand for chippers, the availability of chipping equipment, and the currently reduced supply of urban wood materials as fuel for biomass plants due to the economic downturn.

Open Burning

Burning of citrus orchard removal materials (less than 3,500 acres) is not automatically allowed, rather, each request to burn citrus orchard removals is evaluated on a case-by-case basis under the District's agricultural burn permit program, which does not allow burning if it will cause or contribute to the exceedance of air quality standards. To more specifically describe the criteria for case-by-case evaluations (and as described in the June 27, 2011 and October 12, 2012 letters to EPA), the District annually evaluates and determines the feasibility of further prohibiting open burning of these materials based on the availability of sufficient biomass capacity and economically feasible chipping services. As of July 2011, the prohibition threshold is established as citrus farms with a combined acreage of 3,500 acres or greater. Consistent with this criteria, any request (beyond the 15 acre allowance provided for all citrus orchard removals) from citrus farms to open burn orchard removals are evaluated on a case-by-case basis.

The following is a summary of the analysis the District used to make the citrus determinations; these contributing factors will be re-evaluated in 2015 as committed to in the 2010 Rule 4103 amendment.

Alternatives to Open Burning

The alternative to open-burning citrus orchard removal material is to chip the material and send it to biomass plant. Biomass plant capacity and the availability of economically feasible chipping services were evaluated in order to determine the feasibility of this alternative to open burning citrus orchard removals. Concerns raised in the *2010 Report* remain valid of whether or not biomass plants will accept citrus along with the additional processing and costs that are required to make the citrus chips acceptable as fuel, especially once the economy improves and construction material is more abundant.

- **Chipping.** The adobe soil in which citrus crops are usually grown is extremely difficult to remove from the extensive root system of citrus trees. Separating the roots from the trunk prior to chipping, as well as screening the chipped root material to remove excessive soil clumps all increase the costs associated with chipping citrus material.

- **Biomass.** Biomass facilities have a limited capacity for citrus orchard removals due to the composition of the citrus materials as discussed in detail in the *2010 Report*. In addition, ground citrus wood produces stringy material and takes longer to dry out enough to burn properly. As a result, biomass facilities which do accept citrus material will blend up to 30% of citrus material with other crops to promote better flow of the material through the equipment. There is uncertainty in the amount of citrus orchard removal biomass facilities will accept in the future as biomass facilities have not committed to burning a specific amount of agricultural material. As described in the *2012 Report*, there has not been a significant increase in biomass fuel consumption or storage capacity from the addition of new/converted facilities.

Previously, monetary incentives have also been provided to increase use of biomass and offset the cost of chipping services. However, these monetary incentive programs are short-term in nature, either because the program sunsets within a few years, funding for the program has to be re-appropriated, or funding per project is for a limited period. Funding previously available for chipping agricultural materials provided by the Natural Resources Conservation Service (NRCS) was discontinued in 2012, making it more cost prohibitive to completely prohibit open burning. Therefore, there are currently no long-term federal or state funding commitments for the operation of biomass facilities or development of alternatives to burning. The *2010 Report* specified that Rule 4103 is as stringent as economically and technologically feasible. Therefore, there are no additional identified opportunities for emissions reductions from this source category at this time. This category will be re-evaluated in 2015 as committed to in the 2010 Rule 4103 amendment.

Risk-based Strategy Analysis

The emissions from this source category contribute 10.0% of average winter NO_x, and 12.2% of average winter PM_{2.5} emitted from stationary and area sources in the 2012 emission inventory. District regulatory efforts have fostered significant reductions in emission from this source category. Although winter emissions are slightly elevated compared to summer emission levels, the District's Smoke Management System (SMS) prohibits agricultural burning on days when an exceedance of federal standards is forecast to occur, thus reducing potential public health impacts from this source category.

Control Measure Commitments

The following is a summary of recommended commitments for Rule 4103.

Regulatory Action

The District's analysis did not identify any additional technologically feasible and cost effective potential controls. Therefore, there are no recommendations for additional regulatory actions for Rule 4103. The District carefully manages agricultural burning with its SMS and continues to consider the economic feasibility of burning alternatives on a case-by-case basis and in accordance with the five year evaluation period outlined in Rule 4103.

Incentive Action

Over the past ten years, the Natural Resources Conservation Service (NRCS) has encouraged growers to chip or shred prunings from almond and walnut orchards by providing a cost-share basis through the Environmental Quality Incentives Program. According to conversations with NRCS staff, the program was not continued into 2012.

Technology Advancement Action

The District is currently funding a project through its Technology Advancement Program which will test a prototype device to reduce emissions from the burning of raisin trays. While this project, as well as many others, are in the process of developing alternatives to reduce emissions, it is still under evaluation and not yet commercially available.

There is no recommendation for a new technology advancement project for this source category. Through its Technology Advancement Program, the District will continue to seek potential feasible and low-cost technologies that may provide for additional emission reduction opportunities in this category.

Policy Initiatives

The District currently supports legislation that would provide for the continued operation of strategically located biomass facilities to provide disposal options for agricultural, urban, and forest wood waste. Subsidies and/or preferential utility rates for power produced from biomass can serve as measures to enhance the economic feasibility of this alternative. The recommendation is to continue supporting the current legislative platform but there are no recommendations for new policy initiatives at this time.

Education and Outreach

The District currently provides a robust education and outreach program for regulated sources through the Small Business Assistance program, Permit Stakeholder Meetings, Compliance Assistance Bulletins, and public notices for public workshops and public hearings. There are no recommendations for additional education and outreach efforts for Rule 4103 at this time. The District will continue to work closely with affected sources to ensure successful compliance.

D.3.2 Rule 4106 Prescribed Burning and Hazard Reduction Burning

Source Category

This source category includes all prescribed burning within the District. It also includes hazard reduction burning in the wildland/urban interface. Rule 4106 was adopted in June 2001. The adoption of Rule 4106 was not aimed at reducing the total emissions from this category as the District recognizes the importance of both prescribed burning and hazard reduction burning, but rather the adoption of established tools that the District could use to manage smoke emissions in the Valley. Through these tools, the District has expended considerable resources to ensure that the ignition of burn projects is only allowed when air quality and dispersion conditions are favorable, thus lessening the health impacts on Valley citizens and on air quality in the Valley.

EPA finalized approval for Rule 4106 on February 27, 2002. Rule 4106 was evaluated in the RACT State Implementation Plan (SIP) demonstration, however the Technical Support Document (TSD) states the rule is not subject to RACT because it is not a Control Techniques Guidelines (CTG) category and it does not regulate major sources.

Emission Inventory

Pollutant	2007	2012	2014	2015	2016	2017	2018	2019
<i>Annual Average - Tons per day</i>								
PM2.5	9.31	9.32	9.32	9.32	9.33	9.33	9.33	9.33
NOx	3.26	3.26	3.26	3.26	3.26	3.26	3.26	3.26
SOx	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
<i>Winter Average - Tons per day</i>								
PM2.5	0.72	0.73	0.73	0.74	0.74	0.74	0.75	0.75
NOx	0.21	0.21	0.21	0.21	0.21	0.22	0.22	0.22
SOx	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05

Regulatory Evaluation

How does District Rule 4106 compare with federal rules and regulations?

There is currently no federal guidance given for this source category under the federal Alternative Control Techniques (ACT), New Source Performance Standards (NSPS), National Emission Standards for Hazardous Air Pollutants (NESHAP), Maximum Achievable Control Technology (MACT), and Control Techniques Guidelines (CTG).

How does District Rule 4106 compare to rules in other air districts?

Upon comparing Rule 4106 to other California air districts' rules for similar sources, it has been determined that Rule 4106 is as stringent as the following analogous rules: SCAQMD Rule 444 (Open Burning); BAAQMD Regulation 5 (Open Burning); SMAQMD Rule 501 (Agricultural Burning); VCAPCD Rule 56 (Open Burning), and Placer County

APCD Rule 301 (Nonagricultural Burning Smoke Management) and Rule 303 (Prescribed Burning Smoke Management).

Prescribed Burning Emission Reduction Opportunities

Land Management Agencies (LMAs) are the agencies that regularly conduct prescribed burning operations. Since the adoption of Rule 4106, the District has developed cooperative relationships with the LMAs. Through this cooperation, the District advises the LMA on which days would be the most conducive for igniting a burn project, based on air quality and meteorological conditions. The District will continue to work with LMAs to identify favorable burning conditions with the goal of completing a maximum number of prescribed burning projects while minimizing air quality impacts. This collaborative effort ensures that the ignition of burn projects occurs when air quality and dispersion conditions are favorable, thus lessening the impacts on air quality in the Valley. Diligent District analysis identified the following two potential opportunities to reduce emissions from this process: the use of firebox air curtain burners and increased communication between the District and LMAs in managing wild fires.

Firebox Air Curtain Burners

As opposed to burning, a LMA may be able to mechanically remove material from the project site. This could achieve a significant reduction in emissions, yet it is often not practical or possible to bring mechanical equipment to remote and dense forest lands. Mechanical removal is much more expensive for the LMA to reduce the fuels in an area as compared to burning, and is not physically possible for many sites, making it not a feasible alternative. However, assuming that a LMA could mechanically remove all of the material from a project burn site, and the material was placed in piles and prepared for burning, an alternative to open burning would be to use a firebox air curtain burner. A firebox air curtain burner is a device that circulates large volumes of air over a burning fire in an open topped fire proof metal box. When compared to open burning, firebox air curtain burners have been shown to greatly reduce PM and carbon dioxide emissions, but have greater emissions of NO_x than open burning. Based on District analysis in 2009, firebox air curtain burners on average cost \$75,000, and the cost effectiveness was calculated at \$40,308 per ton of PM_{2.5}, and \$238,182 per ton of NO_x. This alternative is not cost effective and therefore not feasible.

Wild Fires

Often, primarily during the warm summer months, wildfires are naturally ignited through lightning strikes from passing storms. These wildfires have the potential to produce significant emissions and heavily impact residents within the Valley. When these wildfires occur, the District works with the responsible LMA in managing the fire as the dispersion and air quality conditions fluctuate. This cooperation allows the LMA to be more aggressive with the fire when meteorological conditions are favorable and more defensive when the conditions are poor. The District will continue to use the tools available to guide the activities of LMAs when wildfires occur; and is continuously seeking opportunities to work with LMAs to improve the management of these fires in order to reduce emissions and impacts to Valley residents.

Hazard Reduction Burning Emission Reduction Opportunities

Section 4291 of the California Public Resources Code states that structures must maintain a defensible perimeter of 100 feet in all directions; this defensible perimeter is commonly created through the clearing of vegetation. Although Section 4291 doesn't require it, most of this vegetation is burned, because it's less expensive, faster, and more convenient than other options. Potential opportunities evaluated in this plan development process included the reorganization of hazard reduction zones, and the feasibility of alternatives to burning the vegetation.

Reorganization of Hazard Reduction Zones

The possibility of reducing emissions by reorganizing the currently established hazard reduction zones is examined in the following discussion. Under Rule 4106, hazard reduction burning is only allowed when the District forecasts favorable air quality and dispersion conditions. Currently this forecast is based on a county-by-county basis, with appropriate elevation breaks. As an improvement to this zone system, and similar to agricultural burning, the Valley could be separated into smaller hazard reduction zones to provide more effective smoke management. Managing the allowance of hazard reduction burning under this type of scheme also has the potential to limit smoke impacts on residents. Establishing this type of management system would not cause an increase in costs for landowners, making this a cost effective opportunity. However, emissions reduced would be minimal, since the burning would still occur, just on different days when conditions are favorable.

Alternatives to Burning

As an alternative to the open burning of the vegetation, the District could encourage alternative methods like chipping or burn boxes through grant programs targeted at communities that regularly conduct hazard reduction burning. These options are discussed below.

Note that the year 2012 emissions inventory for the hazard reduction burning portion of this control measure category is 0.21 tons per day of PM_{2.5}, 0.05 tons per day of NO_x, and 0.0043 tons per day of SO_x. So although the alternatives below may be successful, the reductions in the inventory will be minimal.

Chipping

As previously mentioned, one alternative to the open burning of material is to use a chipper to break down the material into small pieces suitable for landscaping, dust control cover, or biomass burning. Further evaluation of this alternative option revealed that chippers are not a viable alternative because the requirement of the defensible perimeter of 100 feet is enforced annually; therefore, the types of materials to be cleared and disposed of are leaves, pine needles, weeds, and some small brush, all of which are not considered acceptable materials for wood chippers. The amount of useable material produced from this type of chipping would be negligible at best.

Firebox Air Curtain Burners

Another potential opportunity examined is the feasibility of usage of a firebox air curtain burner, which was described earlier. Based on the District's analysis in 2009, the average cost of a firebox air curtain burner is \$75,000. Through the use of a firebox air curtain burner for hazard reduction burning, the cost effectiveness of emissions reductions was determined to be \$34,026 per ton of PM_{2.5}, and \$204,154 per ton of NO_x. This is not cost effective, and therefore not recommended.

Biomass Removal Program

A potential opportunity to reduce emissions from hazard reduction burning by removing the biomass from the area and sending it for combustion at a biomass plant, similar to a program implemented by the Placer County Air Pollution Control District (Placer) was evaluated. Placer implemented a "Biomass Box" program beginning in the spring of 2007 to collect and utilize biomass that would traditionally be collected and burned as a part of hazard reduction efforts, for use as fuel for producing energy. The program collected the biomass by distributing 20' to 40' industrial containers throughout participating communities in the county. When full, the containers were transported to another location where the materials were grinded into useable fuel that biomass energy companies accept. The chipped biomass was then loaded onto larger trucks and hauled to one of two biomass facilities. This was a very successful program for Placer, with net air pollution reductions at 88.6%, including 24.7 tons of particulates and 4.0 tons of NO_x reduced at a cost of \$80,000.

Evaluation of this program supports Placer's assertion that this is a highly successful program and a similar program could benefit the Valley. However, the Valley faces several challenges in implementing such a program due to our unique geography. The Valley is considerably larger than Placer County with the Sierra Nevada mountain range stretching the length of the Valley. This poses two unique challenges to the feasibility of this program; the first being the challenge of distributing the boxes and the quantity of boxes needed to be effective, and the second challenge being the distance from the box collection locations to the biomass power plants. The Placer program estimated total transport miles for the entire program to be 14,800 miles. The mileage required in the Valley to distribute, collect, and transport the materials to a biomass power plant would be significantly more than Placer, which brings into issue the increased truck emissions. Additionally, as stated before, the annual emissions from hazard reduction burning in the Valley are 0.05 tpd of NO_x and 0.21 tpd of PM_{2.5}, meaning emissions reduced could be lower than those achieved in Placer.

Risk-based Strategy Analysis

The emissions from this source category contribute 1.3% of average winter PM2.5 emitted from stationary and area sources in the 2012 emission inventory. Because of the nature of the source of these emissions, the emissions are primarily a summer issue, as illustrated in the emission inventory table above. This source category does not significantly contribute to winter time PM2.5 concentrations; further control of this source would not make a significant impact towards the region's attainment of the federal PM2.5 air quality standard. However, since wildfires can often heavily impact the health of Valley residents, prescribed and hazard reduction burning mitigate the impact that a wildfire can have on the landscape, thus reducing the public's potential exposure to smoke. Continued support and management of this source category will ensure an improvement in both the health of the public and the ecosystems of the parks and forests within the San Joaquin Valley.

Control Measure Commitments

The following is a summary of recommended commitments for Rule 4106.

Regulatory Action

The District's analysis did not identify any additional technologically feasible and cost effective potential controls. Therefore, there are no recommendations for additional regulatory actions for Rule 4106. Further study is recommended to determine the feasibility of utilizing a biomass removal program similar to that in Placer County.

Incentive Action

There are no incentive programs currently funded by the District specific to prescribed or hazard reduction burning. There are no recommendations for new incentive actions for this source category at this time.

Technology Advancement Action

There is no recommendation for a new technology advancement project for this source category. Through its Technology Advancement Program, the District will continue to seek potential feasible and low-cost technologies that may provide for additional emission reduction opportunities in this category.

Policy Initiatives

Reducing wildfires and the resulting air pollutants requires a sustained and multi-faceted approach that employs effective measures to reduce fuel supplies and adequate resources to manage fires when they occur. Towards that end, the District currently supports policies and initiatives that would encourage rapid disposal of the fuel supply, including the following:

- Additional financial and staffing resources for public and private land managers to conduct prescribed burning as an effective means for reducing fuel supplies that lead to large and uncontrollable wildfires.
- Additional resources to manage wildfires when they occur.
- Lessening or removal of contradictory environmental protection policies that prohibit the use of mechanized methods, or prescribed burning to reduce fuels when those are the only feasible methods available.
- Changes in the federal policies that better incorporate air quality concerns by shifting focus to prescribed burning and employing fire management techniques that reduce air quality impact when wildfires occur.

While there are no recommendations for new policy initiatives, the recommendation is to continue supporting the policies and initiatives identified above.

Education and Outreach

The District currently provides a robust education and outreach program for regulated sources through the Small Business Assistance program, Permit Stakeholder Meetings, Compliance Assistance Bulletins, and public notices for public workshops and public hearings. No new education and outreach efforts are recommended for these sources at this time. The District will continue to work closely with affected sources to ensure successful compliance.

D.4 AGRICULTURAL PROCESSES

For many years, the Valley's agricultural community has employed sound conservation management practices to safeguard the natural resources of the land. However, prior to 2004, agricultural operations were exempt from air permitting requirements in California. Agricultural processors were regulated as permitted sources; and regulation of agricultural emissions was limited to Title 13 restrictions on open burning. Particulate emissions for unpaved roads and storage piles were regulated through Regulation VIII, but only where the extent of these emissions exceeded threshold exemption values.

In September 2003, Governor Gray Davis signed Senate Bill 700 (2003) which amended air pollution control requirements in the California Health and Safety Code to include requirements for agricultural sources of air pollution. Since then, the District has implemented a series of stringent regulatory changes that added more oversight to agricultural operations and set new emission control goals. The agricultural sector has responded with significant investments in new emission control programs, and considerable changes to their longstanding practices. Collectively, the mitigation measures implemented have met or exceeded desired PM10 and VOC emissions reductions. The agricultural community has also replaced thousands of old, high-emitting diesel irrigation engines with cleaner, more efficient engines and electric motors with the assistance of District grant programs.

This control measure source category includes in-field food and agriculture production, and food and agriculture product processing. For the discussions about engines or other combustion devices used at these sources, refer to the Combustion Devices control measure source category discussion of this appendix.

Existing Control Strategies

Due to the degree of difficulty and enormity of the challenge that the Valley faces in meeting the National Ambient Air Quality Standards (NAAQS), the District recognizes that prohibitory rules alone are not enough to reduce emissions to meet attainment requirements and protect public health. The District's longstanding, progressive strategy for reducing emissions is a multifaceted effort that includes incentive programs and policy initiatives in addition to prohibitory rules. The following discussion summarizes both the existing District efforts to reduce emissions from this source category, and evaluations for potential opportunities for further emissions reductions.

Incentive Programs

Incentive programs are an integral part of the emission reduction efforts of the District, especially where the District lacks direct jurisdiction in establishing emission control requirements. The District is currently funding one incentive program that is specific to engines used in the agricultural sector. The stationary agricultural irrigation pump engine program component of the District's *Heavy-Duty Engine Program* was created to assist agricultural stakeholders in replacing old polluting internal combustion engines with new more efficient and less polluting units or with electric units with zero emissions.

For more information about this incentive program please refer to the Combustion Devices control measure source category discussion of this appendix.

In addition to District incentive programs, there are federal funding opportunities offered by various organizations including the Natural Resources Conservation Service (NRCS) and EPA. The Environmental Quality Incentives Program through NRCS for example, provides financial assistance to help plan and implement conservation practices specifically to help operators meet environmental regulations. The variety of programs that provide funding to agricultural operations have resulted in significant emissions reductions for the agricultural sector.

Policy Initiatives

Similar to the Incentive programs, the District's policies and Legislative Platform are important components to the District's strategy to attain federal ambient air quality standards. The District utilizes policies and the legislative platform to bring attention to major issues that have a direct impact on the Valley's air quality.

The District encourages federal support for the continuation of air quality funding in the Farm Bill that is designed to accelerate the replacement of agricultural equipment. As part of the efforts to attain federal air quality standards in the Valley, the California Air Resources Board (ARB) committed to reducing emissions from in-use agricultural equipment to achieve five to ten tons per day of NO_x reductions in the Valley by 2017. This measure would accelerate fleet turnover of equipment with engines to new cleaner units that meet new engine NO_x standards. This is being implemented through the District's Tractor Replacement Program and the Natural Resource Conservation Service (NRCS) Conservation Innovation Grants program. These programs combined are on track to achieve the five to ten tons per day of NO_x reductions by 2017.

The District supports efforts to secure federal funds and other mechanisms to achieve near-term reductions from agricultural equipment that can be credited to the SIP. Towards that end, the District supports the inclusion of continued air quality funding through the United States Department of Agriculture (USDA) in the Farm Bill, including funding to reduce emissions from agricultural equipment.

Adoption of Senate Bill 705, which phases out the ability to burn certain agricultural material in the field, has underlined the importance of biomass facilities in providing a mechanism to dispose of this agricultural material. As such, the District supports efforts that provide cost effective alternatives to agricultural burning, including subsidies and/or preferential utility rates for power produced from biomass and additional research to identify other technologically and economically feasible alternatives. The legislative platform also supports energy efficiency/alternative energy policies and initiatives that will result in emissions reductions and cost effective alternatives to burning agricultural waste.

Rules and Regulations

The following is a list of rules specific to the Agricultural Processes category. Each of the following rules will be evaluated to examine potential opportunities for additional emissions reductions. Refer to other sections of this appendix for discussions on other rules that may be applicable to the agricultural community, but that are not agriculture-specific.

Table D-9 Current Agricultural Process Rules

Rule	Last Amended/ Adopted
Rule 4204 Cotton Gins	02/17/2005
Rule 4550 Conservation Management Practices	08/19/2004

D.4.1 Rule 4204 Cotton Gins

Source Category

Adopted on February 17, 2005, Rule 4204 is intended to reduce particulate emissions from cotton ginning facilities operating within the Valley. The implementation of this rule has achieved 0.79 tpd of PM10 reductions from this source category. EPA finalized approval of Rule 4204 on November 9, 2006 and deemed this rule as at least meeting established RACT standards.

There are two types of cotton gins, saw and roller. A saw gin is commonly used for short fiber cotton where the cotton is pulled across knifed edges to remove seeds and trash. A roller gin is instead used for long fiber cotton and the cylinders or rollers carry the cotton across screens or perforated metal where the trash is removed. Throughput for saw gins can be higher than that of a roller gin but a roller gin gives a higher quality end-product.

Emission Inventory

Pollutant	2007	2012	2014	2015	2016	2017	2018	2019
Annual Average - Tons per day								
PM2.5	0.24	0.23	0.24	0.23	0.23	0.24	0.24	0.24
NOx	0	0	0	0	0	0	0	0
SOx	0	0	0	0	0	0	0	0
Winter Average - Tons per day								
PM2.5	0.37	0.34	0.35	0.34	0.35	0.36	0.36	0.37
NOx	0	0	0	0	0	0	0	0
SOx	0	0	0	0	0	0	0	0

Regulatory Evaluation

How does District Rule 4204 compare with federal rules and regulations?

There are no specific federal guidelines applying to cotton gins in terms of New Source Performance Standards (NSPS), Control Techniques Guidelines (CTG), Alternative Control Technology (ACT), Maximum Achievable Control Technology (MACT) and National Emission Standards for Hazardous Air Pollutants (NESHAP). There are currently no Best Available Control Technology (BACT) determinations more stringent than what is currently required in Rule 4204.

How does District Rule 4204 compare to rules in other air districts?

There are no comparable rules in other air districts in California. Regulations on cotton ginning operations do exist in states other than California; upon evaluation of regulations in other states, new or more stringent device or stack requirements were not identified. The following regulations are included as a part of the District's analysis:

- New Mexico Administrative Code 20.2.66.1 Cotton Gins
- Louisiana Environmental Regulatory Code
- North Carolina Environmental Management Commissions, Dept. of Environment and Natural Resources, Division of Air Quality Article 21B of Chapter 143
- South Carolina Air Pollution Control Regulations and Standards, Regulation 61-62.5, Standards No. 4 Emissions from Process Industries, Section V Cotton Gins
- Oklahoma Dept. of Environmental Quality, Air Pollution Control, 252:100-23 Cotton Gins
- Texas Commission on Environmental Quality, Control of Air Pollution by Permits on Cotton Gin Facilities and Cotton Burr Tub Grinders

Emission Reduction Opportunities

Rule 4204 is among the most stringent rules in the nation for cotton gins and cotton ginning operations, leaving little remaining opportunities for additional emissions reductions. Research²⁹ is in progress to determine accurate PM_{2.5} control efficiencies attributable to various types of control equipment utilized to reduce PM emissions from the ginning process. The impact of this regulation on PM_{2.5} emissions has not been determined as of yet. As indicated in the emission inventory above, the PM_{2.5} emissions are a relatively small contributor to particulate matter emissions in the Valley. As a part of due diligence in evaluating potential opportunities to further reduce emissions in the Valley, the analysis below includes a discussion of research of the undetermined PM_{2.5} fraction of emissions from cotton ginning operations, and of potential, but not feasible, opportunities to reduce emissions further.

Research and PM_{2.5} Fraction

Research is currently being conducted by the United States Department of Agriculture – Agricultural Research Service (USDA-ARS), in partnership with cotton associations, EPA, the California Air Resources Board (ARB) and the District to measure actual PM₁₀ and PM_{2.5} emissions from stack sources and fugitive emissions in and around the ginning facility. This research will provide emission factors for comparison to previous estimations that are included in emission inventories and will provide data for both types of cotton gins currently in use in California. This project was designed to measure emissions from facilities with current emissions control technologies in place and to improve emission estimation by measurement with the highest quality methods and instruments. The project was not designed to evaluate new technologies or measures to further reduce emissions. Preliminary results for the seven gins that were

²⁹ Agricultural Research Service. (2012). *2011 Final Report for Characterization of Cotton Gin Particulate Matter Emissions*. United States Department of Agriculture.

sampled for the project indicate the estimated ratio of PM_{2.5} to PM₁₀ is approximately 15%.³⁰ This fraction of PM_{2.5} to PM₁₀ is lower than indicated in the emissions inventory currently being used. According to the 2011 Final Report update³¹, this study will finish the laboratory analysis for the final gin in early 2012 and continue processing stack sampling data.

1D-3D Cyclones with Expansion Chamber

Currently, all cotton gins in the Valley are required to operate using a 1D-3D cyclone. About two thirds of the 1D-3D cyclones used in the Valley have an expanded chamber outlet. Research has shown that an expansion chamber allows for more flow since it is not as narrow. In initial tests, a larger D/3 size expanded chamber exit produced PM₁₀ emissions that were about 8% lower than those resulting from use of the standard, small-diameter (D/4) exit³². However, there is no completed research indicating the fraction of PM_{2.5} emitted or the effectiveness of reducing PM_{2.5} by installing an expanded chamber. As 1D-3D cyclones are already required by the current rule, and there is no definitive data to verify effectiveness in reducing PM_{2.5} emissions with an expansion chamber, this is not a feasible opportunity to reduce emissions.

Loadout

Rule 4204 currently requires wind screens for loadout. Two potential opportunities to reduce emissions through control options to capture PM₁₀ emissions from the truck loading operation were identified as follows: 1) venting the loadout area to pre-cleaning cyclones and a baghouse; and 2) venting the receiving pit to a 1D-3D cyclone. While it is technologically feasible to enclose the loadout area and receiving pits and vent to the respective control devices, the District's BACT Guideline 5.1.8 has found those options to not be cost effective. This previous analysis was calculated according to PM₁₀ emission factors and again, the PM_{2.5} fraction is unknown at this time.

Mechanical Conveyance

Mechanical conveyance for the main trash handling system could be a potential opportunity to reduce emissions but it has only been demonstrated as feasible for newly constructed or re-built cotton gins. Mechanical conveyance almost entirely eliminates emissions from gin trash handling exhaust streams, which were previously moved pneumatically. The gin trash handling systems only comprise a fraction of the emissions that are released from the full cotton ginning process. Newer or re-built gins are able to accommodate a mechanical conveyance system since they are able to design the gin around the equipment and space needed. Operators that have installed a mechanical conveyance system for their gin have had to build a lower floor, below the main level containing the major gin equipment, to house the mechanical conveyors. Therefore, as confirmed by industry representatives and equipment manufacturers, it is not technologically feasible to retrofit existing gins with a mechanical conveyance

³⁰ Agricultural Research Service. (2012). 2012 2nd Quarter Report for Characterization of Cotton Gin Particulate Matter Emissions. United States Department of Agriculture.

³¹ Agricultural Research Service. (2012). 2011 Final Report for Characterization of Cotton Gin Particulate Matter Emissions. United States Department of Agriculture.

³² Baker R.V. and Hughs S.E., 1998. Influence of Air Inlet and Outlet Design and Trash Exit Size on 1D3D Cyclone Performance. Transactions of the ASAE, vol. 42(1): 17-21.

system to replace existing trash handling equipment. Additionally, any new facilities would trigger New Source Review requirements and would be required to implement BACT level controls.

Plenum Chambers

Plenum chambers are in use at a number of gins in the Valley. Plenum chambers are placed upstream of selected cyclones to remove large trash. Studies have been inconclusive in demonstrating an increase in PM control efficiency with the utilization of a plenum chamber. Most cotton ginning facilities that have chosen to install plenum chambers are using those devices to reduce the wear and tear on the cyclones, thus prolonging the life of the cyclones, and not for increased particulate matter controls.

The District's analysis indicates that there are no feasible opportunities for additional emission reductions for this source category.

Risk-based Strategy Analysis

The emissions from this source category contribute 0.6% of average winter PM_{2.5} emitted from stationary and area sources in the 2012 emission inventory. The emissions from this source category are relatively small throughout the year, with no significant increase in emission levels in the winter months.

Control Measure Commitments

The following is a summary of recommended commitments for Rule 4204.

Regulatory Action

The District's analysis did not identify any additional technologically feasible and cost effective potential controls. Therefore, there are no recommendations for additional regulatory actions for Rule 4204.

Incentive Action

Units subject to Rule 4204 are currently regulated stationary sources making opportunities for incentive actions minimal; there are no recommendations for incentive actions at this time.

Technology Advancement Action

There is no recommendation for a new technology advancement project for this source category. Through its Technology Advancement Program, the District will continue to seek potential feasible and low-cost technologies that may provide for additional emission reduction opportunities in this category.

Policy Initiatives

The District does not currently have any policy initiatives specific to cotton ginning activities. There are no recommendations for new policy initiatives specific to these units.

Education and Outreach

The District currently provides a robust education and outreach program for regulated sources through the Small Business Assistance program, Permit Stakeholder Meetings, Compliance Assistance Bulletins, and public notices for public workshops and public hearings. There are no recommendations for additional education and outreach efforts for these sources. The District will continue to work closely with affected sources to ensure successful compliance.

D.4.2 Rule 4550 Conservation Management Practices

Source Category

Rule 4550 was adopted on August 19, 2004 to help bring the Valley into attainment of federal PM10 standards, and applies to on-field farming and agricultural operation sites located within the Valley. Rule 4550 has served as a model for other regions seeking to reduce fugitive particulate emissions from agricultural sources. EPA finalized approval of Rule 4550 on February 14, 2006 and determined that the rule met Best Available Control Measure (BACM) requirements of Clean Air Act (CAA) 189(b).

The District worked extensively with numerous stakeholders, growers, and the Agricultural Technical Committee for the San Joaquin Valleywide Air Pollution Study Agency (AgTech) for two years prior to developing the Conservation Management Practices (CMP) Rule. Rule 4550 is unique because it is intended primarily to reduce fugitive particulate matter emissions and is based upon a menu approach of control techniques to accommodate the variability of agricultural industries. The selected CMPs are listed on application forms that are submitted to the District for approval as a CMP Plan. The District worked with agricultural stakeholders and other agencies, such as the Natural Resources Conservation Service (NRCS), to ensure affected sources were assisted as much as possible in understanding and complying with the requirements of Rule 4550. Efforts included creating an informational pamphlet, assisting stakeholders through the application process, and extensive outreach through 40 workshops throughout the Valley.

Emission Inventory

Pollutant	2007	2012	2014	2015	2016	2017	2018	2019
<i>Annual Average - Tons per day</i>								
PM2.5	19.31	18.90	18.74	18.66	18.57	18.49	18.41	18.33
NOx	0	0	0	0	0	0	0	0
SOx	0	0	0	0	0	0	0	0
<i>Winter Average - Tons per day</i>								
PM2.5	15.10	14.72	14.57	14.50	14.42	14.35	14.28	14.20
NOx	0	0	0	0	0	0	0	0
SOx	0	0	0	0	0	0	0	0

Regulatory Evaluation

How does District Rule 4550 compare with federal rules and regulations?

Federal requirements such as New Source Performance Standards (NSPS), National Emission Standards for Hazardous Air Pollutants (NESHAP), and Maximum Achievable Control Technology (MACT) requirements are not applicable to this source category; additionally, there are no EPA Control Techniques Guidelines (CTGs) or Alternative Control Techniques (ACTs) listed for this category.

How does District Rule 4550 compare to rules in other air districts?

Rule 4550, when compared to other California air districts' rules for similar sources and is found to be at least as stringent as the analogous rules for Imperial County Air Pollution Control District (ICAPCD) Rule 806 (Conservation Management Practices) and SMAQMD Rule 215 (Agricultural Permit Requirements and New Agricultural Permit Review). SCAQMD and the Arizona Department of Environmental Quality have adopted agricultural best management practices programs, which were approved by EPA as Best Available Control Measures (BACMs); however, the District's CMP rule exceeds these standards. Similar rules were not found for BAAQMD or VCAPCD.

Emission Reduction Opportunities

Rule 4550 was the first rule of its kind in the nation to target fugitive particulate emissions from agricultural operations. Through this rule, PM10 emissions have been reduced by 35.3 tons per day, which is approximately a 24% reduction for this source category. Similarly, implementation of Rule 4550 by agricultural operations has resulted in the reduction of PM2.5 emissions through the reduction of passes of agricultural equipment and implementation of other conservation practices. A full evaluation of the success seen through implementation of the Rule 4550 CMP Program can be found on the District's website at:

http://www.valleyair.org/farmpermits/updates/cmp_program_report_for_2005.pdf.

While Rule 4550 has been successful in reducing both PM10 and PM2.5 emissions, recent studies have indicated that the PM2.5 fraction of emissions makes up a small portion of the total particulate emissions from agricultural operations. Additionally, particulate emissions from agricultural operations are geologic in nature. As described in Chapter 2 of this plan, these geologic particulate emissions make up a relatively small portion of the overall PM2.5 concentrations during the winter season, and have relatively low toxicity. Accordingly, particulate emissions from agricultural sources do not play a significant role with regard to attainment of the 24-hour PM2.5 standard addressed by this plan, and Rule 4550 is primarily a PM10 reduction strategy. EPA's approval of Rule 4550 as BACM and the District's review of similar rules in other regions also demonstrate that the District has adopted the most stringent rule of its kind. Given the relatively low contribution that emissions from this category make to the Valley's 24-hour PM2.5 concentrations and current stringent requirements under Rule

4550, the District has not identified any additional opportunities for further emission reductions from this category.

Risk-based Strategy Analysis

Particulate matter emissions from agricultural operations are primarily geologic in nature, and do not constitute a significant fraction of the total PM_{2.5} concentrations during the winter season, the period during which exceedances for the 24-hour PM_{2.5} standard are observed. As discussed in Chapter 2, research indicates that the geologic fraction of PM_{2.5} has a relatively low toxicity. Given the relative insignificance of PM_{2.5} emissions from this category and the relative low toxicity, further reductions from this category will not significantly expedite attainment or provide accelerated health benefits.

Control Measure Commitments

The following is a summary of recommended commitments for Rule 4550.

Regulatory Action

There are no recommendations for additional regulatory actions for Rule 4550. The District will continue to work collaboratively with NRCS, researchers, and agricultural stakeholders to evaluate current and potential CMPs to determine if there are more effective options for reducing emissions. Further study through additional research on the PM_{2.5} fraction and effectiveness of CMPs in reducing PM_{2.5} emissions is recommended.

Incentive Action

There are no recommendations for new incentive actions at this time.

Technology Advancement Action

Through its Technology Advancement Program and other research efforts, the District will continue to seek projects that support the development of new technologies and practices that provide further potential options for reducing emissions from agricultural operations. One example of a research effort in this area includes a recent study aimed at understanding of the effectiveness of reducing particulate emissions through implementation of CMPs. This Regional Applied Research Effort (RARE) is a collaborative study by the District and EPA, and is focused on comparatively evaluating particulate emissions from conventional agricultural tillage methods and a CMP tillage method utilizing the Optimizer during after-harvest land preparation. The Optimizer is a tillage implement that incorporates functions from multiple conventional tillage implements into one piece of equipment. Preliminary results indicate that the Combined Operations tillage method reduced PM_{2.5} emissions by 29%, PM₁₀ by 60%, and total suspended particulates (TSP) by 25%.³³ The District will continue to seek additional opportunities for supporting the advancement of new technologies and practices in this area.

³³ Williams, D. et al. *Los Banos, CA Fall 2007 Tillage Campaign: Data Analysis*.

Policy Initiatives

The District currently supports efforts to secure federal funds and other mechanisms to achieve near-term reductions from agricultural equipment that can be credited to the State Implementation Plan (SIP), and supports the inclusion of continued air quality funding through the NRCS in the Farm Bill, including funding to reduce emissions from agricultural equipment and conservation practices. Although there are no recommendations for new policy initiatives, the recommendation is to continue supporting the current District legislative platform items as identified above.

Education and Outreach

The District currently provides a robust education and outreach program for regulated sources through the Small Business Assistance program, Permit Stakeholder Meetings, Compliance Assistance Bulletins, and public notices for public workshops and public hearings. The outreach program developed collaboratively with the USDA-NRCS and agricultural stakeholders to assist affected agricultural sources to understand and comply with Rule 4550 requirements has served as a model for other agencies seeking to adopt similar strategies. The District will continue to work closely with affected sources to ensure successful compliance.

D.5 RESIDENTIAL AND COMMERCIAL

Significant emissions have been reduced in the Valley through several generations of regulations focused on industrial stationary sources. With emissions from stationary sources having been greatly reduced, the Valley is receiving diminishing returns from new controls on these stationary sources. The work of identifying more regulatory control measure source categories for stationary sources continues, but it is critical that Valley residents reduce emissions in their daily routines as well.

Population-wise, the Valley is California's fastest growing region, with its population expected to grow to over four and a half million by 2019, the expected attainment year for the 2006 PM_{2.5} standard. Increased population results in increased vehicle activity and consumer product use, which leads to increased pollutant emissions – potentially undermining progress made by regulations.

The District's regulatory jurisdiction is somewhat limited when it comes to pollutant sources linked to the general population. For example, ARB regulates consumer products. Also, since direct regulatory authority on motor vehicle tailpipe emissions rests with ARB and EPA, the District can only decrease pollutant emissions from vehicles through incentives, public outreach, and innovative regulations focused on fleets or indirect means (see Appendix C on mobile source control measures for more information).

Through the District's Rule 4901 (Wood Burning Fireplaces and Wood Burning Heaters), Valley residents are taking actions that are achieving significant reductions of health-impacting pollutants when and where these reductions are most needed. Through the District's Healthy Air Living program, Valley residents (as well as businesses) are provided the tools to make air quality a priority in their day-to-day decisions.

Additionally, emissions from under-fired charbroilers in the Valley continue to be a concern. Local restaurants using uncontrolled under-fired charbroilers can often heavily impact residents in the surrounding neighborhoods, especially on days when dispersion is poor. Emissions from this source are known to be hazardous to human health, and therefore reductions in this category would be valuable in light of the District's Risk-based Strategy.

There is potential for both regulatory and innovative approaches for reducing emissions from residential sources, as is shown in the following control measure source category discussion.

Existing Control Strategies

Due to the degree of difficulty and enormity of the challenge that the Valley faces in meeting the National Ambient Air Quality Standards (NAAQS), the District recognizes that prohibitory rules alone are not enough to reduce emissions to meet attainment requirements and protect public health. The District's longstanding, progressive strategy for reducing emissions is a multifaceted effort that includes incentive programs and policy initiatives in addition to prohibitory rules. The following discussion summarizes both the existing District efforts to reduce emissions from this source category, and evaluations for potential opportunities for further emissions reductions.

Incentive Programs

Incentive programs are an integral part of the emission reduction efforts of the District, especially where the District lacks direct jurisdiction in establishing emission control requirements. The District is currently funding two incentive programs that affect the residential sector. The *Clean Green Yard Machine* program has provided \$1,472,977 in grant money toward the replacement of 8,600 gas-powered lawn mowers in the Valley. For more details on the *Clean Green Yard Machine* program and other programs related to lawn care refer to the Additional Sources section of this appendix. The *Wood Stove Change Out* program has provided \$1,190,000 in grant money toward the replacement of 1,988 units, resulting in a reduction of 342 tons of particulate matter emissions in the Valley.

In an effort to demonstrate and establish a proven technology for reducing emissions from under-fired charbroilers in the Valley, the District established the Charbroiler Incentive Program (ChIP) in October 2009, concurrent with the last amendment of Rule 4692. Due to lack of participation from the industry, the program was extended until March 2011 and outreach efforts were increased. However, no applications for funding were submitted during the extended solicitation period. With new technology options potentially becoming available, the District will continue to seek local demonstration projects to develop control technology options.

Policy Initiatives

Similar to the Incentive Programs, the District's policies and Legislative Platform are important components to the District's strategy to attain federal ambient air quality standards. The District utilizes policies and the legislative platform to bring attention to major issues that have a direct impact on the Valley's air quality. The District supports policies and has legislative platforms for energy efficiency and clean alternatives, and opposes legislation that limits the District's ability to regulate the installation and utilization of wood-burning devices at residences.

The District promotes energy efficiency and clean alternatives as they provide an opportunity for meaningful reductions in emissions in areas with well-established strong regulatory measures on stationary sources such as in the Valley. For more details about these efforts refer to the Additional Sources section of this appendix.

Rules and Regulations

The following is a list of rules specific to the Residential and Commercial category. Each of the following rules will be evaluated to examine potential opportunities for additional emissions reductions.

Table D-10 Current Residential and Commercial Rules

Rule		Last Amended/ Adopted
Rule 4692	Commercial Charbroiling	9/17/2009
Rule 4901	Wood Burning Fireplaces and Wood Burning Heaters	10/16/2008
Rule 4902	Residential Water Heaters	03/19/2009
Rule 4905	Natural Gas-Fired, Fan-Type, Residential Central Furnaces	10/20/2005

D.5.1 Rule 4692 Commercial Charbroiling

Source Category

There are two types of commercial charbroilers: chain-driven and under-fired. A chain-driven charbroiler is a semi-enclosed broiler that moves food mechanically through the device on a grated grill to cook the food for a specific amount of time. An under-fired charbroiler has a metal "grid," a heavy-duty grill like that of a home barbecue, with gas burners, electric heating elements, or wood under the grid to cook the food. The smoke and vapors generated by cooking on either type of charbroiler contain water, volatile organic compounds (VOCs), and PM. Larger particles and grease are typically captured by the grease filter of the ventilation hood over the charbroiler. The remaining VOCs and PM_{2.5} are exhausted outside the restaurant, unless a secondary control is installed.

Currently, District Rule 4692 reduces emissions by requiring catalytic oxidizers for chain-driven charbroilers that meet rule applicability thresholds. Charbroiler exhaust is directed through the catalytic oxidizer with little loss of temperature. As high-temperature exhaust goes through the heated catalyst, PM and VOC are oxidized to carbon dioxide and water vapor. This chemical reaction releases energy that heats the catalyst and is transferred to a heat recovery system, so no additional fuel is needed for the unit.

The original rule, adopted in March 2002, reduced PM_{2.5} emissions from chain-driven charbroilers by 84%. The September 2009 rule amendment expanded rule applicability to more chain-driven charbroilers, reducing 25% of the remaining PM_{2.5} chain-driven charbroiler emissions. EPA finalized approval for Rule 4692 on November 3, 2011. The District evaluated Rule 4692 in its RACT State Implementation Plan (SIP) demonstration; however, EPA noted in its Technical Support Document (TSD) for the approval of Rule 4692 that the rule is not subject to RACT because it is not subject to Control Techniques Guidelines (CTG) requirements and it does not regulate major sources.

The District created and implemented a pilot program, the Charbroiler Incentive Program (ChIP), to provide grant funding to cover a significant portion of the cost of installing particulate control devices on under-fired charbroilers. However, there has been no stakeholder interest in this program so far. Zero proposals were submitted, so no projects have been funded under ChIP.

The District has also been tracking and involved with technology demonstration projects for under-fired charbroilers at other agencies:

- **SCAQMD:** South Coast has partnered with the University of California at Riverside to test control technologies for under-fired charbroilers at the College of Engineering's Center for Environmental Research and Technology (CE-CERT). District staff participated in proposal review for this program in early 2012 and have been actively tracking the progress of this project, which should be complete by the end of 2012.
- **EPA:** EPA contracted with Innova Tech, who has manufactured a low-cost and low-maintenance under-fired charbroiler filtration device. Initial testing of Innova Tech's NovaMist™ aerosol particulate filtration technology has shown that their system has the capability of removing over 98% of aerosol particulates at particulate concentrations less than or equal to 40 µg/m³, as well as a general VOC reduction of 42%. This control device is also self-cleaning, continually degreasing itself during use. The next step for Innova Tech is to partner with other corporations to aid in the commercialization and marketing of their product.

Emission Inventory – All Charbroilers

Pollutant	2007	2012	2014	2015	2016	2017	2018	2019
<i>Annual Average - Tons per day</i>								
PM2.5	2.85	2.89	2.98	3.03	3.08	3.13	3.17	3.22
NOx	0	0	0	0	0	0	0	0
SOx	0	0	0	0	0	0	0	0
<i>Winter Average - Tons per day</i>								
PM2.5	2.85	2.88	2.98	3.03	3.08	3.12	3.17	3.22
NOx	0	0	0	0	0	0	0	0
SOx	0	0	0	0	0	0	0	0

This emission inventory includes emissions from both chain-driven and under-fired charbroilers. Based on the data included in the District's 2009 emission inventory methodology for commercial charbroiling, chain-driven charbroilers account for about 42% of the charbroiling inventory, and under-fired charbroilers account for about 58% of the inventory.

The emissions inventory above accounts for emissions reductions achieved by Rule 4692's controls on chain-driven charbroilers. The inventory above is grown in future years due to human population growth in the Valley.

Emission Inventory – Under-Fired Charbroilers

Pollutant	2007	2012	2014	2015	2016	2017	2018	2019
Annual Average - Tons per day								
PM2.5	1.66	1.68	1.73	1.76	1.79	1.82	1.84	1.87
NOx	0	0	0	0	0	0	0	0
SOx	0	0	0	0	0	0	0	0
Winter Average - Tons per day								
PM2.5	1.66	1.68	1.73	1.76	1.79	1.82	1.84	1.87
NOx	0	0	0	0	0	0	0	0
SOx	0	0	0	0	0	0	0	0

These emissions inventories include emissions from food cooking only, not from fuel use. The combustion of the fuel source for the cooking equipment is a very small component of the NOx and SOx emissions in the Stationary Source Fuel Combustion category, "Service and Commercial," which is not reflected in the inventory for this control measure.

Regulatory Evaluation**How does Rule 4692 compare with federal rules and regulations?**

There is currently no guidance given for this source category under the federal Alternative Control Techniques (ACT) documents, the New Source Performance Standards (NSPS), the National Emission Standards for Hazardous Air Pollutants (NESHAP), and the Maximum Achievable Control Technology (MACT) requirements. Additionally, there is no EPA CTG listed for this category.

How does Rule 4692 compare to rules in other air districts?

Rule 4692 was compared to other California air districts' rules for similar sources and was found to be more stringent than SCAQMD Rule 1138 (Control of Emissions from Restaurant Operations) and VCAPCD (Rule 74.25 Restaurant Cooking Operations). Rule 4692 and these two rules apply to chain-driven charbroilers only, and not under-fired. However, the SCAQMD and VCAPCD rules apply to charbroilers cooking 875 pounds of meat or more per week, whereas the District rule applies to charbroilers cooking 400 pounds of meat or more per week. BAAQMD Regulation 6 Rule 2(Commercial Cooking Equipment) is applicable to chain-driven charbroilers in a restaurant that purchases 500 pounds of beef or more per week or an under-fired charbroiler in a restaurant that purchases 1,000 pounds of beef or more per week. SMAQMD does not currently have a rule for commercial charbroiling.

As previously mentioned, BAAQMD Regulation 6 Rule 2 regulates both chain-driven and under-fired units. Newly installed under-fired units with more than 10 square feet of cooking area are required to limit emissions to 1 lb of PM10 per 1,000 lbs of cooked

beef. Effective January 2013, the same emissions requirements will also apply to pre-existing units. However, as the BAAQMD rule is implemented, a significant portion of under-fired charbroilers are below the applicability thresholds for grill size or amount of food cooked, and are thus exempt from rule requirements.

Emission Reduction Opportunities

Potential emission reduction opportunities from this source category include emissions from two types of charbroilers: chain-driven charbroilers and under-fired charbroilers. District Rule 4692 is one of the most stringent rules in the nation for chain-driven charbroilers and therefore the primary focus for potential emissions reductions as discussed below focus on the under-fired charbroilers. Discussions on both technologies are discussed below.

Chain-Driven Charbroilers

Rule 4692 requires emission controls for chain-driven charbroilers that cook 400 pounds of meat or more per week. In 2009, the amended rule was estimated to apply to about 280 of the 427 chain-driven identified charbroilers of the Valley. This rule thus applies to about 65% of the units and a much greater percentage of the total emissions from chain-driven charbroilers since they are higher use. The applicability threshold for chain-driven charbroilers under Rule 4692 could be lowered to make smaller facilities subject to the rule. However, these currently-exempt chain-driven units are a very small portion of the total inventory for this category. Emissions reductions would be minimal and costly through this approach. Furthermore, the District's applicability threshold is already lower than that of other air districts.

Under-Fired Charbroilers

Rule 4692 does not currently require emissions controls for under-fired charbroilers. Catalytic oxidizers are not effective for reducing emissions from under-fired charbroilers because the exhaust from these devices loses too much heat as it is directed to the control device, and the reactions at the catalyst cannot take place under this lower temperature. The following control strategies are more effective for under-fired charbroilers:

- **High efficiency particulate-arresting (HEPA) filtration systems:** This system adds a HEPA filter to the appliance's existing grease filters to effectively eliminate particulates down to about 0.3 microns in diameter. System maintenance is relatively easy to perform, but filters need to be regularly changed (perhaps weekly, depending on the amount of food cooked).
- **Electrostatic precipitators (ESPs):** Exhaust particles become electrically charged as they pass through an electrically charged screen. These ionized particles are then collected by one of two oppositely-charged plates. ESP systems need filtration prior to the ESP itself to remove grease and larger particles from kitchen exhaust. These devices are cleaned daily with a clean-in-place system, and more thorough cleaning is required once or twice a year.

Routine maintenance often requires hiring an outside company, since the ESP plates can weigh as much as 75 pounds.

- **Wet scrubbers:** A fine stream of water and detergent “washes” the particulates from the kitchen exhaust. The particulate/water/detergent mix is then filtered: the filtered water/detergent mix is recycled through to clean more exhaust, and the particulate-laden wash water is discharged to the sewer system. In addition to the cost of the system itself, associated water/sewer usage costs and detergent costs can be high, although recent improvements in design are improving system efficiencies.

These controls for under-fired charbroilers were unproven and extremely costly as of the District’s 2009 amendment of Rule 4692. The costs of these under-fired charbroiler controls, as analyzed in 2009, ranged from \$37,500 to \$104,000, with a cost effectiveness of up to \$58,200 per ton of PM_{2.5} reduced. However, the control technology for under-fired units has continued to develop over the past few years, in part through the SCAQMD and EPA technology demonstration efforts. Since under-fired charbroilers are a larger part of the total commercial charbroiling inventory, and since these units are currently unregulated in the Valley, there is potential to achieve emissions reductions from under-fired charbroilers.

In parallel with this plan, SCAQMD has also included a draft commitment in Chapter 4 of their *Draft 2012 AQMP* to achieve a 1 tpd PM_{2.5} reduction from under-fired charbroilers, though the details of their approach are yet to be determined³⁴. South Coast AQMD would submit their approach into the SIP once technically feasible and cost effective options are confirmed.

Risk-based Strategy Analysis

The emissions from units subject to Rule 4692 contribute 5.2% of average winter PM_{2.5} emitted from stationary and area sources in the 2012 emission inventory. Although the emissions from commercial charbroiling are small in comparison to the total emissions inventory, this category is one of the largest single contributors of directly emitted PM_{2.5} in the Valley. Photochemical modeling conducted for this plan shows that reducing commercial charbroiling emissions would contribute to improved PM_{2.5} air quality and PM_{2.5} attainment in the Valley.

Furthermore, charbroiling emissions occur in populated areas. The PM_{2.5} species associated with charbroiling is organic carbon (OC)³⁵; as noted in Chapter 2, health research shows there is evidence of high toxicity and significant health effects associated with OC. Since the cooking of meat can release carcinogenic PM_{2.5} species like polycyclic aromatic hydrocarbons (PAH), controlling emissions from under-fired charbroilers would have a substantial positive impact on public health. The air quality impacts on neighborhoods near restaurants with under-fired charbroilers can be significant on days when meteorological conditions are stable, when dispersion is

³⁴ <http://aqmd.gov/aqmp/2012aqmp/draft/Chapters/Ch4.pdf>

³⁵ See Schauer and Cass (2000) *Environmental Science and Technology*, Vol. 34 (9), pp. 1821-1832.

limited and emissions are trapped near the surface within the surrounding neighborhoods. This potential for neighborhood-level concentration of emissions during evening or multi-day stagnation events raises environmental justice concerns.

Control Measure Commitments

The following is a summary of recommended commitments for Rule 4692.

Regulatory Action

The recommendation is to amend Rule 4692 to reduce PM_{2.5} emissions from under-fired charbroilers. As part of this process, the District would conduct a thorough review of all available information about under-fired charbroilers and under-fired charbroiler controls. The District would take advantage of the most recent technology demonstration information available and, if needed, initiate an independent technology demonstration. To allow sufficient time for this and other related rule development work, the recommendation is to amend Rule 4692 in 2016. The District estimates that this amendment would achieve, at minimum, a 20% reduction in the baseline emissions inventory for under-fired charbroilers. The modeling conducted for this plan shows that reducing emissions from under-fired charbroiling by 20% in Kern County is necessary for attainment; thus, by reducing emissions 20% Valley-wide, the District achieves significant health benefits Valley-wide per the District's Risk-based Strategy. Refer to Chapter 9 for more details.

Table D-11 Estimated Emissions Reductions

	2007	2012	2014	2015	2016	2017	2018	2019
PM _{2.5} Tons per day – winter season								
Kern County (Attainment Need)	0	0	0	0	0	0.1	0.1	0.1
Other Valley Counties	0	0	0	0	0	0.3	0.3	0.3
Valley-wide Total	0	0	0	0	0	0.4	0.4	0.4

Incentive Action

The District's current CHIP is a pilot demonstration plan, rather than a more widely-available incentive program. After completion of a few pilot demonstration projects under CHIP, though, the District could consider expanding its charbroiling incentive efforts into a broader incentive program. Therefore, although there are no recommendations for new incentive actions at this time, the recommendation is to continue the District CHIP.

Technology Advancement Action

The District will also seek to identify restaurants to participate in the District's existing CHIP pilot program to demonstrate promising under-fired charbroiler emissions controls in a working-restaurant setting in the Valley. Such a demonstration project could eventually be developed into a larger incentive program. Additionally, the District will continue to collaborate with EPA and South Coast technology demonstration efforts for

under-fired charbroiling. The South Coast project should be completed by the end of 2012, and may yield useful information to assist in implementing emission reduction strategies for this category.

Policy Initiatives

The District is not currently supporting any policy initiatives specific to commercial charbroiling and there are no recommendations for new policy initiatives for this source.

Education and Outreach

The District currently provides a robust education and outreach program for regulated sources through the Small Business Assistance program, Permit Stakeholder Meetings, Compliance Assistance Bulletins, and public notices for public workshops and public hearings. It is recommended that the District provide strong stakeholder outreach in conjunction with the regulatory, incentives, and technology demonstration commitments as appropriate. The District will continue to work closely with affected sources to ensure successful compliance.

D.5.2 Rule 4901 Wood Burning Fireplaces and Wood Burning Heaters

Source Category

Residential wood burning is one of the Valley's largest sources of directly-emitted PM_{2.5} in the winter. Rule 4901 (Wood Burning Fireplaces and Wood Burning Heaters) limits emissions from wood burning fireplaces, wood burning heaters, and outdoor wood burning devices. Rule 4901 also restricts the sale and transfers of non-compliant wood burning devices, and limits the installation of wood burning devices in new residential developments.

Through the Check Before You Burn program, which is based on Rule 4901, the District has declared and enforced episodic wood burning curtailments, also called "No Burn" days, since 2003. Check Before You Burn and District Rule 4901 reduce harmful species of PM_{2.5} when and where those reductions are most needed: in impacted urbanized areas when the local weather is forecast to hamper PM dispersion.

Rule 4901 was adopted in 1993 and has been amended twice. The adoption of Rule 4901 established a public education program on techniques to reduce wood burning emissions. It also enforced EPA Phase II requirements for new wood burning heaters, prohibited the sale of used wood burning heaters, established a list of prohibited fuel types, and required the District to request voluntary curtailment of wood burning on days when the ambient air quality was unhealthy.

In 2003, the rule was amended to include episodic wood burning curtailments when air quality was forecast to be at 150 or higher on the air quality index (AQI), which is equivalent to a PM_{2.5} concentration of 65 µg/m³. The 2003 amendments also added restrictions on the installation of wood burning devices in new residential developments, based on housing density. In 2008, the District amended Rule 4901 again, this time to lower the mandatory curtailment level to a PM_{2.5} concentration of 30 µg/m³ (based on EPA's 2006 PM_{2.5} National Ambient Air Quality Standard (NAAQS) of 35 µg/m³ with an added margin of safety). The 2008 amendments also included a contingency measure to lower the wood burning curtailment level to 20 µg/m³ in the event that EPA finds that the Valley does not attain the 1997 PM_{2.5} air quality standard in 2014. EPA finalized approval for District Rule 4901 on November 10, 2009.

Rule 4901 wood burning curtailments only apply in areas with natural gas service, and wood burning curtailments do not apply to homes for which wood burning is the only source of heat. Compared to other District rules, District Rule 4901 provides for the most cost effective means to reduce wintertime PM_{2.5} concentrations. Direct PM_{2.5} emissions are controlled by approximately 14% for this source category during the wood burning season. The full effectiveness of the rule can be understated when considered in terms of annual average emissions or even "average winter emissions". On a Valley-wide "No Burn" day, Rule 4901 has the potential to reduce 16 tons of directly emitted PM_{2.5}.

Emission Inventory

Pollutant	2007	2012	2014	2015	2016	2017	2018	2019
Annual Average - Tons per day								
PM2.5	10.63	4.48	4.28	4.28	4.28	4.28	4.28	4.28
NOx	1.20	0.50	0.48	0.48	0.48	0.48	0.48	0.48
SOx	0.20	0.08	0.08	0.08	0.08	0.08	0.08	0.08
Winter Average - Tons per day								
PM2.5	20.72	8.73	8.35	8.35	8.35	8.35	8.35	8.35
NOx	2.35	0.98	0.94	0.94	0.94	0.94	0.94	0.94
SOx	0.39	0.16	0.15	0.15	0.15	0.15	0.15	0.15

Regulatory Evaluation**How does District Rule 4901 compare with federal rules and regulations?**

Rule 4901 is as stringent as the current federal New Source Performance Standards (NSPS) (40 CFR 60 Subpart AAA (Standards of Performance for New Residential Wood Heaters). The District continues to track EPA's current efforts to revise this NSPS. Additionally there are no EPA Control Techniques Guidelines (CTG), Alternative Control Techniques (ACT), National Emission Standards for Hazardous Air Pollutants (NESHAP), or Maximum Achievable Control Technology (MACT) guidelines for this source category.

How does District Rule 4901 compare to rules in other air districts?

Rule 4901 is compared to other air districts' rules for similar sources, including Washington State's Department of Ecology regulation Chapter 173-433 WAC (Solid Fuel Burning Devices); Colorado Air Quality Control Commissions Regulation No. 4, Spokane Regional Clean Air Agency Regulation I Article VIII; Oregon Department of Environmental Quality Division 262 (Heat Smart Program for Residential Woodstoves and Other Solid Fuel Heating Devices); SCAQMD Rule 445 (Wood Burning Devices); BAAQMD Regulation 6 Rule 3 (Wood-Burning Devices); Yolo-Solano Air Quality Management District Rule 2.40 (Wood Burning Appliances), and SMAQMD Rules 417 (Wood Burning Appliances); and 421 (Mandatory Episodic Curtailment of Wood and other Solid Fuel Burning). SCAQMD Rule 445 prohibits installation of wood burning devices in new developments that have access to natural gas service. However, District Rule 4901 has the most stringent wood burning curtailment level, compared to those of other air districts.

Emission Reduction Opportunities

The District evaluated Rule 4901 for potential opportunities to reduce emissions. Potential opportunities evaluated include an analysis of benefits from reducing the curtailment level, allowing cleaner wood burning devices under certain circumstances to encourage consumers to switch to these clean devices from uncontrolled fireplaces, the possibility of extending the wood burning season, and the possibility of amending the portion of the rule pertaining to the quantity of units allowed in new developments. These evaluations resulted in the District committing to amend Rule 4901 through a public rule-amending process (see Chapters 5 and 10 for these commitments). The analyses are as follows:

Curtailment Level

A potential opportunity for further emissions reductions is to lower the curtailment level, which would reduce emissions by increasing the number of “No Burn” days. Lowering the curtailment level below the current level would reduce the build-up of emissions during the long stagnation periods experienced in the Valley during the winter season, and would help avoid exceedances of the PM_{2.5} standard. The table below shows the average number of days wood burning could be prohibited if the curtailment level was reduced below the current level of 30 µg/m³, based on 2009-2012 air quality forecasts. The actual number of “No Burn” days that would occur under the lower curtailment level would likely be lower when actually implemented, since additional emissions reductions will phase in and improve PM_{2.5} air quality before the lower “No Burn” level would take effect. As discussed in Chapter 4, this reduction in emissions during the peak PM_{2.5} winter would significantly reduce PM_{2.5} concentrations in Kern County, and greatly assist in attaining the 24-hour PM_{2.5} standard.

Table D-12 Average Number of Days Forecast Above Curtailment Thresholds*

	<i>Current Threshold</i>		<i>Contingency Threshold</i>
County	>=30 µg/m³	>=25 µg/m³	>=20 µg/m³
San Joaquin	18	30	47
Stanislaus	36	62	74
Merced	26	43	63
Madera	37	56	73
Fresno	53	75	85
Kings	41	60	73
Tulare	40	59	71
Kern	47	66	78
Kern (Greater Frazier Park Area)	0	2	3

*Based on the 2009-10, 2010-11, and 2011-12 wood-burning seasons.

Wood burning curtailments under Rule 4901 have been shown to significantly reduce PM_{2.5} concentrations on “No Burn” days, as demonstrated in the District’s annual “End of the Season Wood Burning Reports.” Currently, Valley-wide curtailment of wood

burning during winter is estimated to reduce 16 tons per day of PM_{2.5} emissions. Prohibitions are declared by county or forecast area and apply to areas with natural gas service, allowing the rule to target the most densely-populated urban areas that are most likely to experienced localized effects of wood burning in the neighborhood.

Although a “No Burn” day can increase a resident’s natural gas costs, natural gas can more efficiently heat the whole home; some homes could also offset increased natural gas costs by spending less on wood. Compared to other District rules, curtailing burning under Rule 4901 is the most cost effective rule for reducing PM_{2.5} concentrations.

Wood Burning Devices

Rule 4901 limits the installation of new wood burning devices, and limits the use of wood burning devices on “No Burn” days in areas that have natural gas service. When and where residents are allowed to burn and choose to do so, they are encouraged to burn as cleanly as possible. For example, dry, seasoned wood and manufactured logs burn cleaner than unseasoned wood.

Upgrading a home’s wood burning device also reduces air pollutant emissions on days when wood burning is allowed. By operating more efficiently, these devices can lower the overall home heating cost. District Rule 4901 neither prohibits nor requires wood burning device upgrades. However, the District encourages such upgrades through its public outreach and through its *Burn Cleaner Program*, which provides funding to Valley residents to upgrade their current wood-burning devices and open fireplaces to natural or propane gas devices, to certified wood stoves or inserts, or to pellet devices. The District’s webpage³⁶ has more information on program eligibility and qualified devices.

There are several types of wood burning devices and device inserts available. Wood stoves, especially newer models, are generally safe and efficient devices for home heating. There are two types of wood stoves: catalytic and non-catalytic. EPA’s Phase II certified wood stoves produce only 2 to 7 grams of smoke per hour, compared to 15 to 30 grams of smoke per hour from older, uncertified devices.

Pellet stoves are similar in appearance to wood stoves, but burn compressed pellets made of ground, dried wood and other biomass wastes. Pellet stoves are generally more expensive than wood stoves and require electricity for operation; however, they are typically more efficient than wood stoves due to the better fuel-to-air ratio in the combustion chamber. EPA also certifies pellet stoves.

Wood burning fireplaces include traditional masonry fireplaces built into brick or stone, constructed in the home, and “low mass” fireplaces that are pre-fabricated prior to installation. Most fireplaces are not used as a primary source of heat, but serve as a secondary heating source or for ambiance. Fireplaces generate much more emissions than wood stoves or pellet stoves, but fireplace inserts are available to reduce

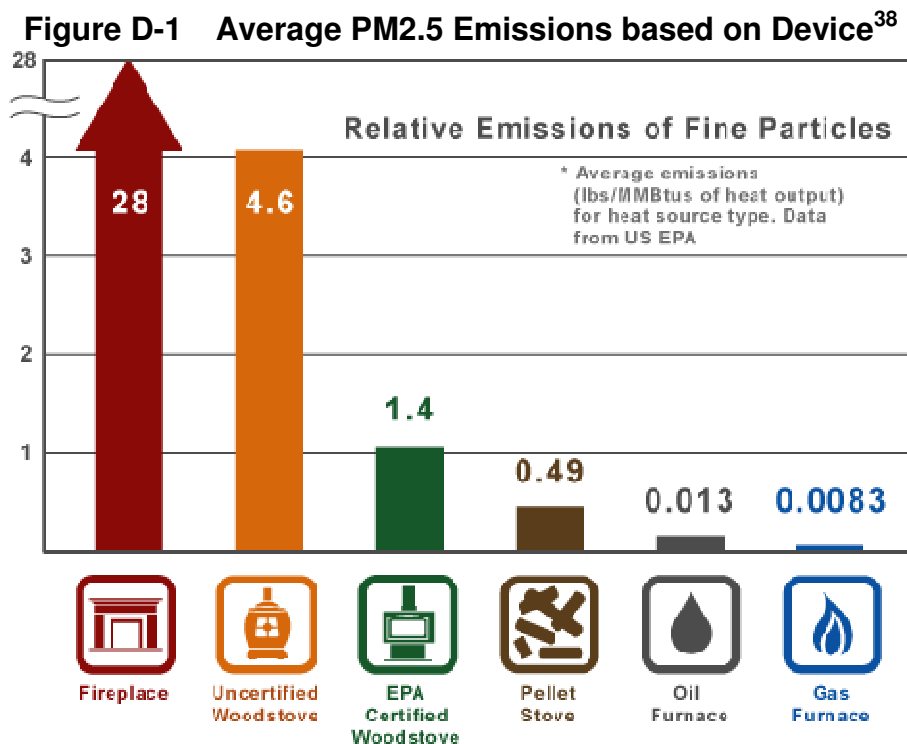
³⁶ www.valleyair.org/Grant_Programs/GrantPrograms.htm#WoodStoveChangeOut

emissions. EPA does not certify fireplaces or fireplace inserts, but does have a voluntary program for devices that meet qualifications to be considered cleaner burning than typical fireplaces and fireplace inserts. Phase I qualified units are approximately 57% cleaner than older fireplace models, while Phase II qualified units are approximately 70% cleaner. While these devices reduce emissions relative to uncontrolled fireplaces, their emissions are still relatively higher than certified wood stoves and pellet stoves.

Gas stoves and gas fireplaces burn natural gas or propane, emit very little air pollution, and require little maintenance. Gas devices are not subject to the requirements of Rule 4901, so they can be used on “No Burn” days. For more information about the various types of wood burning devices available, see EPA’s Burn Wise program webpages³⁷.

The District will consider allowing the use of cleaner EPA-certified wood burning devices, particularly during new potential curtailment days aimed at reducing the buildup of PM_{2.5} emissions. EPA-certified devices have been designed and demonstrated to reduce PM_{2.5} emissions by 70% or greater in comparison to uncertified woodstoves, and by 95% in comparison to wood-burning fireplaces. Pellet stoves have demonstrated even greater reductions in PM_{2.5} emissions, with an 89% reduction in comparison to uncertified woodstoves and a 98% reduction from wood-burning fireplaces. Figure D-1 illustrates the average PM_{2.5} emissions based on various heat sources.

³⁷ www.epa.gov/burnwise



Many Valley residents have upgraded their homes with these newer devices, including through programs such as the *District's Burn Cleaner Program* and federal tax incentives. Given their much lower relative emissions, allowed use of these devices during a lower curtailment level could still achieve the goal of significantly reducing the overall emissions that ultimately lead to violations of the standard. This potential allowance and the appropriate level of acceptable clean certified devices will be examined through the public rule amendment process. Enforcing this added flexibility would be difficult given the challenge in distinguishing wood smoke emissions from various wood burning devices, and the District would explore various options during the rule development process for ensuring that this issue is addressed. Along with this potential allowance, the District will continue to provide incentives to encourage the replacement of existing older devices with newer clean devices.

Wood Burning Season

An additional opportunity for further reducing emissions from this source includes lengthening the wood burning curtailment season, given the relatively high levels of PM_{2.5} emissions often observed during the months of October and March. The District's current Rule 4901 wood burning curtailment season runs from the beginning of November until the end of February. Expanding District Rule 4901's curtailment season to include October and/or March would potentially increase the number of curtailment days in each wood burning season, particularly in October, based on recent air quality data. However, measured Valley concentrations of levoglucosan, a primary indicator for

³⁸EPA. Consumers – Energy Efficiency and Wood-Burning Stoves and Fireplaces. (2012, November 14). Retrieved from <http://www.epa.gov/burnwise/energyefficiency.html>.

wood burning, are not nearly as high in October or March as found to be during the current curtailment season of November through February. Therefore, while total PM_{2.5} concentrations are often relatively high during the months of October and March, there may be limited potential benefit in extending the season to these months if the amount of wood burning and related contribution to the total PM_{2.5} concentrations is limited in scale. Extending the wood burning season to include curtailments in October and/or March and the associated potential air quality benefits resulting from that extension will be considered during the public rule amending process for Rule 4901.

New Residential Developments

The District considered further limiting the installation of wood burning fireplaces and heaters in new residential developments by strengthening Section 5.3 of Rule 4901. South Coast Rule 445 prohibits the installation of wood burning devices in any development that has natural gas service. However, since most of the Valley's new developments are already subject to restrictions based on their housing densities, the emissions reduction potential is minimal.

Risk-based Strategy Analysis

Wood smoke contains PM_{2.5}, carbon monoxide, formaldehyde, sulfur dioxide, irritant gases, and known and suspected carcinogens, such as polycyclic aromatic hydrocarbons (PAH). The toxic air pollutants in wood smoke can cause human health impacts such as coughs, headaches, and eye and throat irritation. Studies show that prolonged inhalation of wood smoke contributes to chronic interstitial lung disease, pulmonary arterial hypertension, and cor pulmonale, which can eventually lead to heart failure, in adults³⁹. Wood smoke has also been linked to detrimental mutagenic and systemic effects such as oxidative stress and coagulation, which can ultimately result in cell damage and possibly lead to cancer^{40, 41, 42}. Children with the highest exposure to wood smoke show a significant decrease in lung function⁴³. Studies also found that wood smoke is twelve times more carcinogenic than an equal concentration of cigarette smoke⁴⁴. Efforts to reduce wood smoke target some of the most harmful species of PM_{2.5}.

³⁹ Sandoval, J.; Slas, J.; Martinez-Guerra, M.L.; Gomez, A.; Martinez, C.; Portales, A.; Palomar, A.; Villegas, M.; and Barrios, R. Pulmonary Arterial Hypertension and Cor Pulmonale Associated with Chronic Domestic Woodsmoke Inhalation. (1993) *Chest* 103:12-20.

⁴⁰ Danielsen, P.H.; Bräuner, E.V.; Barregard, L.; Sällsten, G.; Wallin, M.; Olinski, R.; Rozalski, R.; Møller, P.; Loft, S. Oxidatively damaged DNA and its repair after experimental exposure to wood smoke in healthy humans. (2008) *Mutat Res.* 642(1-2):37-42.

⁴¹ Barregard, L.; Allsten, G.S.; Gustafson, P.; Johansson, L.; Johannesson, S.; Basu, S.; Stigendal, L. Experimental Exposure to Wood-Smoke Particles in Healthy Humans: Effects on Markers of Inflammation, Coagulation, and Lipid Peroxidation (2006) *Inhalation Toxicology* 18:845–853.

⁴² Sapkota, A.; Gajalakshmi, V.; Jetly, D.H.; Roychowdhury, S.; Dikshit, R.P.; Brennan, P.; Hashibe, M.; Boffetta, P. Indoor air pollution from solid fuels and risk of hypopharyngeal/laryngeal and lung cancers: a multicentric case-control study from India. (2008) *Int J Epidemiol.* 37(2):321-8.

⁴³ Heumann, M.; Foster, L.R.; Johnson, L.; Kelly, L. Woodsmoke Air Pollution and Changes in Pulmonary Function Among Elementary School Children (1991) Air & Waste Management Association 84th Annual Meeting & Exhibition, Vancouver, British Columbia.

⁴⁴ Lewtas, J.; Zweidinger, R.B.; Cupitt, L.; Mutagenicity, Tumorigenicity and Estimation of Cancer Risk from Ambient Aerosol and Source Emissions from Woodsmoke and Motor Vehicles. (1991) Air and Waste Management Association 84th Annual Meeting & Exhibition, Vancouver, British Columbia.

People can be exposed to wood smoke when they use their wood burning devices. Additionally, people can be exposed to wood smoke when people in their neighborhoods use their wood burning devices; windows and doors cannot keep the particles in wood smoke out of homes. A recent ARB-funded study of residential wood smoke impacts on indoor air quality was conducted in Cambria, California and published in 2011. Using aethalometers designed to monitor carbon black as the definitive chemical signature of wood smoke, the study found nocturnal outdoor concentrations in Cambria neighborhoods that were 2 to 10 times higher than the cleanest part of the city. Most significantly, over the course of the winter season, indoor concentrations of carbon black in non-burning homes were found to be 74% as high as concentrations measured just outside the same homes. This combination of processes results in a very high intake fraction (the portion of the total emissions that actually end up being inhaled) for neighborhood wood combustion when compared to other sources of PM that are less proximate.

The studies referenced above demonstrate the importance of reducing wood burning emissions to improve public health. Rule 4901 prohibits wood burning by county or forecast area on days when that area is forecast to exceed $30 \mu\text{g}/\text{m}^3$ (the level of EPA's 2006 health-based PM_{2.5} standard of $35 \mu\text{g}/\text{m}^3$, plus a margin of safety). Thus, District Rule 4901 and its corresponding *Check Before You Burn Program* reduce PM_{2.5} when and where those reductions are most needed: in impacted urbanized areas when the local weather is forecast to hamper PM dispersion.

Given the time, location, and type of PM_{2.5} emissions reductions associated with District wood burning prohibitions, Rule 4901 is a key component of the District's Risk-based Strategy. In 2008, the Central Valley Health Policy Institute found that District wood burning curtailments on high pollution days reduced annual exposure by about 13% in Bakersfield and Fresno, resulting in 30 to 70 avoided cases of annual premature mortality. Strengthening Rule 4901 could allow for even greater health benefits.

The emissions from this source category contribute 15.6% of average winter PM_{2.5} emitted from stationary and area sources in the 2012 emission inventory making residential wood burning one of the Valley's largest source of directly-emitted PM_{2.5}. Also, emissions associated with residential wood burning are confined to the time of year when the Valley experiences its PM_{2.5} exceedance days. Reducing emissions from this source category further is a key strategy for the Valley to attain the PM_{2.5} national ambient air quality standards. Photochemical modeling conducted for this plan shows that further reducing residential wood burning emissions would contribute to improved PM_{2.5} air quality in the Valley.

Control Measure Commitments

The following is a summary of recommended commitments for Rule 4901.

Regulatory Action

There is potential to reduce residential wood combustion PM_{2.5} emissions by lowering the threshold at which a "No Burn" day is called for each county. As discussed above,

the recommendation is to lower the curtailment threshold to 20 $\mu\text{g}/\text{m}^3$. While significantly below the federal standard of 35 $\mu\text{g}/\text{m}^3$, establishing the curtailment threshold at this level will reduce the buildup of emissions during the long stagnation periods characteristic to the Valley. Table D-12 details the impact that lowering the threshold will have on the number of “No Burn” days in each county for the current November – February wood burning season under Rule 4901.

With this lower wood burning curtailment threshold, intended to reduce buildup during stagnation events, the District will consider allowing the use of cleaner EPA-certified wood burning devices during these buildup periods. Given their much lower relative emissions, allowed use of these devices during certain curtailment levels could still achieve the goal of significantly reducing the overall emissions that ultimately lead to violations of the standard.

Expanding the applicability of Rule 4901 curtailments to include October and/or March will also be considered when Rule 4901 is next amended. This could potentially increase the number of “No Burn” days, particularly in October. At this time, the District does not propose to change any of the existing rule exemptions. However, exemptions could be re-evaluated during the rule amendment process.

Contingency

With the District’s 2008 adoption of a contingency measure that would lower the wood burning curtailment level to 20 $\mu\text{g}/\text{m}^3$ in 2014, the District committed to evaluate the appropriateness of a substitute contingency measure starting in 2012. In conjunction with the District’s current recommendation to formally lower the curtailment level to 20 $\mu\text{g}/\text{m}^3$, the District proposes a new contingency level of 15 $\mu\text{g}/\text{m}^3$, to be implemented if EPA finds that the Valley fails to attain the 2006 PM_{2.5} NAAQS by 2019. In addition, the attainment year contingency-trigger would achieve an additional 1.5 tons per day of PM_{2.5}, as an average day during the wood burning season (November - February). This would serve as additional contingency reductions in 2020.

Table D-13 Potential Emissions Reductions

	2007	2012	2014	2015	2016	2017	2018	2019
PM _{2.5} Tons per day – winter season								
Kern and Kings Counties (Attainment Need)	0	0	0	0	0.1	0.2	0.2	0.2
Other Valley Counties	0	0	0	0	0.7	1.3	1.3	1.3
Valley-wide Total	0	0	0	0	0.8	1.5	1.5	1.5

Table D-14 Estimated Change in Number of No Burn Days

County	“No Burn” Days at Current Threshold $\geq 30 \mu\text{g}/\text{m}^3$	“No Burn” Days at Lower Threshold $\geq 20 \mu\text{g}/\text{m}^3$	“No Burn” Days at Contingency Threshold $\geq 15 \mu\text{g}/\text{m}^3$
San Joaquin	18	47	71
Stanislaus	36	74	93
Merced	26	63	85
Madera	37	73	96
Fresno	53	85	104
Kings	41	73	96
Tulare	40	71	92
Kern	47	78	100

Incentive Action

No new incentive actions are recommended for wood burning fireplaces and wood burning heaters. The District expects to continue its *Burn Cleaner Program* to change out older wood burning devices.

Technology Advancement Action

Several manufacturers are developing Phase 2 qualified fireplace inserts and fireplaces that emit less PM_{2.5} than their uncontrolled fireplace counterparts. However, Phase II certified wood stoves, pellet stoves, and natural gas heating emit less PM_{2.5} than even the cleanest Phase 2 qualified fireplaces and fireplace inserts. The District does not anticipate participating in any technology advancement actions related to wood burning fireplaces at this time.

Policy Initiatives

The District will evaluate potential strategies for implementing the lower curtailment level during the public rule development process.

Education and Outreach

The District’s comprehensive, multimedia “Check Before You Burn” outreach utilizes billboards, radio ads, brochures, social media, strong media partnerships and more to ensure the public is informed about wood burning curtailments. The District is committed to continuing this strong public outreach effort to educate the public, help ensure the success of the District’s Rule 4901, and reduce these emissions in the Valley.

D.5.3 Rule 4902 Residential Water Heaters

Source Category

Rule 4902 applies to manufacturers, distributors, retailers, and installers of Public Utilities Commission (PUC) quality natural gas-fired residential water heaters with heat input rates less than or equal to 75,000 Btu/hr. It is a point-of-sale type of rule that limits NOx emissions from residential water heaters.

Rule 4902 was adopted on July 17, 1993 to control NOx emissions from natural gas-fired water heaters. The original rule enforced a NOx emissions limit of 40 nanograms of NOx per Joule of heat output (ng/J). Since its adoption, the rule has been amended once. The March 2009 amendments strengthened the rule by enforcing a limit of 10 ng/J for new or replacement water heaters and a limit of 14 ng/J for instantaneous water heaters. EPA finalized approval for Rule 4902 on May 5, 2010. Rule 4902 is not subject to RACT because it is not a Control Techniques Guidelines (CTG) category and it is applicable to sources that are too small to exceed the major source threshold.

Emission Inventory

Pollutant	2007	2012	2014	2015	2016	2017	2018	2019
Annual Average - Tons per day								
PM2.5	0.20	0.20	0.20	0.20	0.21	0.21	0.21	0.21
NOx	2.44	2.16	2.13	2.11	2.10	2.08	2.06	2.05
SOx	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Winter Average - Tons per day								
PM2.5	0.28	0.27	0.27	0.27	0.28	0.28	0.29	0.29
NOx	3.30	2.91	2.87	2.85	2.82	2.80	2.78	2.76
SOx	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02

Regulatory Evaluation

How does District Rule 4902 compare with federal rules and regulations?

There is currently no federal guidance given for this source category under the federal CTG, Alternative Control Techniques (ACT), New Source Performance Standards (NSPS), National Emission Standards for Hazardous Air Pollutants (NESHAP), and Maximum Achievable Control Technology (MACT) requirements.

How does District Rule 4902 compare to rules in other air districts?

District analysis compares Rule 4902 to the following analogous rules in other air districts: SCAQMD Rule 1121 (Control of Nitrogen Oxides from Residential Type, Natural Gas-Fired Water Heaters), SMAQMD Rule 414 (Water Heaters, Boilers and Process Heaters Rated Less than 1,000,000 BTU Per Hour), BAAQMD Regulation 9 Rule 6 (Nitrogen Oxides Emissions from Natural Gas-Fired Boilers and Water Heaters), and VCAPCD Rule 74.11 (Natural Gas-Fired Water Heaters) and determined that Rule 4902 is at least as stringent as those rules.

Emission Reduction Opportunities

As stated above, the most recent amendment of Rule 4902 strengthened the emission limit and as a result, NO_x emissions have been controlled by approximately 88% for this source category. Units subject to Rule 4902 are fired on PUC quality natural gas, and are inherently low-emitters of SO_x and PM_{2.5} emissions. Given the significant efforts and investments already made to reduce emissions from this source category, there are little remaining opportunities for obtaining additional emissions reductions. For the sake of thoroughness, the possibility of further reducing emissions from natural-gas fired water heaters is evaluated in the following discussion.

The potential opportunity evaluated is the possibility of achieving additional emission reductions from this category by taking advantage of lower emitting water heating technology. Rule 4902 is a point of sale rule, and nearly all water heaters sold in the District are conventional storage water heaters that operate on natural gas. The potential opportunity would be to replace natural gas and propane water heaters with units that run on electricity. A comparison of three water heaters that utilize the different fuel types with an emissions reduction and cost effectiveness analysis for these units is summarized below.

Table D-15 Emissions Reductions and Cost Effectiveness of Water Heaters by Fuel Type

Fuel Type	Low NOx Natural Gas	Propane	Electricity
Capacity ¹	50 gallons	50 gallons	50 gallons
Shipping Weight ¹	180 lbs	151 lbs	109 lbs
Energy Factor ¹	0.62	0.59	0.91
Purchase Price ¹	\$902.00	\$899.00	\$473.25
Estimated Life Expectancy ²	13 years	13 years	13 years
Lifetime Energy Use ²	3,133 therms	2,867 gallons of LP	62,439 kWh
Lifetime Energy Costs ³	\$3,568	\$7,176	\$9,834
Lifetime NOx Emissions ⁴	30.60 lbs	48.09 lbs	0.00 lbs
Annual NOx Emissions	2.35 lbs	3.70 lbs	0.00 lbs
Comparing Natural Gas and Propane to Electricity			
Annualized capital cost ⁵	\$76.99	\$76.99	N/A
Annual Operating Cost Savings Compared to Electric	\$482.00	\$204.46	
Cost per pound NOx	\$237.87	\$76.07	
Cost per ton NOx	\$475,736	\$152,135	

¹ Unit specifications and prices acquired from Grainger Industrial Supply as of August 7, 2012

² Data from US Department of Energy – Energy Cost Calculator for Electric and Gas Water Heaters
http://www1.eere.energy.gov/femp/technologies/eep_waterheaters_calc.html

³ Cost data based on the of the average cost of units of energy in 2010 according to the US Energy Information Administration.
<http://www.eia.gov/>

⁴ Emissions factors derived from Appendix EA-1 of US Department of Energy's Energy Assessment for Proposed Energy Conservation Standards for Residential Clothes Washers

⁵ The annualized capital equipment cost is calculated by multiplying the installed equipment cost by the capital recovery factor of 0.1627.

The operating cost for electric water heaters is higher than for propane and natural gas units, due to the higher cost of electricity over propane and natural gas. However, the initial purchase price is considerably lower for electric units. Converting to an electric water heater also may require modifications to the residence and have associated costs, though electric water heaters are amongst the safest units available. Electric units also weigh considerably less, due to the lack of safety equipment needed on a gas fueled water heater. While the lifetime cost of an electric water heater is higher than that of propane and natural gas, the emissions benefits may make converting to electric water heating a viable control strategy.

Risk-based Strategy Analysis

The emissions from units subject to Rule 4902 contribute 6.0% of average winter NOx emitted from stationary and area sources in the 2012 emission inventory. As illustrated in the emission inventory table above, the emissions from this source category are more prominent during winter months. However, these units are primarily fired on PUC-quality natural gas, which is generally considered a clean burning fuel with low SOx and PM emissions. Overall, Rule 4902 has significantly reduced NOx and SOx emissions from these units and has assisted in reducing PM2.5 concentrations through reductions of this key precursor.

Control Measure Commitments

The following is a summary of recommended commitments for Rule 4902.

Regulatory Action

The District's analysis did not identify any additional technologically feasible and cost effective potential controls. Therefore, there are no recommendations for additional regulatory actions for Rule 4902.

Incentive Action

The District does not currently fund any incentive programs specific to residential water heating, and there are no recommendations for new incentive programs for these sources at this time.

Technology Advancement Action

There are no recommendations for technology advancement actions at this time. Through its Technology Advancement Program, the District will continue to seek potential feasible and low-cost technologies that may provide for additional emission reduction opportunities in this category.

Policy Initiatives

The District does not currently have any policy initiatives specific to this rule. There are no recommendations for new policy initiatives specific to these units.

Education and Outreach

The District currently provides a robust education and outreach program for regulated sources through the Small Business Assistance program, Permit Stakeholder Meetings, Compliance Assistance Bulletins, and public notices for public workshops and public hearings. As this is a point of sale rule, this outreach would be applicable to retailers and manufacturers of residential water heaters. The District will continue to work closely with affected sources to ensure successful compliance. No new education and outreach efforts are recommended for these sources at this time.

D.5.4 Rule 4905 Natural Gas-Fired, Fan-Type, Residential Central Furnaces

Source Category

Rule 4905 is a point of sale rule that applies to any person who sells, offers for sale, installs or solicits the installation of natural-gas-fired, fan-type residential central furnaces, for use within the Valley with a rated heat input capacity of less than 175,000 Btu/hour, and for combination heating and cooling units with a rated cooling capacity of less than 65,000 Btu/hour.

The rule was adopted on October 20, 2005 to establish NO_x limits for residential central furnaces supplied, sold, or installed in the Valley. The rule set a NO_x emission limit of 0.093 pounds per million Btu of heat output (lb/MMBtu). EPA finalized approval for Rule 4905 on May 30, 2007. Rule 4905 is not subject to RACT requirements because it is not a Control Techniques Guidelines (CTG) category and it is applicable to sources that are too small to exceed the major source threshold.

Emission Inventory

Pollutant	2007	2012	2014	2015	2016	2017	2018	2019
<i>Annual Average - Tons per day</i>								
PM2.5	0.20	0.19	0.20	0.20	0.20	0.21	0.21	0.21
NO _x	2.49	2.40	2.45	2.48	2.51	2.54	2.58	2.61
SO _x	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
<i>Winter Average - Tons per day</i>								
PM2.5	0.36	0.35	0.36	0.36	0.36	0.37	0.37	0.38
NO _x	4.47	4.31	4.40	4.45	4.51	4.56	4.62	4.68
SO _x	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03

Regulatory Evaluation

How does District Rule 4905 compare with federal rules and regulations?

There are no applicable CTG, Alternative Control Techniques (ACT), New Source Performance Standards (NSPS), National Emission Standards for Hazardous Air Pollutants (NESHAP), or Maximum Achievable Control Technology (MACT) guidelines for this source category.

How does District Rule 4905 compare to rules in other air districts?

Rule 4905 when compared to other California air districts' rules for similar sources is found to be at least as stringent as the other rules. Specifically, Rule 4905 was compared to the following rules: SMAQMD Rule 414 (Water Heaters, Boilers and Process Heaters Rated Less Than 1,000,000 BTU Per Hour), BAAQMD Regulation 9

Rule 4 (Nitrogen Oxides from Fan Type Residential Central Furnaces), and VCAPCD Rule 74.22 (Natural Gas-Fired, Fan-Type Central Furnaces).

SCAQMD Rule 1111 (Reduction of NO_x Emissions from Natural Gas-Fired, Fan-Type Central Furnaces) limits NO_x emissions of all furnaces to 0.0325 lb/MMBtu by October 1, 2018, whereas the Rule 4905 NO_x limit is 0.093 lb/MMBtu. In addition, SCAQMD Rule 1111 applies to both commercial and residential units, whereas District Rule 4905 only applies to residential units. The District has already committed to amending Rule 4905 in 2014.

Emission Reduction Opportunities

The District committed to amending Rule 4905 in the 2008 *PM_{2.5} Plan*. This amendment is scheduled for 2014, and will lower NO_x emission limits for new natural gas-fired, fan-type residential central furnaces as appropriate for the Valley based on NO_x limits within SCAQMD Rule 1111. However, it has still not been determined if manufacturers will be able to meet the limits in SCAQMD Rule 1111. In 2010, SCAQMD released a Request for Proposal (RFP) for the development of prototype ultra-low NO_x natural gas-fired fan-type central furnaces. Four different projects were selected with different burner and emission control technologies for funding and are ongoing. The District will work closely with South Coast staff throughout the technology development project. When Rule 4905 is amended, NO_x emission limits will be based on the results of those studies and the technology that is expected to be available.

Commercial Furnaces

As previously stated, SCAQMD Rule 1111 currently regulates small residential and commercial furnaces less than 175,000 Btu/hr, whereas District Rule 4905 regulates residential furnaces of the same size, but not commercial furnaces. The technology of commercial furnaces does not differ from residential central furnaces.

As a part of their on-going research efforts, SCAQMD plans on conducting a new technical assessment of the technology available to offset emissions from commercial central furnaces greater than 175,000 Btu/hr by 2014. SCAQMD plans on following up the assessment with a rule amendment that incorporates a new NO_x limit for commercial units greater than 175,000 Btu/hr, which are currently unregulated, by 2016.

The District has committed to amending Rule 4905 in 2014 to lower NO_x limits; during that rule-amending project the possibility of extending the applicability of this rule to include commercial units based on technological feasibility and cost effectiveness will also be evaluated. The District will work closely with SCAQMD to discuss the findings from their technical assessments of low-NO_x technologies for commercial furnaces.

Risk-based Strategy Analysis

The emissions from units subject to Rule 4905 contribute 8.9% of average winter NO_x emitted from stationary and area sources in the 2012 emission inventory. As illustrated in the emission inventory table above, the emissions from this source category are primarily a winter issue.

Control Measure Commitments

The following is a summary of recommended commitments for Rule 4905.

Regulatory Action

The recommendation is to amend the rule in 2014 as committed to in the District *2008 PM2.5 Plan*, and as a part of that process examine the possibility of extending the applicability of rule requirements to include natural gas-fired, fan-type, commercial central furnaces.

Incentive Action

Rule 4905 is currently under commitment to be amended to make the rule more stringent, and no new technologies were identified to further reduce emissions beyond those technologies that will be evaluated during the 2014 rule amending project. No new incentive actions are recommended for these natural gas-fired, fan-type, residential central furnaces.

Technology Advancement Action

As discussed above, the SCAQMD is currently testing new technologies to reduce emissions from these sources and the District intends to use the findings from that testing to make determinations as to the appropriate amendments for the rule. This effort, aside, there is no recommendation for a new technology advancement project for this source category. Through its Technology Advancement Program, the District will continue to seek potential feasible and low-cost technologies that may provide for additional emission reduction opportunities in this category.

Policy Initiatives

The District is not currently supporting any policy initiatives specific to natural gas-fired, fan-type, residential central furnaces, and there are no recommendations for new policy initiatives for these sources.

Education and Outreach

The District currently provides a robust education and outreach program for regulated sources through the Small Business Assistance program, Permit Stakeholder Meetings, Compliance Assistance Bulletins, and public notices for public workshops and public hearings. This is a point of sale rule; District outreach is primarily applicable to retailers of these natural gas-fired, fan-type, residential central furnaces. No new education and outreach efforts are recommended for these retailers at this time. The District will continue to work closely with affected sources to ensure successful compliance.

D.6 FUGITIVE PARTICULATE MATTER

District Regulation VIII is comprised of eight rules that regulate fugitive dust emissions. Regulation VIII applies only to outdoor anthropogenic (human-caused) fugitive dust sources; primary PM10 sources that result in fugitive dust emissions such as construction, demolition, excavation, extraction or other earthmoving activities; handling, transport, and storage of bulk materials; landfill operations; carryout and trackout; open areas with disturbed soil; unpaved roads; unpaved vehicle/equipment traffic areas (such as parking, shipping, receiving, transfer, and service areas), and off-field agricultural sources. Regulation VIII does not apply to PM10 precursor sources or sources of smoke. Regulation VIII prohibitory standards are performance based whereby the operators are allowed to determine the control technique sufficient to limit visible dust emissions to 20 percent opacity and, in certain instances, to implement requirements for a stabilized surface.

Regulation VIII was critical in the District's attainment of the National Ambient Air Quality Standard for PM10. However, a variety of studies have been conducted which may indicate that the PM2.5 fraction of the PM emissions from this source category may not be as significant as the PM coarse fraction. A better quantification of the PM2.5 fraction is required to develop a more accurate emissions inventory for the various activities in this category and to indicate the level of significance of those PM2.5 emissions. At this time, PM2.5 emission control factors are not well defined and it is not known if controls for PM10 are effective for producing PM2.5 emissions reductions for this category.

In the Risk-based Strategy chapter of this plan, modeling results show that the geologic fraction of PM2.5 found in the San Joaquin Valley makes a relatively small contribution to overall PM2.5 mass (see Figure 2.1). In addition, studies have shown that geologic dust, by itself, has relatively low toxicity. For more information on the impacts of geologic PM2.5 refer to Chapter 2.

Regulation VIII Rules do not regulate the vehicles that create dust because the District does not have the jurisdiction to regulate mobile sources. Refer to Chapter 6 (Incentive Programs) and Appendix C (Mobile Source Control Strategies) for details on how the District addresses mobile sources.

Existing Control Strategies

Due to the degree of difficulty and enormity of the challenge that the Valley faces in meeting the National Ambient Air Quality Standards (NAAQS), the District recognizes that prohibitory rules alone are not enough to reduce emissions to meet attainment requirements and protect public health. The District's longstanding, progressive strategy for reducing emissions is a multifaceted effort that includes incentive programs and policy initiatives in addition to prohibitory rules. The following discussion summarizes both the existing District efforts to reduce emissions from this source category, and evaluations for potential opportunities for further emissions reductions.

Incentive Programs

Incentive programs are an integral part of the emission reduction efforts of the District, especially where the District lacks direct jurisdiction in establishing emission control requirements. Because the District has regulatory authority and currently regulates these control measure source categories, the opportunities for incentive programs are minimal. In fact, there are not currently any incentive programs specific to the reduction of fugitive PM from sources subject to the Regulation VIII rules. The District does however implement incentive programs for off-road vehicles; refer to Chapter 6 for details on those programs.

Policy Initiatives

Similar to the Incentive Programs, the District's policies and Legislative Platform are important components to the District's strategy to attain federal ambient air quality standards. The District utilizes policies and the legislative platform to bring attention to major issues that have a direct impact on the Valley's air quality. Water shortages have an adverse impact on air quality in the Valley in a number of ways. Taking agricultural land out of production has led to the exposure of bare land, which can cause soil erosion and result in wind-blown dust. Furthermore, one of the key dust control measures that the Valley relies upon to control fugitive dust is wet suppression, which also requires water. With this in mind, the District supports measures to provide reliable water supplies to the Valley.

Rules and Regulations

The following table identifies the District Regulatory VIII rules, each of which will be evaluated to examine potential opportunities for additional emissions reductions.

Table D-16 Current Regulation VIII Rules

Rule	Last Amended/ Adopted
Rule 8011 General Requirements	08/19/2004
Rule 8021 Construction, Demolition, Excavation, Extraction, and Other Earthmoving Activities	08/19/2004
Rule 8031 Bulk Materials	08/19/2004
Rule 8041 Carryout and Trackout	08/19/2004
Rule 8051 Open Areas	08/19/2004
Rule 8061 Paved and Unpaved Roads	08/19/2004
Rule 8071 Unpaved Vehicle/ Equipment Traffic Areas	08/19/2004
Rule 8081 Agricultural Sources	08/19/2004

D.6.1 Rule 8011 General Requirements

Source Category

The provisions of Rule 8011 are applicable to specified outdoor fugitive dust sources. The definitions, exemptions, requirements, administrative requirements, recordkeeping requirements, and test methods set forth in this rule are applicable to all rules under District Regulation VIII (Fugitive PM₁₀ Prohibitions). The Regulation VIII series was adopted in November 2001, and subsequently amended in 2004. The rules were developed pursuant to EPA guidelines for serious PM₁₀ nonattainment areas. In 2004, the District adopted amendments to Regulation VIII to upgrade existing Reasonably Available Control Measure (RACM) level rules to meet the more stringent Best Available Control Measure (BACM) level required in serious PM₁₀ nonattainment areas.

Emission Inventory

The emission inventory for this rule is not quantified because it is a supplementary rule to the other seven Regulation VIII Rules. Although this rule applies to all sources that have the potential to emit particulate matter there are no control requirements established within this rule. Emissions and emission reductions are addressed in the other seven Regulation VIII Rules. Emissions from Regulation VIII Rules can be found in Appendix B, and summarized in the other seven Regulation VIII rule discussions in this appendix.

Regulatory Evaluation

How does District Rule 8011 compare with federal rules and regulations?

Rule 8011 when compared to EPA rules, regulations, and guidelines that apply to fugitive dust is found to meet or exceed these standards. Federal requirements are located in General Preamble for Title I of the Clean Air Act Amendments of 1990 Appendix (57 FR 13498, April 16, 1992) and Fugitive Dust Background Document and Technical Information Document for Best Available Control Measures (EPA-450/2-92-004).

How does District Rule 8011 compare to rules in other air districts?

Rule 8011 was compared to fugitive dust regulations at other air districts and where comparable, is at least as stringent, if not more stringent, than other districts' rules. Comparisons to other air district rules, included SCAQMD Rule 1156 (Further Reductions of Particulate Emissions from Cement Manufacturing Facilities), SCAQMD Rule 1157 (PM₁₀ Emission Reductions from Aggregate and Related Operations), SMAQMD Rule 403 (Fugitive Dust), VCAPCD Rule 55 (Fugitive Dust), and Clark County Department of Air Quality (CCDAQ) Section 41 (Fugitive Dust). BAAQMD does not have a comparable rule.

Emission Reduction Opportunities

This rule is administrative in nature, and is intended to be a supplementary rule to the other District Regulation VIII rules. Opportunities for emission reductions would be found with each of the other Regulation VIII rules and would not be identified as a possibility for this rule. As such, there are no emission reduction opportunities for Rule 8011.

Risk-based Strategy Analysis

As discussed above, the emissions from this source category are accounted for with the other Regulation VIII rules. This is a general requirement rule meant to supplement and support the other Regulation VIII rules. The emissions associated with the Regulation VIII rules are geological; as discussed in Chapter 2, research indicates that the geologic fraction of PM_{2.5} in the Valley makes a relatively small contribution to overall PM_{2.5} mass in peak winter months, and by itself has a relatively low toxicity. The emissions associated with sources subject to each of the Regulation VIII rules are identified and discussed in each rule control measure source category discussion.

Control Measure Commitments

The following is a summary of recommended commitments for Rule 8011.

Regulatory Action

This rule is an administrative and supplemental rule to other Regulation VIII rules. The District's analysis did not identify any additional technologically feasible and cost effective potential controls. Therefore, there are no recommendations for additional regulatory actions for Rule 8011.

Incentive Action

There are no recommendations for incentive actions for this rule because the rule is administrative in nature and if any incentive actions were to be recommended, they would need to be directed at the other Regulation VIII rules.

Technology Advancement Action

There is no recommendation for a new technology advancement project for this source category. Through its Technology Advancement Program, the District will continue to seek potential feasible and low-cost technologies that may provide for additional emission reduction opportunities in this category.

Policy Initiatives

As discussed previously, one of the key dust control measures that residents and operators in the Valley rely upon to control fugitive dust is wet suppression. Being mindful of this, the District currently supports legislative measures to provide reliable water supplies to the Valley. While there are no recommendations for new policy initiatives, the recommendation is to continue supporting legislative activities that aim to provide reliable water supplies to the Valley.

Education and Outreach

The District currently provides a robust education and outreach program for regulated sources through the Small Business Assistance program, Permit Stakeholder Meetings, Compliance Assistance Bulletins, and public notices for public workshops and public hearings. The District does not have recommendations for new education and outreach efforts for these sources. The District will continue to work closely with affected sources to ensure successful compliance.

D.6.2 Rule 8021 Construction, Demolition, Excavation, Extraction, and Other Earthmoving Activities

Source Category

Rule 8021 applies to construction or demolition related disturbances of soil, including land clearing, grubbing, scraping, excavation, extraction, land leveling, grading, cut and fill operations, travel on the site, travel access roads to and from the site, and demolition activities. The rule also applies to construction of new landfill disposal sites or modifications to existing landfill disposal sites prior to commencement of landfilling activities.

In 2004, the District adopted amendments to Regulation VIII to upgrade existing RACM level rules to meet the more stringent BACM level required in serious PM10 nonattainment areas. Rule 8021 was amended to add dust suppression requirements, and to require submittal of Dust Control Plans on residential construction sites 10.0 acres or more in size and on non-residential construction sites 5.0 acres or more in size.

Emission Inventory

Pollutant	2007	2012	2014	2015	2016	2017	2018	2019
<i>Annual Average - Tons per day</i>								
PM2.5	1.19	1.11	1.12	1.13	1.14	1.15	1.16	1.17
NOx	0	0	0	0	0	0	0	0
SOx	0	0	0	0	0	0	0	0
<i>Winter Average - Tons per day</i>								
PM2.5	1.09	1.01	1.03	1.04	1.05	1.06	1.06	1.07
NOx	0	0	0	0	0	0	0	0
SOx	0	0	0	0	0	0	0	0

Regulatory Evaluation

How does District Rule 8021 compare with federal rules and regulations?

Rule 8021, when compared to EPA rules, regulations, and guidelines that apply to fugitive dust, is found to meet or exceed these standards. Federal requirements are located in General Preamble for Title I of the Clean Air Act Amendments of 1990 Appendix (57 FR 13498, April 16, 1992) and Fugitive Dust Background Document and Technical Information Document for Best Available Control Measures (EPA-450/2-92-004).

How does District Rule 8021 compare to rules in other air districts?

Rule 8021 was compared to fugitive dust regulations at other air districts and where comparable, is at least as stringent, if not more stringent, than other districts' rules. Comparisons to other air district rules included SCAQMD Rule 1156 (Further

Reductions of Particulate Emissions from Cement Manufacturing Facilities), SCAQMD Rule 1157 (PM10 Emission Reductions from Aggregate and Related Operations), SMAQMD Rule 403 (Fugitive Dust), VCAPCD Rule 55 (Fugitive Dust), and Clark County Department of Air Quality (CCDAQ) Section 94 (Permitting and Dust Control for Construction Activities). BAAQMD does not have a comparable rule.

Emission Reduction Opportunities

District analysis identified one potential opportunity to further reduce emissions from this source category; to require signs to be posted at certain size work sites, asking the public to contact the District if the work site is producing significant dust emissions. While, this potential opportunity would increase the awareness of the workers and the public, there is no conclusion that it would result in reduced emissions. If emissions are reduced, it is not likely to result in quantifiable emission reductions.

Risk-based Strategy Analysis

The emissions from this source category contribute to 1.8% of average winter PM2.5 emitted from stationary and area sources in the 2012 emission inventory. The particulate matter emissions are geological and the inventory is relatively small and consistent throughout the year, with no elevated emission levels in winter months. As discussed in Chapter 2, research indicates that the geologic fraction of PM2.5 in the Valley makes a relatively small contribution to overall PM2.5 mass in peak winter months, and by itself has a relatively low toxicity.

Control Measure Commitments

The following is a summary of recommended commitments for Rule 8021.

Regulatory Action

The District's analysis did not identify any additional technologically feasible and cost effective potential controls. Therefore, there are no recommendations for additional regulatory actions for Rule 8021.

Incentive Action

The District does not currently have an incentive program specific to construction or demolition related disturbances of soil. There are no recommendations for new incentive actions at this time.

Technology Advancement Action

There is no recommendation for a new technology advancement project for this source category. Through its Technology Advancement Program, the District will continue to seek potential feasible and low-cost technologies that may provide for additional emission reduction opportunities in this category.

Policy Initiatives

As discussed previously, one of the key dust control measures that residents and operators in the Valley rely upon to control fugitive dust is wet suppression. Being mindful of this, the District currently supports legislative measures to provide reliable water supplies to the Valley. While there are no recommendations for new policy initiatives, the recommendation is to continue supporting legislative activities that aim to provide reliable water supplies to the Valley.

Education and Outreach

The District currently provides a robust education and outreach program for regulated sources through the Small Business Assistance program, Permit Stakeholder Meetings, Compliance Assistance Bulletins, and public notices for public workshops and public hearings. There are no recommendations for new education and outreach efforts for these sources. The District will continue to work closely with affected sources to ensure successful compliance.

D.6.3 Rule 8031 Bulk Materials

Source Category

Rule 8031 applies to the outside storage and handling of any unpackaged material, which emits or has the potential to emit dust when stored or handled. Rule 8031 requires bulk handling and storage facilities to restrict dust from material transfer, and reduce emissions from transport material and storage piles that emit dust. Facilities subject to Rule 8031 are required use control measures to ensure that visible dust emissions are limited to 20% opacity or less. These control measures can include application of water or other dust stabilizers, covering of bulk materials, construction of wind barriers, covering of haul trucks, etc.

In 2004, the District adopted amendments to Regulation VIII to upgrade existing RACM level rules to meet the more stringent BACM level required in serious PM10 nonattainment areas. Rule 8031 was amended to require construction and maintenance of wind barriers when handling bulk materials.

Emission Inventory

Pollutant	2007	2012	2014	2015	2016	2017	2018	2019
<i>Annual Average - Tons per day</i>								
PM2.5	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
NOx	0	0	0	0	0	0	0	0
SOx	0	0	0	0	0	0	0	0
<i>Winter Average - Tons per day</i>								
PM2.5	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
NOx	0	0	0	0	0	0	0	0
SOx	0	0	0	0	0	0	0	0

Regulatory Evaluation

How does District Rule 8031 compare with federal rules and regulations?

Rule 8031, when compared to EPA rules, regulations, and guidelines that apply to fugitive dust, is found to meet or exceed these standards. Federal requirements are located in General Preamble for Title I of the Clean Air Act Amendments of 1990 Appendix (57 FR 13498, April 16, 1992) and Fugitive Dust Background Document and Technical Information Document for Best Available Control Measures (EPA-450/2-92-004).

How does District Rule 8031 compare to rules in other air districts?

Rule 8031 was compared to fugitive dust regulations at other air districts and where comparable, is at least as stringent, if not more stringent, than other districts' rules. Comparisons to other air district rules included SCAQMD Rule 1156 (Further Reductions of Particulate Emissions from Cement Manufacturing Facilities), SCAQMD Rule 1157 (PM10 Emission Reductions from Aggregate and Related Operations), SMAQMD Rule 403 (Fugitive Dust), VCAPCD Rule 55 (Fugitive Dust), and Clark County Department of Air Quality (CCDAQ) Section 41 (Fugitive Dust). BAAQMD does not have a comparable rule.

Emission Reduction Opportunities

Rule 8031 currently employs the best dust mitigation techniques; there are no additional potential opportunities for further reductions of emissions from this source category. Rule 8031's requirement of limiting opacity to 20% is as or more stringent than any other District's rule and compliance with the standard requires significant mitigation efforts from sites that store bulk materials.

Risk-based Strategy Analysis

The PM_{2.5} emissions from this source category contribute to 0.04% of average winter PM_{2.5} emitted from stationary and area sources in the 2012 emission inventory. The particulate matter emissions are geological and the inventory is relatively small and consistent throughout the year, with no elevated emission levels in winter months. As discussed in Chapter 2, research indicates that the geologic fraction of PM_{2.5} in the Valley makes a relatively small contribution to overall PM_{2.5} mass in peak winter months, and by itself has a relatively low toxicity.

Control Measure Commitments

The following is a summary of recommended commitments for Rule 8031.

Regulatory Action

The District's analysis did not identify any additional technologically feasible and cost effective potential controls. Therefore, there are no recommendations for additional regulatory actions for Rule 8031.

Incentive Action

The District does not currently fund incentive programs specific to the outside storage and handling of bulk materials. There are no recommendations for new incentive actions at this time.

Technology Advancement Action

There is no recommendation for a new technology advancement project for this source category. Through its Technology Advancement Program, the District will continue to seek potential feasible and low-cost technologies that may provide for additional emission reduction opportunities in this category.

Policy Initiatives

As discussed previously, one of the key dust control measures that residents and operators in the Valley rely upon to control fugitive dust is wet suppression. Being mindful of this, the District currently supports legislative measures to provide reliable water supplies to the Valley. While there are no recommendations for new policy initiatives the recommendation is to continue supporting legislative activities that aim to provide reliable water supplies to the Valley.

Education and Outreach

The District currently provides a robust education and outreach program for regulated sources through the Small Business Assistance program, Permit Stakeholder Meetings, Compliance Assistance Bulletins, and public notices for public workshops and public hearings. There are no recommendations for new education and outreach efforts for these sources. The District will continue to work closely with affected sources to ensure successful compliance.

D.6.4 Rule 8041 Carryout and Trackout

Source Category

Rule 8041 applies to the prevention and cleanup of mud and dirt whenever it is deposited (carryout and trackout) onto public paved roads from activities subject to the requirements of Rules 8021, 8031, 8061, and 8071. The rule contains requirements for: removing carryout and trackout at the end of each workday; thresholds for any site with 150 daily vehicle trips; addressing carryout and trackout in Dust Control Plans; removing carryout and trackout in urban areas; paved interior roads; and prevention of carryout and trackout.

In 2004, the District adopted amendments to Regulation VIII to upgrade existing RACM level rules to meet the more stringent BACM level required in serious PM10 nonattainment areas. Rule 8041 was amended to require a threshold for vehicles with three or more axles to take actions for carryout/trackout. Amendments included a threshold for projects located in rural areas, a provision requiring actions within half an hour if specified measures are insufficient to prevent carryout/trackout, and specifications for dust collectors, gravel pads, and paved surfaces.

Emission Inventory

The emission inventory for this rule is not quantifiable independent from paved and unpaved roads. These emissions occur on paved and unpaved roads and therefore are documented as a part of the inventory for Rule 8061 (Paved and Unpaved Roads). Refer to the control measure write up for Rule 8061 for this combined inventory.

Regulatory Evaluation

How does District Rule 8041 compare with federal rules and regulations?

Rule 8041, when compared to EPA rules, regulations, and guidelines that apply to fugitive dust, is found to meet or exceed these standards. Federal requirements are located in General Preamble for Title I of the Clean Air Act Amendments of 1990 Appendix (57 FR 13498, April 16, 1992) and Fugitive Dust Background Document and Technical Information Document for Best Available Control Measures (EPA-450/2-92-004).

How does District Rule 8041 compare to rules in other air districts?

Rule 8041 was compared to fugitive dust regulations at other air districts and where comparable, is at least as stringent, if not more stringent, than other districts' rules. Comparisons to other air district rules included SCAQMD Rule 1156 (Further Reductions of Particulate Emissions from Cement Manufacturing Facilities), SCAQMD Rule 1157 (PM10 Emission Reductions from Aggregate and Related Operations), SMAQMD Rule 403 (Fugitive Dust), VCAPCD Rule 55 (Fugitive Dust), and Clark County Department of Air Quality (CCDAQ) Section 94 (Permitting and Dust Control for Construction Activities). BAAQMD does not have a comparable rule.

Emission Reduction Opportunities

Two potential opportunities to reduce emissions were identified, evaluated, and determined to not be feasible. The first potential emission reduction opportunity would be to reduce the threshold for daily trips per worksite that requires a carryout and trackout prevention system (currently 150 trips). Reducing this threshold would require smaller worksites to install costly trackout prevention equipment like wheel washers, metal grates, and gravel pads. At these smaller worksites the emission reductions that would be achieved would be minimal and not cost effective because of the small size of the sites. The second potential opportunity would be to shorten the distance from the nearest unpaved exit point of a site at which trackout must be immediately cleaned (currently 50 feet). Lowering this threshold would significantly increase the use of street sweepers and their associated emissions, which are more toxic to human health (see Chapter 2). Therefore this opportunity has been determined to not be feasible.

Risk-based Strategy Analysis

The emissions from this source category are documented as a part of the emissions inventory for Rule 8061 (Paved and Unpaved Roads). The PM_{2.5} emissions from these two source categories combined contribute to 11.2% of the average winter PM_{2.5} emitted from stationary and area sources in the 2012 emission inventory. The particulate matter emissions are geological and the inventory is relatively small and consistent throughout the year, with no elevated emission levels in winter months. As discussed in Chapter 2, research indicates that the geologic fraction of PM_{2.5} in the Valley makes a relatively small contribution to overall PM_{2.5} mass in peak winter months, and by itself has a relatively low toxicity.

Control Measure Commitments

The following is a summary of recommended commitments for Rule 8041.

Regulatory Action

The District's analysis did not identify any additional technologically feasible and cost effective potential controls. Therefore, there are no recommendations for additional regulatory actions for Rule 8041.

Incentive Action

The District does not currently fund incentive programs specific to this source category; there are no recommendations for new incentive actions at this time.

Technology Advancement Action

There is no recommendation for a new technology advancement project for this source category. Through its Technology Advancement Program, the District will continue to seek potential feasible and low-cost technologies that may provide for additional emission reduction opportunities in this category.

Policy Initiatives

As discussed previously, one of the key dust control measures that residents and operators in the Valley rely upon to control fugitive dust is wet suppression. Being mindful of this, the District currently supports legislative measures to provide reliable water supplies to the Valley. While there are no recommendations for new policy initiatives the recommendation is to continue supporting legislative activities that aim to provide reliable water supplies to the Valley.

Education and Outreach

The District currently provides a robust education and outreach program for regulated sources through the Small Business Assistance program, Permit Stakeholder Meetings, Compliance Assistance Bulletins, and public notices for public workshops and public hearings. There are no recommendations for new education and outreach efforts for these sources. The District will continue to work closely with affected sources to ensure successful compliance.

D.6.5 Rule 8051 Open Areas

Source Category

Rule 8051 applies to any open area 0.5 acres or more within urban areas, or 3.0 acres or more within rural areas that contains at least 1,000 square feet of disturbed surface area. The rule has requirements for limiting visible dust emissions (VDE) to 20% opacity, to comply with the conditions of a stabilized surface, and to install barriers to prevent unauthorized vehicles from accessing the stabilized areas.

In 2004, the District adopted amendments to Regulation VIII that upgraded existing RACM level rules to meet the more stringent BACM level required in serious PM10 nonattainment areas. Rule 8051 was amended to add applicability thresholds for rural and urban areas.

Emission Inventory

Pollutant	2007	2012	2014	2015	2016	2017	2018	2019
<i>Annual Average - Tons per day</i>								
PM2.5	0.41	0.34	0.34	0.34	0.34	0.34	0.34	0.34
NOx	0	0	0	0	0	0	0	0
SOx	0	0	0	0	0	0	0	0
<i>Winter Average - Tons per day</i>								
PM2.5	0.26	0.21	0.21	0.21	0.21	0.21	0.21	0.21
NOx	0	0	0	0	0	0	0	0
SOx	0	0	0	0	0	0	0	0

Regulatory Evaluation

How does District Rule 8051 compare with federal rules and regulations?

Rule 8051, when compared to EPA rules, regulations, and guidelines that apply to fugitive dust, is found to meet or exceed these standards. Federal requirements are located in General Preamble for Title I of the Clean Air Act Amendments of 1990 Appendix (57 FR 13498, April 16, 1992) and Fugitive Dust Background Document and Technical Information Document for Best Available Control Measures (EPA-450/2-92-004).

How does District Rule 8051 compare to rules in other air districts?

Rule 8051 was compared to fugitive dust regulations at other air districts and where comparable, is at least as stringent, if not more stringent, than other districts' rules. Comparisons to other air district rules included SCAQMD Rule 1156 (Further Reductions of Particulate Emissions from Cement Manufacturing Facilities), SCAQMD Rule 1157 (PM10 Emission Reductions from Aggregate and Related Operations), SMAQMD Rule 403 (Fugitive Dust), VCAPCD Rule 55 (Fugitive Dust), and Clark

County Department of Air Quality (CCDAQ) Section 90 (Permitting and Dust Control for Construction Activities). BAAQMD does not have a comparable rule.

Emission Reduction Opportunities

The District's analysis did not identify any potential opportunities to further reduce emissions from this source category beyond those emissions that are already being reduced by rule requirements. As a part of due diligence efforts in seeking additional emission reduction opportunities, the following two potential opportunities have been identified to improve rule clarity. Language could be added to the rule to clarify that it applies to off-road recreational vehicle use areas. Also, the rule provides an exemption for weed abatement activity utilizing mowing and/or cutting. Adding language to specify that weed abatement by tilling is not exempt would also add clarity to the rule.

Risk-based Strategy Analysis

The emissions from this source category contribute 0.4% of average winter PM_{2.5} emitted from stationary and area sources in the 2012 emission inventory. The particulate matter emissions are geological and the inventory is relatively small and consistent throughout the year, with no elevated emission levels in winter months. As discussed in Chapter 2, research indicates that the geologic fraction of PM_{2.5} in the Valley makes a relatively small contribution to overall PM_{2.5} mass in peak winter months, and by itself has a relatively low toxicity.

Control Measure Commitments

The following is a summary of recommended commitments for Rule 8051.

Regulatory Action

The District's analysis did not identify any additional technologically feasible and cost effective potential controls that would result in reduced emissions. Therefore, there are no recommendations for additional regulatory actions for Rule 8051.

Incentive Action

The District does not currently fund any incentive programs specific to this source category; there are no recommendations for new incentive actions at this time.

Technology Advancement Action

There is no recommendation for a new technology advancement project for this source category. Through its Technology Advancement Program, the District will continue to seek potential feasible and low-cost technologies that may provide for additional emission reduction opportunities in this category.

Policy Initiatives

As discussed previously, one of the key dust control measures that residents and operators in the Valley rely upon to control fugitive dust is wet suppression. Being mindful of this, the District currently supports legislative measures to provide reliable water supplies to the Valley. While there are no recommendations for new policy initiatives the recommendation is to continue supporting legislative activities that aim to provide reliable water supplies to the Valley.

Education and Outreach

The District currently provides a robust education and outreach program for regulated sources through the Small Business Assistance program, Permit Stakeholder Meetings, Compliance Assistance Bulletins, and public notices for public workshops and public hearings. No new education and outreach efforts are recommended for these sources at this time. The District will continue to work closely with affected sources to ensure successful compliance.

D.6.6 Rule 8061 Paved and Unpaved Roads

Source Category

Rule 8061 establishes standards for the construction of new and modified paved roads in accordance with published guidelines by the American Association of State Highway and Transportation Officials for road construction and applies to any paved, unpaved, or modified public or private road, street highway, freeway, alley way, access drive, access easement, or driveway. The rule also allows alternative means of achieving the same level of dust reduction. Rule 8061 also establishes thresholds that when exceeded require that roads are treated to reduce visible dust emissions.

In 2004, the District adopted amendments to Regulation VIII to upgrade existing RACM level rules to meet the more stringent BACM level required in serious PM10 nonattainment areas. Rule 8061 was amended to replace the existing 75 maximum daily vehicle trip threshold with a 26 annual average daily vehicle trips (AADT) threshold on unpaved roads, and require all new unpaved roads within urban areas be paved.

Emission Inventory

This inventory accounts for emissions occurring on paved and unpaved roads and includes the inventory from carryout and trackout (Rule 8041) activities onto these roads.

Paved Roads

Pollutant	2007	2012	2014	2015	2016	2017	2018	2019
<i>Annual Average - Tons per day</i>								
PM2.5	5.57	5.18	5.18	5.18	5.18	5.18	5.18	5.18
NOx	0	0	0	0	0	0	0	0
SOx	0	0	0	0	0	0	0	0
<i>Winter Average - Tons per day</i>								
PM2.5	4.80	4.46	4.46	4.46	4.46	4.46	4.46	4.46
NOx	0	0	0	0	0	0	0	0
SOx	0	0	0	0	0	0	0	0

Unpaved Roads

Pollutant	2007	2012	2014	2015	2016	2017	2018	2019
<i>Annual Average - Tons per day</i>								
PM2.5	2.02	1.96	1.98	1.99	2.01	2.02	2.04	2.05
NOx	0	0	0	0	0	0	0	0
SOx	0	0	0	0	0	0	0	0
<i>Winter Average - Tons per day</i>								
PM2.5	1.82	1.77	1.79	1.80	1.81	1.82	1.84	1.85
NOx	0	0	0	0	0	0	0	0
SOx	0	0	0	0	0	0	0	0

Regulatory Evaluation

How does District Rule 8061 compare with federal rules and regulations?

Rule 8061, when compared to EPA rules, regulations, and guidelines that apply to fugitive dust, is found to meet or exceed these standards. Federal requirements are located in General Preamble for Title I of the Clean Air Act Amendments of 1990 Appendix (57 FR 13498, April 16, 1992) and Fugitive Dust Background Document and Technical Information Document for Best Available Control Measures (EPA-450/2-92-004).

How does District Rule 8061 compare to rules in other air districts?

Rule 8061 was compared to fugitive dust regulations at other air districts and where comparable, is at least as stringent, if not more stringent, than other districts' rules. Comparisons to other air district rules included SCAQMD Rule 1156 (Further Reductions of Particulate Emissions from Cement Manufacturing Facilities), SCAQMD Rule 1157 (PM10 Emission Reductions from Aggregate and Related Operations), SMAQMD Rule 403 (Fugitive Dust), VCAPCD Rule 55 (Fugitive Dust), Clark County Department of Air Quality (CCDAQ) Section 91 (Fugitive Dust from Unpaved Roads, Unpaved Alleys, and Unpaved Easement Roads), and CCDAQ Section 93 (Fugitive Dust from Paved Roads and Street Sweeping Equipment). BAAQMD does not have a comparable rule.

Emission Reduction Opportunities

The following potential opportunity to reduce emissions from paved and unpaved roads was identified and determined to be not feasible. Section 5.2.1 of the rule requires dust control measures for any unpaved road segments with 26 or more annual average daily trips. A potential opportunity to reduce emissions would be to lower this threshold. This would require more owners/operators to implement at least one control measure to reduce fugitive emissions.

Analysis of the emission inventory indicates that the majority of the particulate emissions attributable to unpaved roads are generated from unpaved roads already subject to the mitigation requirements of Rule 8061. Therefore, the remaining portion of emissions associated with unpaved roads (less than 26 AADT) does not provide an opportunity for additional reductions.

Additionally, emissions from unpaved roads are lowest in the winter months, when the District's PM_{2.5} 24-hour exceedances occur. District staff believes the winter average PM_{2.5} emission inventory is overestimated for the following reasons:

- ARB methodology assumes that rainfall of at least 0.01 inch on any day mitigates unpaved road dust for 24 hours
- 71% of the days with precipitation occur during the winter months.
- Many US Forest and Park Roads are inaccessible during winter months due to increased amounts of rain and snow, yet emissions from these roads make up a larger percentage of the total unpaved road emissions in winter (42.8%) than in the annual average (40.7%)

For these reasons, lowering the trip threshold is not a viable emission reduction opportunity.

Risk-based Strategy Analysis

The emissions inventory from this source category includes the inventory for emissions from sources subject to the Rule 8041 (Carryout and Trackout) control measure source category. The emissions from these two source categories combined contribute to 11.2% of average winter PM_{2.5} emitted from stationary and area sources in the 2012 emission inventory. The particulate matter emissions are geological and the inventory is relatively small and consistent throughout the year, with no elevated emission levels in winter months. As discussed in Chapter 2, research indicates that the geologic fraction of PM_{2.5} in the Valley makes a relatively small contribution to overall PM_{2.5} mass in peak winter months, and by itself has a relatively low toxicity.

Control Measure Commitments

The following is a summary of recommended commitments for Rule 8061.

Regulatory Action

The District's analysis did not identify any additional technologically feasible and cost effective potential controls. Therefore, there are no recommendations for additional regulatory actions for Rule 8061. The key potential opportunity identified to reduce emissions for this rule is to lower the trip threshold that requires dust control measures on public unpaved roads. Staff reviewed this source category and determined that lowering this threshold would not result in measureable emission reductions.

Incentive Action

The District does not currently fund an incentive program specific to paved and unpaved roads; there are no recommendations for new incentive actions specific to this rule at this time.

Technology Advancement Action

There is no recommendation for a new technology advancement project for this source category. Through its Technology Advancement Program, the District will continue to seek potential feasible and low-cost technologies that may provide for additional emission reduction opportunities in this category.

Policy Initiatives

As discussed previously, one of the key dust control measures that residents and operators in the Valley rely upon to control fugitive dust is wet suppression. Being mindful of this, the District currently supports legislative measures to provide reliable water supplies to the Valley. While there are no recommendations for new policy initiatives the recommendation is to continue supporting legislative activities that aim to provide reliable water supplies to the Valley.

Education and Outreach

The District currently provides a robust education and outreach program for regulated sources through the Small Business Assistance program, Permit Stakeholder Meetings, Compliance Assistance Bulletins, and public notices for public workshops and public hearings. There are no recommendations for new education and outreach efforts for these sources. The District will continue to work closely with affected sources to ensure successful compliance.

D.6.7 Rule 8071 Unpaved Vehicle/ Equipment Traffic Areas

Source Category

Rule 8071 is applicable to unpaved vehicle/equipment areas, parking, fueling and service areas, and shipping, receiving, and transfer areas. The rule contains requirements for when vehicle traffic reaches or exceeds specified thresholds, limitations on visible dust emissions (VDE), compliance requirements with the conditions of a stabilized surface, and lists control techniques, which could be implemented to limit VDE and to comply with the conditions of a stabilized surface.

In 2004, the District adopted amendments to Regulation VIII to upgrade existing RACM level rules to meet the more stringent BACM level required in serious PM10 nonattainment areas. Rule 8071 was amended to remove the 1.0 acre or larger threshold; change the vehicle threshold from 75 vehicle daily trips to 50 annual average daily trips; add a single day peak threshold of 150 VDT or require control for sources that exceed the 150 VDT threshold limit on at least 30 days per year; and add a requirement whenever 25 or more three-axle vehicle trips will occur on an unpaved vehicle/equipment traffic area.

Emission Inventory

Pollutant	2007	2012	2014	2015	2016	2017	2018	2019
<i>Annual Average - Tons per day</i>								
PM2.5	1.01	0.99	0.99	0.99	0.99	0.99	0.99	0.99
NOx	0	0	0	0	0	0	0	0
SOx	0	0	0	0	0	0	0	0
<i>Winter Average - Tons per day</i>								
PM2.5	1.03	1.01	1.01	1.01	1.01	1.01	1.01	1.01
NOx	0	0	0	0	0	0	0	0
SOx	0	0	0	0	0	0	0	0

Regulatory Evaluation

How does District Rule 8071 compare with federal rules and regulations?

Rule 8071, when compared to EPA rules, regulations, and guidelines that apply to fugitive dust, is found to meet or exceed these standards. Federal requirements are located in General Preamble for Title I of the Clean Air Act Amendments of 1990 Appendix (57 FR 13498, April 16, 1992) and Fugitive Dust Background Document and Technical Information Document for Best Available Control Measures (EPA-450/2-92-004).

How does District Rule 8071 compare to rules in other air districts?

Rule 8071 was compared to fugitive dust regulations at other air districts and where comparable, is at least as stringent, if not more stringent, than other districts' rules. Comparisons to other air district rules included SCAQMD Rule 1156 (Further Reductions of Particulate Emissions from Cement Manufacturing Facilities), SCAQMD Rule 1157 (PM10 Emission Reductions from Aggregate and Related Operations), SMAQMD Rule 403 (Fugitive Dust), VCAPCD Rule 55 (Fugitive Dust), and Clark County Department of Air Quality (CCDAQ) Section 92 (Fugitive Dust from Unpaved Parking Lots and Storage Areas). BAAQMD does not have a comparable rule.

Emission Reduction Opportunities

Section 5.2.1 of current rule language requires dust control measures for any unpaved traffic area with 50 or more annual average daily trips. Analysis of lowering this threshold to determine if it is a feasible option to reduce emissions determined that this is not a cost effective opportunity. Lowering the trip threshold of Rule 8071 would result in direct PM emission reductions, but would also result in the requirement that owners and/or operators implement a dust control measure. The most common control measures are watering and covering with gravel. Local cost estimates indicate that installing a 2 inch gravel base with another 2 inches of top gravel would cost approximately \$1.90 per square foot, or around \$83,000 per acre. Based on the small size of the emissions from this source category, and the estimated mitigation costs, requiring control measures for areas with such minimal activity is not a cost effective option.

Risk-based Strategy Analysis

The emissions from this source category contribute to 1.8% of average winter PM_{2.5} emitted from stationary and area sources in the 2012 emission inventory. The particulate matter emissions are geological and the inventory is relatively small and consistent throughout the year, with no elevated emission levels in winter months. As discussed in Chapter 2, research indicates that the geologic fraction of PM_{2.5} in the Valley makes a relatively small contribution to overall PM_{2.5} mass in peak winter months, and by itself has a relatively low toxicity.

Control Measure Commitments

The following is a summary of recommended commitments for Rule 8071.

Regulatory Action

The District's analysis did not identify any additional technologically feasible and cost effective potential controls. Therefore, there are no recommendations for additional regulatory actions for Rule 8071.

Incentive Action

There are no recommendations for new incentive programs specific to this source category at this time.

Technology Advancement Action

There is no recommendation for a new technology advancement project for this source category. Through its Technology Advancement Program, the District will continue to seek potential feasible and low-cost technologies that may provide for additional emission reduction opportunities in this category.

Policy Initiatives

As discussed previously, one of the key dust control measures that residents and operators in the Valley rely upon to control fugitive dust is wet suppression. Being mindful of this, the District currently supports legislative measures to provide reliable water supplies to the Valley. While there are no recommendations for new policy initiatives the recommendation is to continue supporting legislative activities that aim to provide reliable water supplies to the Valley.

Education and Outreach

The District currently provides a robust education and outreach program for regulated sources through the Small Business Assistance program, Permit Stakeholder Meetings, Compliance Assistance Bulletins, and public notices for public workshops and public hearings. There are no recommendations for new education and outreach efforts for these sources. The District will continue to work closely with affected sources to ensure successful compliance.

D.6.8 Rule 8081 Agricultural Sources

Source Category

Rule 8081 applies to “off-field” agricultural sources including, but not limited to, unpaved roads, unpaved vehicle/equipment traffic areas, and bulk materials. The rule contains requirements to limit visible dust emissions (VDE) and/or to comply with the conditions of a stabilized surface, and lists control techniques which could be implemented to limit VDE and to comply with the conditions of a stabilized surface.

In 2004, the District adopted amendments to Regulation VIII to upgrade existing RACM level rules to meet the more stringent BACM level required in serious PM10 nonattainment areas. The amendments added an exemption to the rule for vehicle/equipment traffic areas if they are less than one acre in size and more than one mile from an urban area; expanded rule applicability by updating the vehicle threshold from 75 vehicle daily trips to 50 annual average vehicle trips; and added a requirement specific to whenever 26 or more three-axle vehicle trips will occur on an unpaved vehicle/equipment traffic area.

Emission Inventory

Pollutant	2007	2012	2014	2015	2016	2017	2018	2019
<i>Annual Average - Tons per day</i>								
PM2.5	1.27	1.23	1.22	1.21	1.21	1.20	1.20	1.19
NOx	0	0	0	0	0	0	0	0
SOx	0	0	0	0	0	0	0	0
<i>Winter Average - Tons per day</i>								
PM2.5	1.62	1.56	1.55	1.54	1.54	1.53	1.53	1.52
NOx	0	0	0	0	0	0	0	0
SOx	0	0	0	0	0	0	0	0

Regulatory Evaluation

How does District Rule 8081 compare with federal rules and regulations?

Rule 8081, when compared to EPA rules, regulations, and guidelines that apply to fugitive dust, is found to meet or exceed these standards. Federal requirements are located in General Preamble for Title I of the Clean Air Act Amendments of 1990 Appendix (57 FR 13498, April 16, 1992) and Fugitive Dust Background Document and Technical Information Document for Best Available Control Measures (EPA-450/2-92-004).

How does District Rule 8081 compare to rules in other air districts?

Rule 8081, when compared to EPA rules, regulations, and guidelines that apply to fugitive dust, is found to meet or exceed these standards. Federal requirements are located in General Preamble for Title I of the Clean Air Act Amendments of 1990 Appendix (57 FR 13498, April 16, 1992) and Fugitive Dust Background Document and Technical Information Document for Best Available Control Measures (EPA-450/2-92-004).

Emission Reduction Opportunities

The District's analysis did not identify any potential opportunities to further reduce emissions from this source category. However, a potential opportunity to improve enforceability of this for this source category has been identified. Section 5.4 of the rule references California Vehicle Code section 23112-23113 for prevention of carryout and trackout. This section could be removed and replaced with specific language from the vehicle code, however, as previously stated, this amendment would not result in emissions reductions.

Risk-based Strategy Analysis

The emissions from this source category contribute to 2.8% of average winter PM_{2.5} emitted from stationary and area sources in the 2012 emission inventory. The particulate matter emissions are geological and the inventory is relatively small and consistent throughout the year, with no elevated emission levels in winter months. As discussed in Chapter 2, research indicates that the geologic fraction of PM_{2.5} in the Valley makes a relatively small contribution to overall PM_{2.5} mass in peak winter months, and by itself has a relatively low toxicity.

Control Measure Commitments

The following is a summary of recommended commitments for Rule 8081.

Regulatory Action

The District's analysis did not identify any additional technologically feasible and cost effective potential controls. Therefore, there are no recommendations for additional regulatory actions for Rule 8081.

Incentive Action

There are no recommendations for incentive actions to further reduce directly emitted particulate matter from agricultural sources subject to Rule 8081 at this time.

Technology Advancement Action

There is no recommendation for a new technology advancement project for this source category. Through its Technology Advancement Program, the District will continue to seek potential feasible and low-cost technologies that may provide for additional emission reduction opportunities in this category.

Policy Initiatives

As discussed previously, one of the key dust control measures that residents and operators in the Valley rely upon to control fugitive dust is wet suppression. Being mindful of this, the District currently supports legislative measures to provide reliable water supplies to the Valley. While there are no recommendations for new policy initiatives, the recommendation is to continue supporting legislative activities that aim to provide reliable water supplies to the Valley.

Education and Outreach

The District currently provides a robust education and outreach program for regulated sources through the Small Business Assistance program, Permit Stakeholder Meetings, Compliance Assistance Bulletins, and public notices for public workshops and public hearings. No new education and outreach efforts are recommended for these sources at this time. The District will continue to work closely with affected sources to ensure successful compliance.

D.7 ADDITIONAL SOURCE CATEGORIES

The Valley's ongoing air quality attainment challenges require the District to look beyond the successes of its stringent rules and innovative incentive programs for further emissions reductions. The following potential control measure source categories and programs represent the District's continuing efforts to consider and evaluate new and existing sources for potential emissions reductions.

Through its incentives program and its policy and legislative platform, the District is able to positively affect emissions reductions from non-regulated sources and sources that are outside of its jurisdiction. These efforts include educational programs and public outreach that encourage fuel and energy savings, funding for cleaner-running vehicles and engines, and the support of legislation that impacts air quality in the Valley.

For some of the source categories listed below, the District has made initial efforts through incentive and outreach programs to reduce emissions. This analysis will look beyond such efforts at refinements and new technology to potentially obtain additional emissions reductions for each of the source categories.

Table D-17 Additional Source Categories

Source Categories	
SC 001	Lawn and Garden Equipment
SC 002	Energy Efficiency
SC 003	Fireworks
SC 004	Sand and Gravel Operations
SC 005	Asphalt/Concrete Operations
SC 006	Almond Hulling/Shelling Operations
SC 007	Pistachio Hulling/ Shelling Operations
SC 008	Ag Material Screening/Shaking Operations
SC 009	Tub Grinding Operations
SC 010	Abrasive Blasting

Existing Control Strategies

Due to the degree of difficulty and enormity of the challenge that the Valley faces in meeting the National Ambient Air Quality Standards (NAAQS), the District recognizes that prohibitory rules alone are not enough to reduce emissions to meet attainment requirements and protect public health. The District's longstanding, progressive strategy for reducing emissions is a multifaceted effort that includes incentive programs and policy initiatives in addition to prohibitory rules. The following discussion summarizes existing District efforts to reduce emissions from sources under this category.

Incentive Programs

Incentive programs are an integral part of the emission reduction efforts of the District, especially where the District lacks direct jurisdiction in establishing emission control requirements. As a part of the District's continuing efforts to reduce emissions from sources through the use of incentive programs, the District has already implemented a successful incentive program aimed at replacing lawn care equipment with less polluting equipment and is in the process of launching a new program to test new technologies in the lawn and garden source category to determine if it is a viable alternative.

The District encourages the replacement of polluting gas powered lawn mowers with electric lawn mowers through The *Clean Green Yard Machine* grant program which has provided \$1,472,977 in grant money toward the replacement of 8,600 gas-powered lawn mowers in the Valley.

Other air districts also have incentive programs for lawn and garden equipment. The corresponding programs are generally similar to the District's residential lawn and garden replacement program, using rebates or hosting events to replace lawn mowers. SCAQMD has a similar program incentivizing electric lawn mowers, but they have also extended the program to apply to leaf blowers. Currently, the SCAQMD 2-stroke gas leaf blowers are being replaced with lower emitting 4-stroke equipment.

The availability of zero-emitting or battery powered lawn equipment has been challenging, especially in the commercial sector due to the need for a longer battery life and durability to allow for more frequent and prolonged equipment use. Local operators have previously expressed concerns about the cost and reliability of cordless electric equipment, and how this equipment might affect productivity and competition with other operators. In May 2012, the District solicited proposals from interested equipment manufacturers and vendors to partner with the District and implement the Cordless Zero-Emission Commercial Lawn and Garden Equipment Demonstration Program (using Assembly Bill 118 funding from ARB). The District finalized a contract with the selected equipment manufacturers and vendors and released a Request For Applications in August. The demonstration program has generated significant interest and support from the commercial lawn and garden applicators, which include businesses that provide landscaping services and organizations that have their own maintenance team. District staff is currently working with 61 participants to complete the contract phase and order the cordless zero-emission commercial lawn and garden equipment for the Demonstration Program. Participants will begin using the equipment and provide feedback on the performance and durability of the cordless zero-emission commercial lawn and garden equipment. Based on suggestions from local lawn and garden operators, as a part of the demonstration program, the District will provide training for operators to learn how to use cordless electric equipment properly and efficiently. Incorporating cordless electric lawn equipment will provide emission reductions and should be evaluated further as equipment becomes more readily available to operators.

The District launched an incentive program in early 2012 for alternatives to professionally-managed pyrotechnic fireworks displays. The program committed to provide up to 50% of the cost of a laser-light based display to replace pyrotechnic fireworks displays at existing, annual July 4th events. The program will potentially be restructured to provide more outreach and a better incentive for replacing pyrotechnic fireworks in future years.

This past year, the District provided funding in support of several pilot programs examining the potential benefits of providing energy efficiency tools to Valley manufacturing facilities and other businesses. Early results from this program indicate significant potential opportunities for generating emission reductions from the manufacturing and industrial sectors through the promotion of “lean manufacturing” and other practices.

At this time, there are no incentive programs that directly impact the other source categories listed in the table above, but the District continues to seek out opportunities for other incentive programs to reduce emissions in the Valley.

Policy Initiatives

Similar to the Incentive Programs, the District’s policies and Legislative Platform are important components to the District’s strategy to attain federal ambient air quality standards. The District uses this platform to bring attention to major issues that impact air quality in the Valley, including energy efficiency and clean-energy alternatives and legislation that limits the District’s ability to regulate the installation and use of wood-burning devices in residences.

The District promotes energy efficiency and clean-energy alternatives as an additional means of emissions reductions in areas with well-established, strong regulatory measures on stationary sources, such as in the Valley. These extra efforts will help the District attain air quality standards as expeditiously as possible. As such, the District supports policies and initiatives that encourage renewable energy and energy efficiency including the following:

- Develop additional biomass capacity using agricultural waste materials
- Expand net metering and feed-in tariffs for the utilization of solar and other renewable energy sources
- Promote energy efficiency for energy end-users that will result in lower pollutant emissions and a more stable electric distribution system
- Encourage and incentivize low-emission technologies that use waste gas as an alternative to waste-gas venting or flaring.

California Senate Bill (SB) 1468 would allow the sale of fireworks for the period immediately before New Year’s Eve. Historically, the use of fireworks has been limited to the summer season (late June through early July); however, the proposed legislation now extends the use of fireworks to winter months, the period of time when the Valley experiences stagnation events that trap particulate matter for extended periods of time.

Particulate matter is the main pollutant of concern during the winter months, and the District uses the Check-Before-You-Burn program to reduce particulate matter emissions during winter months. If fireworks are allowed in conjunction with the New Year's Eve celebration, and the usage coincides with a stagnation event, Valley residents will likely be exposed to elevated and unhealthy particulate matter levels, and will likely result in additional fireplace curtailments. Therefore, given the potential for extreme adverse impact to public health, the District Governing Board has approved a policy in opposition to SB 1468.

Rules, Regulations, and Incentives

While rules and regulations are the cornerstone of the District's efforts in obtaining emissions reductions, incentive programs have proven to be a critical component in meeting the Valley's attainment goals. The source categories listed in Table D-17 are evaluated in light of their potential to further reduce emissions and achieve the attainment of federal air quality standards as expeditiously as possible.

D.7.1 SC 001 Lawn and Garden Equipment

Source Category

This source category includes the commercial and residential lawn and garden sectors. The commercial sector includes larger businesses that employ licensed contractors, public agencies and organizations that maintain their own properties or provide landscape services, and small businesses serving residential properties. The residential sector of lawn and garden equipment includes equipment purchased by the public for personal use. A survey conducted in 2003 by the California Air Resources Board (ARB) estimated that there are approximately 13 million pieces of lawn and garden equipment statewide: 12% in the commercial sector, and 88% in the residential sector. Although there are more pieces of equipment used by the residential sector, the survey showed that the commercial sector accounts for 68% of annual use of all lawn care equipment.

Lawn and garden equipment includes the following: chainsaws, chippers, commercial turf equipment, front mowers, lawn and garden tractors, lawn mowers, leaf blowers and vacuums, rear-engine riding mowers, shredders, snow blowers, tillers, trimmers, edgers, brush cutters, wood splitters, and other lawn and garden equipment.

Handheld lawn and garden tools (such as leaf blowers) typically use two-stroke engines, and most larger machines (such as lawn and garden tractors) use four-stroke engines. Lawn mowers are available with either type of engine. Two-stroke engines rely on oil mixed with the gasoline to lubricate the engine components. Much of this oil is not completely combusted by the engine thus creating high exhaust emissions. The major pollutants from a two-stroke engine, for example, are oil-based particulates, PM_{2.5}, NO_x, and a mixture of hydrocarbons, which combine with other gases in the atmosphere to form ozone, carbon monoxide, and other toxic air contaminants. Overall, four-stroke engines emit significantly lower emissions than their two-stroke counterparts, with significantly lower levels of hydrocarbons and particulate matter. Lawn care equipment, particularly leaf blowers, can also cause a significant amount of fugitive dust depending on the work practices employed such as blowing on bare dirt or very dusty paved surfaces. These types of activities would increase fugitive emissions including PM, toxic air contaminants (TAC) and ultrafine particles (UFP) resulting in a negative health impact on those in proximity to the activity.

Emission Inventory

The emissions inventory for lawn care includes exhaust and evaporative emissions from lawn care equipment. Exhaust emissions from lawn care engines (consisting of both unburned fuel and products of incomplete combustion), while high compared to on-road mobile sources on a per engine basis, are a relatively small part of the overall NO_x and directly emitted PM_{2.5} emission inventory. However, these emissions can be highly concentrated geographically as well as within certain hours of the day.

Pollutant	2007	2012	2014	2015	2016	2017	2018	2019
Annual Average - Tons per day								
PM2.5	0.12	0.11	0.11	0.11	0.11	0.11	0.11	0.11
NOx	1.02	0.89	0.88	0.88	0.87	0.87	0.87	0.87
SOx	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Winter Average - Tons per day								
PM2.5	0.11	0.10	0.10	0.10	0.10	0.10	0.10	0.10
NOx	0.98	0.85	0.84	0.83	0.83	0.82	0.82	0.82
SOx	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001

Efforts to improve the emission inventory

Based on the activity levels reported by ARB in their 2003 emissions inventory methodology for lawn care, it is expected that residential activity levels for lawn care equipment in the Valley have been underestimated. ARB is currently planning on conducting a survey of California residents to update and improve the inventory. Concurrently, the District will be conducting additional research to quantify Valley-specific lawn care activity levels to improve the emissions inventory.

Regulatory Evaluation

The District does not currently have any prohibitory rules specifically addressing lawn care emissions, though the Indirect Source Review (ISR) rule does account for lawn care emissions in the model that calculates emissions increases from new developments. Providing electric lawn equipment and incorporating convenient electric charging stations and outlets on the property are currently recognized on-site mitigation measures for meeting ISR requirements. The list of on-site mitigation measures could be expanded to include additional landscape measures such as zero or low-water landscaping. However, the emission reduction benefits would have to be quantified.

The District's innovative strategies to reduce emissions from the lawn care source category, as discussed previously, include funding the residential *Clean Green Yard Machine residential lawn mower* incentive program which replaces conventional mowers with electric lawn mowers, and increased outreach efforts to the community. Additionally, in March of 2012 the District hosted a conference on lawn care, landscaping, and air quality to discuss emerging low-emission technologies.

How would District SC 001 compare with federal rules and regulations?

EPA's small non-road spark-ignition engine rule applies to engines rated below 25 horsepower, including lawn care equipment. The EPA regulation requires exhaust emission standards by 2011 and 2012 depending on the class of the engine. New evaporative emission standards for both handheld and non-handheld equipment include requirements to control fuel tank permeation, fuel line permeation, and diffusion emissions.

ARB also has a rule addressing spark-ignition small off-road engines (SORE) less than 25 horsepower. It was originally adopted in 1990 and established tiered exhaust and evaporative emission standards. The rule requires manufacturers to meet these standards and obtain certification for the engines from ARB and EPA. The SORE rule is an attrition rule, which relies on natural turnover of lawn mowers for reductions to occur. While the rule establishes lower emissions, it does not push zero emissions technology. ARB recently amended the SORE rule in December 2011 to make it more consistent with EPA's test procedures.

There are no applicable federal standards and guidelines, such as New Source Performance Standards (NSPS), National Emission Standards for Hazardous Air Pollutants (NESHAP), and Maximum Achievable Control Technology (MACT) requirements, for this category. Additionally, there are no Control Techniques Guidelines (CTG), Alternative Control Technology (ACT), or Best Available Control Technology (BACT) guidelines requiring additional technologically feasible controls.

How would District SC 001 compare to rules in other air districts?

SCAQMD adopted Rule 1623 (Credits for Clean Lawn and Garden Equipment) in 1996, but it was not approved by EPA and it is currently not being implemented. There doesn't appear to be any other rules currently in place at other air districts.

Emission Reduction Opportunities

ARB and EPA have regulatory authority over engine standards. As described above, the ARB and EPA rules rely on natural turnover and do not push zero emissions technology; therefore, there are still opportunities to reduce emissions by closing the emissions gap and accelerating the use of zero emissions technology. While the District cannot establish new engine standards, it could regulate the use of lawn care and garden equipment. Given the Valley's air quality challenges and the potential benefits, the District may explore in-use regulatory options as a long-term strategy. The District's analysis of potential opportunities to reduce emissions includes evaluations of emerging technologies, potential control strategies such as an in-use rule or best management practices, episodic controls, and zoning. While these evaluations do not result in recommendations for regulatory action, further study is recommended for the evaluation of the emission inventory and of the results from current and future District technology demonstration activities.

Emerging Technologies

There has been recent improvement in the availability and applications of zero emissions lawn care technology. Manufacturers are producing more electric lawn care equipment options and are developing ways to allow for this equipment to be used in the commercial sector, such as carrying additional battery packs. Examples of more recent advances in new electric options include the following:

- Lawn mowers
 - Riding mowers
 - Robotic mowers
 - Self-propelled walk behind mowers
 - Cordless electric lawn mowers
- Battery powered leaf blowers
- Electric sweepers and backpack vacuums
- Battery powered chainsaws
- Electric line trimmers/edgers
- Electric hedge trimmers
- Stronger batteries and battery chargers

Though zero-emitting or battery operated lawn equipment has significantly improved in recent years, the viability of cordless electric technology has not been proven in the commercial sector. This is largely due to the need for a longer battery life and durability to allow for more frequent and prolonged equipment use. On March 21, 2012, the District hosted a conference on lawn care, landscaping, and air quality. The conference highlighted challenges operators face when using lower emitting equipment and commercial viability. Local operators expressed concerns about the cost and reliability of cordless electric equipment, and how this equipment might affect productivity and competition with other operators.

The District is actively pursuing demonstrations of new opportunities through its Technology Advancement Program, including the recent launch of the *Cordless Zero-Emission Commercial Lawn and Garden Equipment Demonstration Program*. The program is funded with State Air Quality Improvement Program and District program funds and would provide eligible cordless zero-emission commercial lawn and garden equipment to commercial landscape professionals who conduct business within the boundaries of the San Joaquin Valley. The District plans to continue to work with commercial operators to address the concerns with commercial viability through the implementation of this program. Technologies capable of reducing emissions in the Valley are being demonstrated, and if successful these demonstrations may provide an opportunity for the District to develop incentive programs to promote these technologies.

Potential Strategies to Reduce Emissions

In evaluating potential control strategies, the District's analysis identified a number of potential regulatory and outreach opportunities. However, there are no recommended regulatory actions at this time due to the need to revise the emissions inventory and complete the technology demonstration project. The District will continue its evaluation of which of the following regulatory approaches are feasible from a regulatory standpoint as well as from a public health standpoint.

In-Use Rule

One potential control strategy would be to require the use of the cleanest available equipment by prohibiting the use of gas combustion equipment. This could be achieved through a point-of-sale rule implementing a tiered approach or by phasing in restrictions as lower or zero-emissions technology becomes more available in the future. This type of control measure could potentially eliminate the portion of emissions resulting from the combustion of fuel. There might also be a need to bifurcate this type of regulation due to the varying availability of low or zero-emitting equipment in the residential sector versus commercial sector.

Best Management Practices

Another potential control strategy would be to require operators to implement Best Management Practices (BMPs) using a menu approach for the use of lawn and garden equipment in the commercial sector. Some examples of potential BMPs include:

- Restrictions near schools and other heavily populated areas
- Courtesy practices, e.g. don't point at people or open windows, don't blow material onto public roads, sidewalks, or neighboring properties
- Particulate prevention practices (no leaf blower use on bare dirt surfaces or very dusty paved surfaces, etc.)

This BMP option would focus on providing education on safety and more efficient use of equipment. Enforcing this type of rule could be challenging due to the large number of operators, variation in size of businesses, and the wide spread distribution of operator activities. Operators could be required to complete a certification course so that they can be educated on proper work practices. The District could also require operators to show a certificate of completion to purchase gas equipment after a certain date, to ensure contractors operating gas equipment are using the most effective work practices to protect public health and decrease emissions.

Episodic Control

Episodic control provides another potential control strategy where use of gas equipment could be limited or prohibited during high-pollution days. There has also been precedence set throughout California with numerous cities and counties adopting ordinances banning or prohibiting the use of leaf blowers on specified days, times, distances from residential areas, or noise levels. The District could create a model ordinance for cities and counties to adopt throughout the Valley to limit or prohibit the use of gas equipment and/or leaf blowers. One example was found where the city of Menlo Park prohibited the use of gas equipment on Spare the Air days in the Bay Area

Air Quality Management District (BAAQMD). This could be an option for future regulatory control in the Valley to reduce emissions, especially on high pollution days.

Table D-18 City Bans of Leaf Blowers

Cities	Ban Type
Dana Point San Diego	Decibel and hours of operations restrictions
Foster City Los Angeles Palo Alto	Restrictions on distance from residential unit and hours allowed to operate
Sacramento Sunnyvale	Restrictions on decibels, hours of operations, and distance from residential areas
Berkeley Beverly Hills Claremont Lawndale Los Altos Santa Barbara	Bans gas blowers
Burlingame	Restrict commercial use to one day per week dependent on determined city districts; Residential restricted by days and hours of operation
Menlo Park	Prohibited on Sundays, observed federal holidays and on "Spare the Air" days as declared by the BAAQMD
Laguna Beach Santa Monica	Bans all blowers

Zoning

Another potential opportunity to reduce emissions could be through the promotion of "zones," where gas equipment would be prohibited or limited in designated zones, such as those close to schools, parks, etc. This approach, known as "greenzoning," is currently being pioneered in Los Angeles County. Greenzoning could potentially be included as a part of the Healthy Air Living outreach program to individual businesses, schools, cities, and counties. A related option could be limiting gas powered equipment use in certain zones to designated days of the week, similar to days allowed to water residential yards. This approach was recently adopted by Burlingame for leaf blower use only. Cleaner electric equipment would have an advantage by still being able to be operated on the days or areas that gas powered equipment is limited. This strategy would also be a win-win by reducing noise nuisances in neighborhoods and near schools. The District could provide model ordinances to cities and counties to adopt to assist them in implementing this type of measure.

Risk-based Strategy Analysis

The emissions from this source category contribute 1.7% of average winter NO_x emitted from stationary and area sources in the 2012 emission inventory. Lawn care emissions can have a potential health impact due to its widespread use in densely populated urban areas. The use of equipment and resultant emissions are typically more concentrated in areas of schools, parks, and commercial districts where lawn and garden upkeep require more frequent equipment use for a longer duration.

Lawn care emissions include criteria pollutants and their precursors, toxic air contaminants from engine emissions and fugitive sources, and PM 0.1 (ultrafine particles, or UFP) from engine emissions and work practices. As noted in Chapter 2 of this plan, PM 0.1 is a special concern for public health. In 2010, the District entered into a contract with UCSF-Fresno to conduct a pilot characterization of PM 0.1 and PM_{2.5} associated with emission plumes from vehicular traffic, lawn care equipment, and wood combustion in the Fresno/Clovis metro area. The pilot study found very high PM 0.1 emission concentrations from lawn care engines, indicating a higher than assumed risk to individuals near the engine exhaust plumes and a considerably higher risk to workers breathing these particles at the epicenter of the plumes. The District will be building upon this pilot study to provide exposure modeling and risk assessment. The extended project will measure PM_{2.5} generated by conventional lawn care equipment and speciate collected PM_{2.5} samples. The resultant mass and chemical species assessment will provide a much more solid assessment of the risk facing lawn care workers. It will also help establish a firmer empirical basis for estimating the contribution of small lawn care engines to ambient concentrations of PM_{2.5}.

Health effects resulting from exhaust emissions, fugitive dust, and noise generated by lawn equipment range from mild to serious, depending on exposure and the sensitivity of the individual exposed. In particular, lawn and landscape operators are exposed to potentially hazardous concentrations of carbon monoxide (CO), PM_{2.5}, and ultrafine particles intermittently throughout their work day. Noise exposures may be high enough that operators are at increased risk of developing hearing loss. While exposures to CO, PM, and noise may not have immediate, acute effects, the potential health impacts are potentially greater for chronic effects.

Describing the impacts on the public at large is more difficult than for workers because exposures, and reactions to those exposures, are much more variable. Exposure could occur from being in the vicinity or downwind of an operator of, for example, residents whose lawns are being serviced, persons in commercial buildings whose landscapes are being maintained or serviced, and persons within a few blocks of the source. In addition, some sensitive individuals may experience extreme physical reactions, mostly respiratory symptoms such as bronchial spasms, from exposure to bioaerosols found in fugitive dust emissions, which include pollen fragments, mold spores, and endotoxins. Lawn care emissions are also concentrated in areas where Valley residents live, work, and go to school. This proximity leads to a potentially high intake fraction from this equipment, defined as that fraction of engine emissions that are actually inhaled by

individuals. The timing, proximity, and potency of emissions from lawn care equipment can thus pose a significant health risk to operators and the public.

Noise from lawn care equipment, especially leaf blowers, has the potential of causing hearing loss and other adverse health impacts. While the majority of the public is likely exposed to noise as bystanders, given the widespread use and the increasing density of cities and towns, there is presently no way of knowing for certain how many are actually exposed, because of the lack of studies. Regulating the use of lawn care equipment could prove to be a win-win from an emissions standpoint as well as for noise concerns.

Control Measure Commitments

The following is a summary of recommended commitments for SC 001.

Regulatory Action

There are no recommendations for regulatory action at this time. Further study of this source category through the noted emissions inventory review and control technology demonstration projects to determine if a regulatory approach is appropriate is recommended.

Incentive Action

There are no recommendations for new incentive programs at this time. The recommendation is to continue to run the *Clean Green Yard Machine residential lawn mower incentive program* as well as evaluate the commercial lawn care equipment technologies capable of reducing emissions in the Valley as they are being demonstrated as a part of the Cordless Zero-Emission Commercial Lawn and Garden Equipment Demonstration Program. The program participants will use the equipment in real world settings to verify equipment durability and performance, battery capacity, and battery charge time. In addition, the participants would be responsible for providing monthly data and feedback to the District. At the conclusion of the program, the District and the technology demonstrators would work together to complete a final report and submit the findings to ARB. Based on these findings and feedback from program participants, the District commits to developing more incentive program options for commercial operators to assist in deploying zero emissions lawn and garden technologies.

Technology Advancement Action

There are no recommendations for new technology advancement programs at this time. The recommendation is to continue the current technology advancement program for cordless zero-emission technologies. In May 2012, the District solicited proposals from interested equipment manufacturers and vendors to partner with the District and implement the *Cordless Zero-Emission Commercial Lawn and Garden Equipment Demonstration Program*. The District finalized a contract with the selected equipment manufacturers and vendors and released a Request For Applications in August. The demonstration program has generated significant interest and support from the commercial lawn and garden applicators, which include businesses that provide landscaping services and organizations that have their own maintenance team. District staff is currently working with 61 participants to complete the contract phase and order the cordless zero-emission commercial lawn and garden equipment for the Demonstration Program. Participants will begin using the equipment and provide feedback on the performance and durability of the cordless zero-emission commercial lawn and garden equipment.

Policy Initiatives

The District is not currently supporting any policy initiatives specific to lawn care equipment, and there are no recommendations for new policy initiatives for these sources.

Education and Outreach

The District currently provides education and outreach regarding the use of lawn care equipment through the Healthy Air Living program. The District also has a robust education and outreach program for regulated sources through the Small Business Assistance program, Permit Stakeholder Meetings, Compliance Assistance Bulletins, and public notices for public workshops and public hearings. There are no recommendations for new education and outreach programs beyond those that the District currently supports, as discussed above.

D.7.2 SC 002 Energy Efficiency

Source Category

This category does not include specific emissions inventory sources in the Valley, but, rather, the opportunity to reduce emissions from all Valley sectors through the promotion of energy efficiency and conservation measures. Generally, emissions reductions could be obtained from reductions in electrical power generation or fuel through the implementation of such measures. Potential areas of focus include residential and commercial buildings, manufacturing and industrial facilities, agricultural operations, and oil/gas production and processing facilities.

Emission Reduction Opportunities

Energy use is not a regulated activity; however, emissions from the generation of electricity are regulated at the power plant. Overall, electricity generation in California is relatively clean when compared to emission factors (criteria pollutants and greenhouse gases (GHG)) from other states. California has been on the forefront of developing renewable energy sources, and has implemented regulations to ensure cleaner non-renewable energy. Whereas coal-fired electricity generation provides a significant percentage of electricity in other parts of the country, especially the eastern states, California relies more heavily on natural gas-fired power plants, which have lower emission rates for criteria pollutants and GHGs.

California imports 31% of its electricity from surrounding states (2009 data from California Energy Commission (CEC)). The state's four major utility companies use this electricity, as well as resources from around the state to supply continuous, reliable electricity to its customers. The inter-related nature of California's electricity transmission leads to a complex relationship between local energy efficiency programs and emissions reductions. Energy dispatch for needed demand is time and market dependent; the closest plant does not necessarily supply energy to the closest demand. In some cases, peak energy demand is met for areas outside the Valley, including Los Angeles and San Diego, with marginal (peaker) power plants within the Valley. Likewise, Valley demand may be met with electricity from marginal power plants outside the Valley. To complicate matters, which marginal plant is used can depend on the time of day, the minute-by-minute energy market, or other highly variable factors.

In 2010, the CEC commissioned an evaluation of energy usage and potential reductions from energy efficiency and renewable energy measures. Using sophisticated dispatch modeling, Synapse Energy Economics Inc. (Synapse) was able to estimate NO_x emissions reductions for renewable energy and energy efficiency projects within California and within each of the four major utility companies.⁴⁵ In preliminary model runs, Synapse showed that approximately 45 pounds of NO_x could be reduced for each gigawatt of displaced base load electricity. Likewise, 76 pounds of NO_x could be

⁴⁵ California Energy Commission. (2011, May). *Emission Reductions from Renewable Energy and Energy Efficiency in California Air Quality Management Districts: Final Project Report* (Draft). Synapse Energy Economics, Inc. for CEC Public Interest Energy Research (PIER) Program. CEC-XXX-XXX-XXX.

reduced for each gigawatt of displaced peak load electricity displaced by targeted energy efficiency efforts during peak demand hours.

Recently, EPA released a roadmap manual⁴⁶ to assist state, tribal, and local air agencies with quantifying and including emissions reductions from energy efficiency and renewable energy in State Implementation Plans (SIPs). The document focuses on emission benefits from energy policies and programs in the electric power sector. The District will focus its future efforts in realizing NOx emissions reductions for potential SIP credit during the upcoming ozone attainment planning process. The complex nature of electricity transmission and dispatch, combined with import and export of electricity in and out of the District and California, will require sophisticated energy modeling to pinpoint emissions reductions attributable to potential energy efficiency and renewable energy control measures.

The District's involvement in energy efficiency and renewable energy is guided by its Regional Energy Efficiency Strategy (REES), which was adopted in January 2010.⁴⁷ This policy document identifies the District's commitment to fostering energy efficiency and clean energy alternatives as opportunities for emissions reductions. The District has initiated several projects that exemplify this policy guidance.

Risk-based Strategy Analysis

The emission inventory for this source category is not quantified as discussed above.

Control Measure Commitments

The following is a summary of recommended commitments for SC 002.

Regulatory Action

The District's analysis did not identify any technologically feasible and cost effective potential controls. Therefore, there are no recommendations for regulatory actions.

Incentive Action

The District currently has incentive programs aimed at reduced energy use in the Valley. To date, the projects include the following:

- The administration of approximately \$4 million in federal and state Energy Efficiency and Conservation Block Grant funds made available to 37 small jurisdictions in the Valley. The majority of the funding was used to retrofit municipal facilities with lighting and other cost effective energy efficiency retrofits;
- The funding of an innovative pilot program to assess the potential to operate more efficiently, thus saving money and using less energy; and

⁴⁶ U.S. Environmental Protection Agency: Incorporating Energy Efficiency/Renewable Energy in State and Tribal Implementation Plans. (2012). Retrieved July 10, 2012 from <http://www.epa.gov/airquality/eere/>

⁴⁷ San Joaquin Valley Air Pollution Control District. (2010). *Approval of the District's Regional Energy Efficiency Strategy*. Memorandum to the SJVAPCD Governing Board. Public Hearing, January 21, 2010. http://www.valleyair.org/Board_meetings/GB/agenda_minutes/Agenda/2010/January/Agenda_Item_7_Jan_21_2010.pdf

- The funding of an outreach program showing governmental and service organizations the benefits of “going green.” This program started in Stockton through the Stockton Chamber of Commerce, and with the District’s help has expanded to the central and southern San Joaquin Valley.

While there are no recommendations for new incentive programs at this time, the recommendation is to continue supporting existing incentive programs.

Technology Advancement Action

The District’s Technology Advancement Program responds to the long-term need for the zero- and near-zero-emission transport of goods and people by informing near-term strategies to overcome the Valley’s significant challenges. Two of the three focus areas for FY 2012–2013 are renewable energy and waste solutions, which take into account energy efficiency. The recommendation is to continue to pursue technology advancement programs that may result in further reducing emissions in the Valley.

Policy Initiatives

Consistent with the District’s 2012 Legislative Platform, the recommendation is to continue to work with stakeholders and state agencies to expand net metering and feed-in tariffs for use of solar and other renewable energy sources, promote energy efficiency programs for energy end users that will result in lower emissions and a more stable electrical distribution system, and develop measures that incentivize and encourage low-emission technologies for use of waste gas as an alternative to waste-gas venting or flaring.

Education and Outreach

The District currently provides a robust education and outreach program for regulated sources through the Small Business Assistance program, Permit Stakeholder Meetings, Compliance Assistance Bulletins, and public notices for public workshops and public hearings. Many of the previously-identified actions and commitments rely heavily on the existing District outreach and communication efforts and will continue with those efforts.

D.7.3 SC 003 Fireworks

Source Category

This category consists of fireworks sold and/or used in the Valley. This includes consumer fireworks for home displays as well as professional products for use by licensed operators in public displays.

Emission Inventory

The emission inventory for this category has not been quantified.

Regulatory Evaluation

How would District SC 003 compare with federal or state rules and regulations?

State fireworks law is contained in the California Health and Safety Code, Section 12500 – 12759, and regulations are encoded as Title 19, California Code of Regulations, Chapter 6. The Health and Safety Code section 12505 requires the designation of “dangerous” for fireworks containing certain chemicals (such as arsenic sulfide), effectively prohibiting their use in consumer (i.e. “safe and sane”) fireworks.

The Office of the State Fire Marshall (SFM) is the California agency with authority to classify fireworks in the state, including the classification of consumer fireworks. Pyrotechnic operators who discharge fireworks in public displays must apply to the SFM for the necessary license, and report in advance of and after completion of displays. The SFM also collects and disposes of seized illegal fireworks.

No federal guidance has been identified for this source category under the federal Alternative Control Techniques (ACT), New Source Performance Standards (NSPS), National Emission Standards for Hazardous Air Pollutants (NESHAP), Maximum Achievable Control Technology (MACT), and Control Techniques Guidelines (CTG).

How would District SC 003 compare to rules in other air districts?

SCAQMD Rule 219 (Equipment not Requiring a Written Permit Pursuant to Regulation II) exempts pyrotechnic equipment, special effects or fireworks paraphernalia equipment used for entertainment purposes from permit requirements. Additionally, fireworks and fireworks displays and pyrotechnics used for creation of special effects at theme parks are excluded from the open burning requirements of SCAQMD Rule 444 (Open Burning), and prohibitory Rule 401 (Visible Emissions) and Rule 402 (Nuisance) do not exempt fireworks displays.

No references to the use of fireworks or pyrotechnics for entertainment purposes were identified for the BAAQMD or the SMAQMD.

Emission Reduction Opportunities

Fireworks usage in the Valley is limited to occasional displays at a small number of entertainment venues (minor league sporting events, for example) and Independence Day/July 4th. On July 4th, with wide-spread consumer fireworks use, the Valley's air monitors typically show peak PM_{2.5} concentrations for several hours on the evening of July 4th and into July 5th. These hourly PM_{2.5} concentrations are much higher than normal PM_{2.5} concentrations during the summer, although 24-hour average PM_{2.5} concentrations on July 4th and 5th do not always go above the level of EPA's standard. In addition, exceedances of the National Ambient Air Quality Standards (NAAQS) due to fireworks qualify as an exceptional event under federal regulations and, with proper documentation and EPA concurrence, do not count against an area's attainment status.⁴⁸ However, the clear relationship between fireworks activity and ambient PM_{2.5} levels; the location of emissions in populated areas; and the fact that the PM_{2.5} species associated with fireworks are health-impacting metals and carbons all demonstrate the value of reducing emissions from fireworks as part of the District's Risk-based Strategy. Fireworks emissions are reduced by limiting the use of fireworks. For several years, the District has utilized public education to inform residents of the risks associated with firework emissions, and the dangers to sensitive populations. Enhancements to future outreach efforts may include partnering with other state and local agencies' outreach efforts.

Despite the strong public affinity for July 4th fireworks, many parts of the country are moving away from pyrotechnic fireworks displays and towards laser light-based shows – particularly in regions with severe drought conditions and extreme fire danger. According to the International Laser Display Association, laser-light-based shows are gaining steadily in popularity as more and more communities are moving in this direction. Several companies in California and throughout the country are engaged in the business of incorporating laser-light based shows into 4th of July celebrations.

In spring 2012, the District offered an incentive program to provide up to 50% of the cost of a municipal laser-light based display for existing annual 4th of July displays where the grantee is willing to commit to 100% elimination of pyrotechnic fireworks at the event. Due to the timing, the District was not able to fund any shows for 2012. The District is interested in reviewing and again providing the program in 2013.

Some fireworks are lower-emitting than others. Disneyland Theme Park started using a patented air launch pyrotechnics system in 2004 to reduce noise and pollution. Use of such a system appears to be limited, and is likely most effective in situations where fireworks displays are frequent enough to justify the cost and permanent installation.

⁴⁸ Treatment of Air Quality Monitoring Data Influenced by Exceptional Events, 40 C.F.R. § 50.14 (b)(2), (2011).

Risk-based Strategy Analysis

The emissions from this source category have not been quantified. Fireworks displays and their associated emissions are occasional and occur primarily in the summer time. Reducing these emissions will not significantly accelerate attainment because exceedances of the PM_{2.5} NAAQS occur during winter months.

However, the PM_{2.5} species associated with fireworks are primarily metals, which, as noted in Chapter 2, are relatively high in toxicity and health-impacting. During a professional display PM_{2.5} levels can be sustained above 1,000 µg/m³.⁴⁹ Particulate matter from ground-level fireworks includes aerosolized metals used as fuel and coloration, and may cause exposures exceeding occupational exposure guidelines for Barium, Strontium, Copper, and Lead.⁵⁰ Consumer fireworks emissions occur in populated areas. Although these emissions are not long-term, these emissions can be very high for a period of several hours. For these reasons, reducing emissions from fireworks and educating the public about the health impacts of fireworks is consistent with the District's Risk-based Strategy.

Control Measure Commitments

The following is a summary of recommended commitments for fireworks.

Regulatory Action

Fireworks use is infrequent and isolated to the summer months, and since there is a very strong public affinity for fireworks displays, there are no recommendations for regulatory action at this time.

Incentive Action

As discussed above, the District launched an incentive program for municipal laser-light shows to replace fireworks displays in 2012, but due to timing issues, was not able to fund any shows. Recommendations for incentive action are to continue this effort with continued research to make any needed program improvements, and making the program available again in future years. Another recommendation would be to seek partners earlier in the year, and consider sponsoring shows combining a small amount of fireworks with an otherwise predominantly laser driven show.

Technology Advancement Action

There are no recommendations for technology advancement actions at this time because the technologies discussed already exist and are in use in some areas. Through its Technology Advancement Program, the District will continue to seek potential feasible and low-cost technologies that may provide for additional emission reduction opportunities in this category.

⁴⁹ Joly, A., Smargiassi, A. Kosatsky, T., Fournier, M., Dabek-zlotorzynska, E., Celo, V., Mathieu, D., Sevrancx, R., D'amours, R., Malo, A., and Brook, J. (2010) Characterization of particulate exposure during fireworks displays. *Atmospheric Environment*, 44, 4325-4329. doi:10.1016/j.atmosenv.2009.12.010

⁵⁰ Croteau, G., Dills, R., Beaudreau, M., and Davis M. (2010) Emission factors and exposures from ground-level pyrotechnics. *Atmospheric Environment*, 44, 3295-3303. doi:10.106/j.atmosenv.2010.05.048

Policy Initiatives

On August 16, 2012, the District Governing Board voted to adopt a position in opposition of California Senate Bill (SB) 1468 (Calderon), which would have allowed for the sale of safe and sane fireworks during the period of December 6th to January 2nd for two years, as a pilot for considering whether such an expanded use of fireworks should continue. This legislation would have thus expanded the use of fireworks to winter months when the Valley experiences stagnant conditions that trap particulates for extended periods of time. Given the potential for extreme adverse impact to public health, the District opposed SB 1468. Ultimately, the bill is not being enacted, likely for financial reasons associated with the data collection and analysis associated with the bill.

No additional policy initiatives are proposed at this time. The recommendation is to take a policy stance opposing any expansion of fireworks use in the Valley, particularly if such expansion were to affect the winter months when there are already high particulate levels.

Education and Outreach

The District currently has a robust education and outreach program, as discussed above, to encourage residents to avoid or reduce consumer fireworks use. The recommendation is to continue current education and outreach activities and possibly seek to partner with local police and fire departments in this messaging, since these entities also encourage residents to avoid or limit fireworks use (especially illegal fireworks use). Another recommendation is to generate interest in the District's municipal incentive program by sponsoring a technology demonstration of lasers at a pre-July 4th public event, such as a minor league sporting event, and invite staff and public representatives from Valley municipalities who might consider laser light shows for their local July 4th celebrations. Such a demonstration could showcase the laser technology before July 4th to improve public acceptance of reducing fireworks.

D.7.4 SC 004 Sand and Gravel Operations

Source Category

Particulate matter emissions from sand and gravel operations occur as excavated aggregate material is conveyed, screened, crushed, and stored. This source category is not subject to RACT because this is not a volatile organic compound (VOC) rule and is not a Control Techniques Guidelines (CTG) rule.

Emission Inventory

Pollutant	2007	2012	2014	2015	2016	2017	2018	2019
<i>Annual Average - Tons per day</i>								
PM2.5	0.077	0.077	0.081	0.083	0.086	0.089	0.092	0.093
NOx	0	0	0	0	0	0	0	0
SOx	0	0	0	0	0	0	0	0
<i>Winter Average - Tons per day</i>								
PM2.5	0.074	0.074	0.078	0.080	0.083	0.086	0.088	0.089
NOx	0	0	0	0	0	0	0	0
SOx	0	0	0	0	0	0	0	0

Regulatory Evaluation

How would SC 004 compare with federal rules and regulations?

“EPA promulgated its New Source Performance Standard (NSPS), 40 CFR Part 60, established under Section 111 of the Clean Air Act on December 16, 1975 (40 FR 58416) as means to regulate stationary sources of particulate matter (PM) emissions. Subpart OOO of the NSPS standard covers nonmetallic mineral processing, which includes regulations for emissions from operating equipment that was manufactured, modified or reconstructed after August 31, 1983. NSPS Subpart OOO was further revised on April 28, 2009. Processing equipment regulated under Subpart OOO affecting the crushed stone, sand and gravel industry includes crushers, grinding mills, screens, bucket elevators, bagging operations, storage bins, enclosed truck and railcars and transfer points on belt conveyors.”⁵¹ There are no other federal guidelines, including CTG, Maximum Achievable Control Technology (MACT), and National Emission Standards for Hazardous Air Pollutants (NESHAP), that apply to the control of particulate matter from sand and gravel operations.

⁵¹ National Stone, Sand and Gravel Association: New Source Performance Standards, Subpart OOO. (2012). Retrieved April 4, 2012 from <http://www.nssga.org/environment/nsps.cfm>

How would SC 004 compare to rules in other air districts?

SCAQMD Rule 1157 (PM10 Emission Reductions from Aggregate and Related Operations) identifies requirements for general performance standards; loading, unloading, and transferring; conveyor; crushing equipment; screening equipment; storage piles; internal roads; and track-out. Such operations are also covered by SCAQMD Rule 403 (Fugitive Dust), which also identifies Best Available Control Measures (BACM) applicable to all construction activity sources. Other than new source review rules, specific rules were not identified in BAAQMD, SMAQMD, and VCAPCD. As described below, the District has regulated these sources under District Rules 8011, 2201, and 4101 for many years, including requiring Best Available Control Technology (BACT) for new and modified facilities.

Emission Reduction Opportunities

Generally, sand and aggregate materials are wet or moist when handled and emissions are often negligible. For processes where water is not an appropriate method for minimizing emissions, baghouse and filter technology and achieved-in-practice controls are generally sufficient to limit visible dust emissions to less than 20 percent opacity as required by District Rule 8011 (General Requirements for Regulation VIII) and District Rule 4101 (Visible Emissions).

While other districts have specific rules for aggregate and related operations (SCAQMD Rule 1157), the ultimate limits for dust emissions is the same as opacity and visible emissions standards used for District operations. SCAQMD provides guidance for specific activities (e.g. loading, conveying, crushing, screening, and storage), but the emissions limits are the same as the District's limits. The District reviews any new or modified stationary source under Rule 2201 (New and Modified Stationary Source Review), which in most cases will trigger Best Available Control Technology (BACT) requirements, thus requiring operators to apply the best controls to reduce emissions during operational activities including crushing, screening, and conveying.

Risk-based Strategy Analysis

The emissions from this source category contribute 0.1% of average winter PM2.5 emitted from stationary and area sources in the 2012 emission inventory. As illustrated in the emission inventory table above, the emission inventory is relatively small and consistent throughout the year, with no elevated emission levels in winter months. Additionally, the emissions are geologic in nature, and, as described in Chapter 2, do not contribute significantly during the peak winter season, and are of low relative toxicity.

Control Measure Commitments

The following is a summary of recommended commitments for SC 004.

Regulatory Action

The District's analysis did not identify any technologically feasible and cost effective potential controls. Therefore, there are no recommendations for regulatory actions.

Incentive Action

There are no incentive action recommendations for this sand and gravel operations.

Technology Advancement Action

There is no recommendation for a new technology advancement project for this source category. Through its Technology Advancement Program, the District will continue to seek potential feasible and low-cost technologies that may provide for additional emission reduction opportunities in this category.

Policy Initiatives

The District is not currently supporting any policy initiatives specific to sand and gravel operations and there are no recommendations for new policy initiatives for this source at this time.

Education and Outreach

The District currently provides a robust education and outreach program for regulated sources through the Small Business Assistance program, Permit Stakeholder Meetings, Compliance Assistance Bulletins, and public notices for public workshops and public hearings. There are no recommendations for new education and outreach efforts for these sources.

D.7.5 SC 005 Asphalt/Concrete Operations

Source Category

This source category includes emissions from asphalt and concrete production operations. Cement concrete production includes cement manufacturing and concrete production. There are only a few cement plants in California, but none within the Valley. However, many operations contribute to potential emissions associated with concrete production, which include the blending of cement powder, water, sand, and coarse aggregate. Similarly, there are operations producing asphalt concrete, which is primarily used for paving parking lots and on-road surfaces and is made by hot-mixing asphalt with size-graded aggregate in drums or batches. If a cement production plant were to be built within the Valley, it would be reviewed and evaluated under District Rule 2201 (New and Modified Stationary Source Review) and would trigger Best Available Control Technology (BACT) requirements for equipment and processes associated with the production of cement.

Emission Inventory

Pollutant	2007	2012	2014	2015	2016	2017	2018	2019
<i>Annual Average - Tons per day</i>								
PM2.5	1.01	1.01	1.07	1.11	1.14	1.18	1.22	1.24
NOx	0.19	0.16	0.17	0.17	0.18	0.18	0.19	0.19
SOx	0.30	0.30	0.32	0.33	0.34	0.35	0.36	0.36
<i>Winter Average - Tons per day</i>								
PM2.5	1.00	1.00	1.06	1.10	1.13	1.17	1.20	1.23
NOx	0.16	0.14	0.15	0.15	0.16	0.16	0.17	0.17
SOx	0.29	0.29	0.31	0.32	0.32	0.33	0.34	0.35

Regulatory Evaluation

How would SC 005 compare with federal rules and regulations?

Because many of the same processes are implemented at sand and gravel operations (crushing, grinding, conveying, mixing of aggregate), EPA's New Source Performance Standard (NSPS), 40 CFR Part 60 Subpart OOO, Standards of Performance for Nonmetallic Mineral Processing Plants, is also applicable to asphalt and concrete operations. NSPS Subpart I, Standards of Performance for Hot Mix Asphalt Facilities, and NSPS Subpart UU, Standards of Performance for Asphalt Processing and Asphalt Roofing Manufacturing, are also applicable to asphalt operations.

Asphalt processing is also subject to National Emission Standards for Hazardous Air Pollutants (NESHAPs), 40 CFR Part 63 Subpart LLLLL, Asphalt Processing and Asphalt Roofing Manufacturing (major sources), and Subpart AAAAAAA, Asphalt Processing and Asphalt Roofing Manufacturing (area sources).

How would SC 005 compare to rules in other air districts?

SCAQMD Rule 1157 (PM10 Emission Reductions from Aggregate and Related Operations) identifies requirements for general performance standards; loading, unloading, and transferring; conveyor; crushing equipment; screening equipment; storage piles; internal roads; and track-out. Such operations are also covered by SCAQMD Rule 403 (Fugitive Dust) which also identifies Best Available Control Measures (BACM) applicable to all construction activity sources. SCAQMD provides only guidance for minimizing emissions during these activities, but, ultimately, the emissions limits are the same as those being achieved under District rules. Similar rules were not identified in BAAQMD, SMAQMD, and VCAPCD.

Emission Reduction Opportunities

Emissions from concrete production operations and asphalt concrete operations are minimized by achieved-in-practice controls meeting the opacity requirements of District Rule 4101 (Visible Emissions) and Rule 2201 (New and Modified Stationary Source Review). For concrete production operations, this technology includes baghouses for screens, crushers, and concrete weight batchers; bin vent filters for concrete and fly ash silos; and water spray for other emissions points. For asphalt operations, achieved-in-practice controls include oil mist collectors and “blue smoke” control with electrostatic precipitators or filter packs. Dryers used for drying aggregate in the asphalt production process are regulated under District Rule 4309 (Dryers, Dehydrators, and Ovens), which limits NO_x and CO to 4.3 and 42 ppmv, respectively, for gaseous-fuel fired units.

Specific to asphalt operations, warm-mix asphalt technologies show promise in reducing emissions associated with the production of asphalt for paving projects when compared to hot-mix asphalt. Both mechanical (foaming) and additive (chemical and organic) technologies “allow the producers of asphalt pavement material to lower the temperatures at which the material is mixed and placed on the road.”⁵² Lower temperatures—50 to 100 degrees Fahrenheit below what is necessary for hot-mix asphalt—result in lower fuel consumption, decreased production of greenhouse gases, lower criteria pollutant emissions, and lower fugitive VOC emissions during application. The amount of emissions reductions is dependent on the additive or process used⁵³, but one additive manufacturer claims reductions of 30% (VOC), greater than 30% (PM), and greater than 50% (NO_x) in emissions measured at the plant stack.⁵⁴ The same manufacturer also claims more than 45% reduction in CO₂ emissions.

Warm-mix asphalt, while widely used in Europe, is relatively new in the United States. There have been many demonstration projects throughout the U.S. and California, and

⁵² National Asphalt Pavement Association, Warm Mix Asphalt Technical Working Group: Warm Mix Asphalt Takes Off. (2012). <http://warmmixasphalt.com/>

⁵³ Jones, D., Wu, R., Tsai, B., Barros, C.B., Peterson, J., (2011). *Key Results from a Comprehensive Accelerated Loading, Laboratory, and Field Testing Study on Warm-Mix Asphalt in California*. Proceedings, 2nd International Warm-Mix Conference, St. Louis, Missouri, October 11–13.

http://www.asphaltpavement.org/big_files/11mwmx/Papers/WM19_Jones.pdf

⁵⁴ MeadWestvaco Corporation [MWV]: Evotherm® Warm Mix Asphalt (2012).

<http://www.meadwestvaco.com/SpecialtyChemicals/AsphaltAdditives/MWV002106>

there is ongoing research to evaluate long-term durability, to verify emissions reductions, and to develop best practices for the use of warm-mix asphalt. The California Department of Transportation (Caltrans), in conjunction with the University of California, Davis, has been investigating implementation issues specific to the use of warm-mix asphalt in California. Caltrans already uses warm-mix asphalt for projects requiring nighttime work or application in cooler temperatures. Caltrans has also issued a contractor-permissive specification that allows the use of warm-mix asphalt for paving projects as conditions and requirements allow. Despite the general acceptance of warm-mix asphalt technologies by Caltrans, use by local jurisdictions has not been well-received; cost and unfamiliarity with the technology remain as barriers to technology penetration.

Of the emissions inventory for this category, approximately 50% of the PM_{2.5} emissions, 80% of the NO_x emissions, and virtually all of the SO₂ emissions are attributable to asphalt concrete production. As of August 2012, there are 22 permitted asphalt production plants in the Valley. While the inventory from these existing plants represents a small portion of the overall inventory, the co-benefits of using warm-mix asphalt (reduced fuel use, reduced worker exposure to on-site emissions, improved compaction, and the ability to extend the paving season and pave in cooler temperatures) may make its use cost effective.

Risk-based Strategy Analysis

The emissions from this source category contribute 3.5% of average winter SO_x, and 1.8% of average winter PM_{2.5} emitted from stationary and area sources in the 2012 emission inventory. As illustrated in the emission inventory table above, the emissions from this source category consist of a relatively small portion of the Valley inventory and do not have elevated emission levels in winter months. Additionally, the emissions are geologic in nature, and, as described in Chapter 2, do not contribute significantly during the peak winter season, and are of low relative toxicity.

Control Measure Commitments

The following is a summary of recommended commitments for SC 005.

Regulatory Action

There are no recommendations for regulatory actions for asphalt and concrete operations. Further study to evaluate the potential of using warm-mix asphalt instead of hot-mix asphalt in the Valley is recommended.

Incentive Action

There are no recommendations for incentive actions for asphalt and concrete operations at this time.

Technology Advancement Action

There are no recommendations for new technology advancement actions at this time. Through its Technology Advancement Program, the District will continue to seek potential feasible and low-cost technologies that may provide for additional emission reduction opportunities in this category.

Policy Initiatives

The District is not currently supporting any policy initiatives specific to asphalt and concrete operations. There are no recommendations for new policy initiatives specific to asphalt and concrete operations.

Education and Outreach

The District currently provides a robust education and outreach program for regulated sources through the Small Business Assistance program, Permit Stakeholder Meetings, Compliance Assistance Bulletins, and public notices for public workshops and public hearings. There are no recommendations for new education and outreach efforts for these sources.

D.7.6 SC 006 Almond Hulling/Shelling Operations

Source Category

This control measure source category would apply to almond hulling and shelling operations. Almonds are harvested from orchards and transported to almond processing facilities, where the almonds are hulled and shelled leaving the nut, or meat. Orchard debris, soil, and pebbles represent 10- 25% of the field weight of material brought to the almond processing facility. Clean almond meats are obtained as about 20% of the field weight. Processes for removing the debris and almond hulls and shells are potential sources of air emissions. The Valley harvests 86% of the almonds produced in California. Production has roughly doubled in the last decade, with the 2010/2011 crop year reaching 1.4 billion pounds.⁵⁵

Emission Inventory

The emission inventory for this control measure source category includes the emissions from the SC 007 (Pistachio Hulling/Shelling Operations) source category for pistachio hulling and shelling operations.

Pollutant	2007	2012	2014	2015	2016	2017	2018	2019
Annual Average - Tons per day								
PM2.5	0.075	0.081	0.084	0.086	0.087	0.089	0.091	0.093
NOx	0	0	0	0	0	0	0	0
SOx	0	0	0	0	0	0	0	0
Winter Average - Tons per day								
PM2.5	0.049	0.052	0.054	0.056	0.057	0.057	0.059	0.060
NOx	0	0	0	0	0	0	0	0
SOx	0	0	0	0	0	0	0	0

Regulatory Evaluation

How would SC 006 compare with federal rules and regulations?

There are no specific federal guidelines applying to almond hulling/shelling operations in terms of Control Techniques Guidelines (CTG), Alternative Control Techniques (ACT), New Source Performance Standards (NSPS), National Emission Standards for Hazardous Air Pollutants (NESHAP), Best Available Control Technology (BACT), and Maximum Achievable Control Technology (MACT) for this category.

⁵⁵ The Tioga Group. (2012). *SJV Nut Industry Profile Preliminary Draft*.
<http://www.sjvcogs.org/pdfs/2012/Nut%20Industry%20030612.pdf>

How would SC 006 compare to rules in other air districts?

No rules or Best Available Control Technology (BACT) guidelines were identified in other California air districts for this source category. Air districts researched included SCAQMD, BAAQMD, VCAPCD, and SMAQMD.

Emission Reduction Opportunities

Evaluation of emission reduction opportunities for almond hulling and shelling operations included a review of on-going research efforts, and the technological feasibility and cost effectiveness of Poly Tetra Fluoro Ethylene bags.

On-Going Research Efforts

Research is currently being conducted by Texas A&M University in partnership with almond harvesting equipment manufacturers, almond farmers, United States Department of Agriculture-Natural Resources Conservation Service (USDA-NRCS), and the District to compare “low dust” almond harvesters and an exhaust abatement device to conventional harvesters in the harvesting of almonds at a Valley farm. No differences were detected in the particle size distribution (PSD) characteristics of PM emitted from each harvester, with the exception of the exhaust abatement device, where large particles were efficiently captured by the cyclone. Emissions of total suspended particulates (TSP) and PM10 trended lower for all new harvesters and were significantly lower for most harvesters. There were significant reductions of PM2.5 ranging from 61-69% observed from the harvesters and a 95% reduction in PM2.5 from the Clean Air Concept cyclone. The results of these tests imply that new harvest technologies are able to reduce PM emissions without affecting product quality.

Poly Tetra Fluoro Ethylene Bags

District BACT guidelines for almond hullers and shellers require the use of a baghouse, which controls PM by moving the contaminated flow of air through bag type filters. The technology has been achieved in practice in the District. Standard polyester bags are the most commonly used type of bag for baghouses in the almond hulling/shelling industry. A layer of dust (dust cake) collects on the upstream side of these bags and filtering efficiency increases as the layer grows; however, they are not designed to provide high PM2.5 control. On the other hand, membrane type bags treated with Poly Tetra Fluoro Ethylene (PTFE) contain extremely small pores and filtering occurs on the bag surface instead of in a dust cake. These types of filters are capable of controlling 99.9%⁵⁶ of PM2.5 emissions, whereas baghouses with polyester bags control PM2.5 emissions by 95%-99%⁵⁷.

The costs of using baghouses with PTFE bags rather than standard polyester bags were calculated. The pressure drop across polyester and PTFE bags is about the same

⁵⁶ Baghouse: PTFE Filters. (2012). Retrieved March 15, 2012 from <http://www.baghouse.com/products/dust-collector-filters/baghouse-filter/ptfe-filters/> as supported by EPA Air Pollution Control Technology Center, Verified Technologies. (2012).

⁵⁷ Roberts, C. (2009). *Information on Air Pollution Control Technology for Woody Biomass Boilers*. Northeast States for Coordinated Air Use Management and the EPA Office of Air Quality Planning and Standards.

so there should not be a significant increase in electrical costs by using one bag over another. Additionally, existing baghouses would not require modifications to accommodate PTFE bags so the increased cost lies solely in the cost of the bags. A PTFE bag typically costs \$23, whereas a polyester bag costs \$12. The lifetime of both bags is approximately 2 years. The following cost differential was calculated, with knowledge that some facilities in the Valley have up to 2-3 baghouses, each with 500 bags. District permits also require facilities to have replacement bags accounting for 10% of the total number of bags; therefore 550 bags will be used for the following calculations.

Additional Costs for using PTFE bags

550 bags x (\$23/ PTFE bag - \$12/ polyester bag) / 2 years = **\$3,025/ year** (per baghouse)

3 baghouses x \$3,025/ year = **\$9,075/ year** (for 3 baghouses)

Potential PM2.5 Emission Reductions from using PTFE bags

The control efficiency for PM2.5 for polyester bags is assumed to be equivalent to the control efficiency for PM10.

(99.9% control efficiency from PTFE bags – 99% control efficiency of polyester bags)
= 0.9% additional control efficiency

2012 emission inventory is 0.081 tons/day
(0.081 tons/day PM2.5) x (0.9% additional control from using PTFE bags)
= **0.000729 tons/day reduced**

(0.000729 tons/day reduced from using PTFE bags) x (365 days/year)
= **0.266 tons/year reduced**

Potential Cost Effectiveness of using PTFE bags

101 baghouses in the Valley

(101 baghouses) x (PTFE bag costs \$3,025/ year) = **\$305,525/year**

(\$305,525/year) / (0.266 tons/year reduced) = **\$1,148,590/ton**

The cost effectiveness of replacing polyester bags was also calculated at the lower end of the emission control efficiency scale (95%) with the PTFE bags to determine what a more conservative cost effectiveness analysis would reveal; the cost effectiveness from 95% polyester bags to 99.9% PTFE bags is \$210,898/ton PM2.5 reduced.

Although the initial annual capital cost may seem relatively low; in terms of cost effectiveness, PTFE bags are not a cost effective alternative to standard bags. The

additional control efficiency gains are in the fractions of tons of incremental emissions reductions. Additionally, as mentioned above, the emission inventory used in these calculations (0.081 tons/day PM_{2.5}) includes the emissions of both almond hulling and pistachio hulling, meaning the actual inventory is smaller, and making the actual cost effectiveness even higher than calculated.

The cyclone is another technology in common use at Valley facilities for PM control in almond hulling/shelling; however, like baghouses with polyester bags, the technology primarily provides PM₁₀ control. Additionally, cyclones typically achieve 80-85% control efficiency. Approximately 37 facilities in the Valley use cyclones to control PM emissions. Therefore, if these facilities were required to replace cyclones with baghouses, the cost effectiveness would be as follows:

Potential PM_{2.5} Emission Reductions for replacing cyclones with Baghouses with PTFE

The PM_{2.5} control efficiency for cyclones is assumed to be equivalent to the control efficiency for PM₁₀
 (99.9% control efficiency of baghouse – 85% control efficiency of cyclone)
 = 14.9% additional control efficiency

2012 emission inventory is 0.081 tons/day
 (0.081 tons/day PM_{2.5}) x (14.9% control with use of baghouse)
 = **0.012 tons/day reduced**

(0.012 tons/day reduced) x (365 days/year)
 = **4.38 tons/year reduced**

Potential Cost Effectiveness

37 facilities to install baghouses at a minimum of \$150,000 each

With a 10 year amortization factor and 10% interest, the annualized cost for a \$150,000 baghouse would be:

(0.1627) x (\$150,000) = **\$24,405/year**

(37 facilities) x (capital cost of baghouse \$24,405/year) = **\$902,985/year**

(\$902,985/year) / (4.38 tons/year reduced) = **\$206,161/ton**

Replacing the existing cyclones with baghouses with PTFE bags would cost \$206,161/ton, which does not include additional costs of installation, electrical system upgrades, ductwork, demolition or disposal of the cyclone. Therefore, replacing cyclones with baghouses is not a cost effective control option. As previously stated, the

emission inventory used in these calculations (0.081 tons/day PM_{2.5}) includes the emissions of both almond hulling and pistachio hulling, meaning the actual inventory is smaller, and making the actual cost effectiveness even higher than stated.

At this time, the District's analysis indicates that there are no feasible opportunities for additional emission reduction regulatory strategies for this source category.

Risk-based Strategy Analysis

The PM_{2.5} emissions from this source category include the emissions from pistachio hulling and shelling operations (refer to SC 007). The emissions from these two source categories combined contribute 0.1% of average winter PM_{2.5} emitted from stationary and area sources in the 2012 emission inventory. As illustrated in the emission inventory table above, the emissions from this source category are relatively small throughout the year, with peak emissions occurring in summer months. Additionally, the emissions are geologic in nature, and, as described in Chapter 2, do not contribute significantly during the peak winter season, and are of low relative toxicity.

Control Measure Commitments

The following is a summary of recommended commitments for SC 006.

Regulatory Action

The District's analysis did not identify any technologically feasible and cost effective potential controls. Therefore, there are no recommendations for regulatory actions.

Incentive Action

The District does not currently fund any incentive programs specific to almond hulling operations; there are no recommendations for new incentive programs for almond hulling activities at this time. One potential opportunity was identified to reduce emissions, which was found to be not cost effective for current practices. The District could potentially fund the replacement of existing particulate matter control devices with baghouses that use the PTFE bags; however, an incentive program would be unlikely due to the high cost effectiveness and low emissions reductions.

Technology Advancement Action

There is no recommendation for a new technology advancement project for this source category. Through its Technology Advancement Program, the District will continue to seek potential feasible and low-cost technologies that may provide for additional emission reduction opportunities in this category.

Policy Initiatives

The District is not currently supporting any policy initiatives specific to almond hulling operations and there are no recommendations for new policy initiatives for these sources.

Education and Outreach

The District currently provides a robust education and outreach program for regulated sources through the Small Business Assistance program, Permit Stakeholder Meetings, Compliance Assistance Bulletins, and public notices for public workshops and public hearings. There are no recommendations for new education and outreach efforts for these sources.

D.7.7 SC 007 Pistachio Hulling/Shelling Operations

Source Category

This control measure source category would apply to pistachio hulling and shelling operations within the Valley. Pistachio hulling operations are permitted together under the same permit with the pistachio receiving and pre-cleaning portions of the operation. These operations use 1D-3D cyclones to control PM emissions from the pre-cleaning portion of the process, which is the Best Available Control Technology (BACT) standard. Typically pistachio processing equipment, located after the pre-cleaning section and prior to the pistachio dryers, is of a wet-process design; PM emissions from this portion of the operation are assumed to be negligible. California produces 98.5% of U.S. pistachios and production has expanded greatly in the last decade. Pistachio acreage doubled between 1997 and 2010, and production looks like it will continue to increase in the near future.⁵⁸ In the interest of identifying every possible strategy to reduce PM_{2.5} emissions, pistachio hulling and shelling operations were evaluated for potential opportunities to reduce emissions, see the discussion below.

Emission Inventory

The emission inventory for this category is included as a part of the emission inventory for the control measure source category for almond hulling. Refer to the emission inventory table presented in SC 006 for this combined inventory.

Regulatory Evaluation

How would SC 007 compare with federal rules and regulations?

There are no specific federal guidelines applying to pistachio hulling/shelling operations in terms of New Source Performance Standards (NSPS), Control Techniques Guidelines (CTG), Alternative Control Technology (ACT), Maximum Achievable Control Technology (MACT) and National Emission Standards for Hazardous Air Pollutants (NESHAP). Additionally, there are currently no EPA BACT determinations for pistachio hulling and shelling operations.

How would SC 007 compare to rules in other air districts?

This source category was compared to other air districts in California including SCAQMD, BAAQMD, SMAQMD, and VCAPCD; no rules were identified in other air districts regarding pistachio hulling and shelling operations.

⁵⁸ The Tioga Group. (2012). *SJV Nut Industry Profile Preliminary Draft*.
<http://www.sjvcogs.org/pdfs/2012/Nut%20Industry%20030612.pdf>

Emission Reduction Opportunities

Pistachio shelling operations are served by a baghouse, which is the industry standard for shelling operations. While there is no specific BACT guideline for shelling operations, baghouses are typically attributed to a PM_{2.5} control efficiency of 95-99%. As discussed above in SC 006 (Almond Hulling/Shelling Operations), Poly Tetra Fluoro Ethylene (PTFE) bags have the potential to provide additional PM_{2.5} control when used in baghouses but are not cost effective due to the already high control efficiency of existing practices. Refer to SC 006 (Almond Hulling/Shelling Operations) for the cost effectiveness analysis.

Unlike almonds which are shaken on the ground and vacuumed off the soil during harvesting, pistachios are caught with a canvas catcher before they hit the ground, which allows for a very small amount of dust and debris in addition to the pistachios. Much of the PM emissions associated with the processing of pistachios occur during the pre-cleaning stage, which is controlled by cyclones. The hulling stage is a wet process as the nuts are floated on water; PM emissions from this portion of the operation are assumed to be negligible. At this time, the District's analysis indicates that there are no feasible opportunities for additional emission reduction regulatory strategies for this source category.

Risk-based Strategy Analysis

The PM_{2.5} emissions from this source category include the emissions from almond hulling and shelling operations (refer to SC 006). The emissions from these two sources combined contribute 0.1% of average winter PM_{2.5} emitted from stationary and area sources in the 2012 emission inventory. The emissions from this source category are relatively small throughout the year, with peak emissions occurring in summer months. Additionally, the emissions are geologic in nature, and, as described in Chapter 2, do not contribute significantly during the peak winter season, and are of low relative toxicity.

Control Measure Commitments

The following is a summary of recommended commitments for SC 007.

Regulatory Action

The District's analysis did not identify any technologically feasible and cost effective potential controls. Therefore, there are no recommendations for regulatory actions.

Incentive Action

The District does not currently fund any incentive programs specific to pistachio hulling operations; there is no recommendation for a new incentive program specific to pistachio hulling activities. One potential opportunity to reduce emissions was identified, but was found to be not cost effective for current practices (refer to the potential opportunities analysis for almond hulling for the cost effectiveness analysis). The District could potentially fund the replacement of existing PM control devices with baghouses that use the PTFE bags; however, an incentive program would be unlikely due to the high cost effectiveness and low emissions reductions.

Technology Advancement Action

There is no recommendation for a new technology advancement project for this source category. Through its Technology Advancement Program, the District will continue to seek potential feasible and low-cost technologies that may provide for additional emission reduction opportunities in this category.

Policy Initiatives

The District is not currently supporting any policy initiatives specific to pistachio hulling operations and there are no recommendations for new policy initiatives for these sources.

Education and Outreach

The District currently provides a robust education and outreach program for regulated sources through the Small Business Assistance program, Permit Stakeholder Meetings, Compliance Assistance Bulletins, and public notices for public workshops and public hearings. There are no recommendations for new education and outreach efforts for these sources.

D.7.8 SC 008 Agricultural Material Screening/Shaking Operations

Source Category

This control measure source category would be applicable to the handling and processing of agricultural materials in biomass, composting, and other agricultural material handling facilities.

Emission Inventory

The emission inventory for this category is accounted for in other control measure source categories. Refer to Appendix B for the emission inventory.

Regulatory Evaluation

How would SC 008 compare with federal rules and regulations?

There are no applicable federal standards and guidelines, such as Control Techniques Guidelines (CTG), Alternative Control Techniques (ACT), New Source Performance Standards (NSPS), National Emission Standards for Hazardous Air Pollutants (NESHAP), and Maximum Achievable Control Technology (MACT) for this source category. EPA Best Available Control Technology (BACT) requirements were also evaluated for potential opportunities; however no standards were listed for this category.

How would SC 008 compare to rules in other air districts?

SCAQMD Rule 1131.1 (Chipping and Grinding Activities) is the only rule in California identified to be applicable to agricultural material screening and shaking operations. Rule 1133.1 contains provisions to ensure that greenwaste is chipped or ground and used within 48 hours to prevent inadvertent decomposition. Biomass facilities are exempt from most requirements if the material temperature is maintained below 122 degrees Fahrenheit and the moisture content is less than 30%. Greenwaste kept with moisture content less than 30% is also exempt from these requirements. The limits of this rule are targeted at controlling volatile organic compound (VOC) emissions rather than NO_x or PM_{2.5}. District analysis did not identify similar rules, regulated categories, or BACT requirements at BAAQMD and SCAQMD.

Emission Reduction Opportunities

District analysis of potential emission reduction opportunities includes an evaluation of feasibility of wet suppression systems and enclosing conveyors and transfer points.

Wet Suppression System

A wet suppression system can achieve between 40-65% control of PM_{2.5}⁵⁹. In a wet suppression system, water is generally applied to all emissions units, transfer points, and raw material stockpiles to ensure that adequate moisture is provided to the operation to successfully reduce PM emissions. No emissions would be reduced by requiring a wet suppression system because this control is currently in use at all identified facilities in the Valley and would be required at any new facility triggering BACT under the New Source Review Rule 2201.

Enclosed Conveyors and Transfer Points

Enclosing conveyors and transfer points to limit the emissions of PM is a practice used in addition to water spray at seven facilities in the Valley. This control option would potentially reduce emissions at the drop or transfer points on the conveyors. However, in addition to the control efficiency of enclosed conveyors being unknown, conveyors are already operated so that they move very slowly to avoid entraining dust and limit visible emissions. Therefore, the potential to reduce emissions is minimal and reduced emissions would not be quantifiable.

At this time, the District's analysis indicates that there are no feasible opportunities for additional emission reduction regulatory strategies for this source category.

Risk-based Strategy Analysis

The emissions from this source category are accounted for in the emission inventory of other control measures. However, the emissions are geologic in nature, and, as described in Chapter 2, do not contribute significantly during the peak winter season, and are of low relative toxicity.

Refer to Appendix B for the emission inventory.

Control Measure Commitments

The following is a summary of recommended commitments for SC 008.

Regulatory Action

The District's analysis did not identify any technologically feasible and cost effective potential controls. Therefore, there are no recommendations for regulatory actions.

⁵⁹ Environmental Protection Agency [EPA]. (1995). *Compilation of Air Pollutant Emission Factors, Table B.2-3*. Research Triangle Park, NC.

Incentive Action

The District does not currently fund any incentive programs specific to reducing PM emissions from agricultural material screening and shaking operations. There are no recommendations for new incentive actions to reduce PM emissions from this source category.

Technology Advancement Action

There is no recommendation for a new technology advancement project for this source category. Through its Technology Advancement Program, the District will continue to seek potential feasible and low-cost technologies that may provide for additional emission reduction opportunities in this category.

Policy Initiatives

The District is not currently supporting any policy initiatives specific to the control of PM emissions from agricultural material screening and shaking operations, and there are no recommendations for new policy initiatives for PM control of these operations.

Education and Outreach

The District currently provides a robust education and outreach program for regulated sources through the Small Business Assistance program, Permit Stakeholder Meetings, Compliance Assistance Bulletins, and public notices for public workshops and public hearings. There are no recommendations for new education and outreach efforts for these sources.

D.7.9 SC 009 Tub Grinding

Source Category

This control measure source category would apply to operations using a tub grinder for agricultural material processing. Tub grinders are used to grind organic materials such as wood and agricultural materials for biomass fuel processing facilities, composting facilities, landscape material manufacturing (e.g. wood bark, mulch, etc.), or agricultural waste grinding (e.g. orchard removal, land clearing, etc.). These units are typically powered by diesel-fired internal combustion engines (ranging from 100 horse power (hp) to 1,600 hp) and mounted on wheels to be transportable, which allows the units to be towed to the jobsite where the piles of material are to be ground. In addition, these units may also be self-propelled and track-mounted; in this case the diesel engine powering the equipment is also used for motive power and is exempt from District permits since it is considered to be mobile equipment. The diesel engines powering the transportable units are subject to District Rule 4702 (Internal Combustion Engines) and Best Available Control Technology (BACT) Guideline 3.2.11. This control measure source category discussion addresses the particulate matter (PM) emissions from the loading, grinding, and conveying of the process materials.

Emission Inventory

Emissions generated by the engines of the tub grinders are accounted for as a part of the inventory for District Rule 4702 (Internal Combustion Engines). The fugitive particulate emissions from these units are accounted for as a part of the stationary and area inventory. See Appendix B.

Regulatory Evaluation

How would SC 009 compare with federal rules and regulations?

There are no specific federal guidelines applying to wood chipping and stump grinding operations in terms of New Source Performance Standards (NSPS), National Emission Standards for Hazardous Air Pollutants (NESHAP), Maximum Achievable Control Technology (MACT), Control Techniques Guidelines (CTG) or Alternative Control Techniques (ACT) for this category.

How would SC 009 compare to rules in other air districts?

Upon comparing this source category to other California air districts' rules, the only similar rule found was SCAQMD Rule 1131.1 (Chipping and Grinding Activities). Rule 1133.1 contains provisions for biomass facilities to maintain the material temperature below 122 degrees Fahrenheit and the moisture content to less than 30%; however, these limits are targeted at controlling volatile organic compound (VOC) emissions rather than NO_x or PM_{2.5}. Portable chipping and grinding, agricultural chipping and grinding, land clearing chipping and grinding, wood waste chipping and grinding, and palm chipping and grinding activities are exempt from Rule 1133.1. Analysis

determined that no other air district regulates this source category. Air districts analyzed include BAAQMD, SMAQMD, and VCAPCD.

Emission Reduction Opportunities

No technologically feasible or alternative basic equipment are identified in the District's Best Available Control Technology (BACT) guidelines.

Currently, fugitive particulate emissions from transportable and self-propelled tub grinders are controlled with a water sprinkler system during loading, grinding, and unloading of the process materials to prevent visible emissions in excess of 5% opacity per Rule 2201 (New Source Review) and BACT guideline 6.4.2. Water sprinkler systems achieve between 40-65% control of PM_{2.5}⁶⁰. It is standard practice to use water spray on this type of equipment to meet the visible emission requirements of Rule 4101 (Visible Emissions); therefore, requiring water control for tub grinding operations would not result in additional emission reductions from this source category. A potential control option considered would be to require a baghouse to be installed onto the trailer of the equipment to capture fugitive PM emissions. Due to the large size of the additional equipment required to be installed onto the trailer and the limited space available, a baghouse is not technologically feasible for a transportable unit.

Risk-based Strategy Analysis

The emissions from this source category are accounted for in the emission inventory of other control measures. Refer to Appendix B for the emission inventory. The NO_x emissions from this source category are from the engines used to power these units and are currently controlled by Rule 4702 (Internal Combustion Engines). Due to the nature of tub grinding activities, it is assumed that there are no elevated emission levels in the winter months. Additionally, the emissions are geologic in nature, and, as described in Chapter 2, do not contribute significantly during the peak winter season, and are of low relative toxicity.

Control Measure Commitments

The following is a summary of recommended commitments for SC 009.

Regulatory Action

The District's analysis did not identify any technologically feasible and cost effective potential controls. Therefore, there are no recommendations for regulatory actions.

⁶⁰ Environmental Protection Agency [EPA]. (1995). *Compilation of Air Pollutant Emission Factors, Table B.2-3*. Research Triangle Park, NC.

Incentive Action

The District does not currently fund any incentive programs specific to reducing PM emissions from tub grinding operations. There are no incentive action recommendations to reduce PM emissions from tub grinders at this time. The District analysis did not identify new technologies that could potentially reduce emissions from this source category.

Technology Advancement Action

There is no recommendation for a new technology advancement project for this source category. Through its Technology Advancement Program, the District will continue to seek potential feasible and low-cost technologies that may provide for additional emission reduction opportunities in this category.

Policy Initiatives

The District is not currently supporting any policy initiatives specific to the control of PM emissions from tub grinding operations and there are no recommendations for new policy initiatives for PM control of tub grinding operations.

Education and Outreach

The District currently provides a robust education and outreach program for regulated sources through the Small Business Assistance program, Permit Stakeholder Meetings, Compliance Assistance Bulletins, and public notices for public workshops and public hearings. There are no recommendations for new education and outreach efforts for these sources.

D.7.10 SC 010 Abrasive Blasting

Source Category

Abrasive blasting involves the cleaning or preparing of a surface by forcibly propelling a stream of abrasive material against such surface. Abrasive blasting can occur in a confined or an unconfined area, depending on the type of surface or application.

Abrasive materials commonly used are walnut shells, various mineral or metal products, garnet, sand or aggregate, slag, steel grit abrasive, or steel shot.

Emission Inventory

Pollutant	2007	2012	2014	2015	2016	2017	2018	2019
<i>Annual Average - Tons per day</i>								
PM2.5	0.22	0.22	0.24	0.24	0.25	0.26	0.26	0.27
NOx	0	0	0	0	0	0	0	0
SOx	0	0	0	0	0	0	0	0
<i>Winter Average - Tons per day</i>								
PM2.5	0.22	0.22	0.23	0.24	0.25	0.25	0.26	0.27
NOx	0	0	0	0	0	0	0	0
SOx	0	0	0	0	0	0	0	0

Regulatory Evaluation

How would SC 010 compare with federal rules and regulations?

EPA promulgated management practices, and monitoring, recordkeeping, and reporting requirements for dry abrasive blasting within 40 CFR 63, Subpart XXXXXX–National Emission Standards for Hazardous Air Pollutants Area Source Standards for Nine Metal Fabrication and Finishing Source Categories.

Air pollution standards for abrasive blasting operations, or sandblasting, are set by statewide regulations, specifically California Code of Regulations, Title 17, Subchapter 6, Sections 92000 through 92530 (Abrasive Blasting). Furthermore, California Health and Safety Code (CH&SC), Section 41904 stipulates that no air district regulation can be stricter than the state standard. The state standard limits visible emissions from sandblasting operations to 20% opacity if within a permanent structure or 40% if outside a permanent structure.

How would SC 010 compare to rules in other air districts?

No rule from another air district has requirements beyond what is already required in state standards. BAAQMD Regulation 12, Rule 4 (Sandblasting), SCAQMD Rule 1140 (Abrasive Blasting), and VCAPCD Rule 74.1 (Abrasive Blasting) regulate abrasive blasting operations and activities, but all simply conform to the state standards.

Emission Reduction Opportunities

Achieved-in-practice Best Available Control Technology (BACT) controls for sandblasting include baghouses, filters, or cartridge dust collectors. With such technologies, 99% control efficiency can be achieved. As emissions sources, sandblasting operations within the District are subject to District Rule 4102 (Nuisance) and the standards of 17 California Code of Regulations (CCR) Section 92200 (opacity) and 17 CCR Section 92500 (performance standards such as CARB-certified abrasives).

Opportunities for further emissions reductions are limited because of the CH&SC stipulation that air districts cannot impose stricter rules on sandblasting operations. The District's analysis has determined that there are no feasible opportunities for additional emission reductions for this source category.

Risk-based Strategy Analysis

The emissions from this source category contribute 0.4% of average winter PM_{2.5} emitted from stationary and area sources in the 2012 emission inventory. As illustrated in the emission inventory table above, the emissions from this source category are consistently relatively small throughout the year, with no elevated emission levels in the winter months.

Control Measure Commitments

The following is a summary of the recommended commitments for SC 010.

Regulatory Action

The District's analysis did not identify any technologically feasible and cost effective potential controls. Therefore, there are no recommendations for regulatory actions.

Incentive Action

The District does not currently have an incentive program specific to abrasive blasting operations. There is no recommendation for a new incentive program for abrasive blasting operations at this time.

Technology Advancement Action

There is no recommendation for a new technology advancement project for this source category. Through its Technology Advancement Program, the District will continue to seek potential feasible and low-cost technologies that may provide for additional emission reduction opportunities in this category.

Policy Initiatives

The District is not currently supporting any policy initiatives specific to abrasive blasting and there are no recommendations for new policy initiatives for these sources.

Education and Outreach

The District currently provides a robust education and outreach program for regulated sources through the Small Business Assistance program, Permit Stakeholder Meetings, Compliance Assistance Bulletins, and public notices for public workshops and public hearings. There are no recommendations for new education and outreach efforts for these sources.

D.8 EMISSION INVENTORY CODES

Table D-19 Emission Inventory Codes

Control Measure	Emission Inventory Codes
Rule 4103 (Open Burning)	670-660-0262-9842; 670-660-0262-9856; 670-660-0262-9862; 670-660-0262-9874; 670-660-0262-9884; 670-660-0262-9888; 670-660-0262-9892; 670-662-0262-9866; 670-662-0262-9878; 670-662-0262-9882; 670-668-0200-9858; 670-668-0200-9872; 670-668-0200-9886; 670-995-0240-9848; 670-668-0200-9894
Rule 4104 (Reduction of Animal Matter)	420-995-6004-0000
Rule 4106 (Prescribed Burns)	670-666-0200-0000; 670-667-0200-0000; 670-664-0200-0000; 670-670-0200-0000
Rule 4203 (Particulate Matter Emissions from the Incineration of Combustible Refuse)	010-005-0243-0000
Rule 4204 (Cotton Gins)	420-418-6028-0000; 420-420-6028-0000
Rule 4307 (Boilers, Steam Generators and Process Heaters 2 – 5 MMBtu/hr)	010-005-0110-0000; 010-005-0124-0000; 010-005-0130-0000; 010-005-0300-0000; 010-005-1220-0000; 020-005-0110-0000; 030-005-0110-0000; 030-005-0124-0000; 030-005-0130-0000; 030-005-1220-0000; 030-005-1530-0000; 030-010-0110-0000; 030-010-0130-0000; 030-010-1220-0000; 030-010-1600-0000; 030-015-0110-0000; 030-015-0130-0000; 040-005-0110-0000; 040-005-1530-0000; 040-010-0100-0000; 040-010-0110-0000; 040-010-0120-0000; 040-010-0130-0000; 040-010-1000-0000; 050-005-0110-0000; 050-005-0122-0000; 050-005-0124-0000; 050-005-0130-0000; 050-005-0320-0000; 050-005-1100-0000; 050-005-1220-0000; 050-005-1510-0000; 050-005-1520-0000; 050-005-3220-0000; 050-010-0110-0000; 050-010-0120-0000; 050-010-0320-0000; 050-010-1220-0000; 050-010-1500-0000; 052-005-0110-0000; 052-005-0124-0000; 052-005-1220-0000; 052-010-0110-0000; 052-010-0120-0000; 052-010-1224-0000; 060-005-0110-0000; 060-005-0122-0000; 060-005-0124-0000; 060-005-0130-0000; 060-005-0142-0000; 060-005-0144-0000; 060-005-0320-0000; 060-005-1220-0000; 060-005-1510-0000; 060-005-1520-0000; 060-010-0100-0000; 060-010-0110-0000; 060-010-0120-0000; 060-010-0142-0000 The EICs are the same for Rules 4306/4320, 4307, and 4308; the three rules share a combined emission inventory. Baseline emissions from the 2008 and 2009 rule amendments of these rules were used to determine the percentage of emissions for each rule. Those respective percentages are applied to the combined inventory to get the individual emission inventories.
Rule 4308 (Boilers, Steam Generators and Process Heaters 0.075 to less than 2.0 MMBtu/hr)	The EICs are the same for Rules 4306/4320, 4307, and 4308; the three rules share a combined emission inventory. Baseline emissions from the 2008 and 2009 rule amendments of these rules were used to determine the percentage of emissions for each rule. Those respective percentages are applied to the

Control Measure	Emission Inventory Codes
	combined inventory to get the individual emission inventories. See Rule 4307 for the EICs.
Rule 4309 (Dryers)	430-422-7078-0000; 430-424-7006-0000; 430-995-7000-0000; 499-995-0000-0000; 499-995-5630-0000
Rule 4311 (Flares)	110-132-0130-0000; 110-132-0146-0000; 120-132-0136-0000; 130-132-0110-0000; 130-132-0136-0000; 310-320-0010-0000; 310-320-0110-0000; 310-320-0120-0000; 310-320-0130-0000; 320-320-0010-0000; 320-320-0110-0000; 320-320-0120-0000; 320-320-0130-0000
Rule 4313 (Lime Kilns)	Lime kilns are not included in the ARB emissions inventory. There are no lime kilns currently operating in the Valley.
Rule 4320 (AERO for Boilers, Steam Generators, and Process Heaters >5 MMBtu/hr)	The EICs are the same for Rules 4306/4320, 4307, and 4308; the three rules share a combined emission inventory. Baseline emissions from the 2008 and 2009 rule amendments of these rules were used to determine the percentage of emissions for each rule. Those respective percentages are applied to the combined inventory to get the individual emission inventories. See Rule 4307 for the EICs.
Rule 4352 (Solid Fuel Fired Boilers, Steam Generators, and Process Heaters)	010-005-0214-0000; 010-005-0218-0000; 010-005-0220-0000; 010-005-0240-0000; 010-005-0243-0000; 010-005-0254-0000; 020-005-0218-0000; 020-005-0230-0000; 030-005-0214-0000; 050-005-0214-0000; 050-005-0240-0000; 050-005-0254-0000; 052-005-0240-0000; 060-005-0240-0000; 060-005-0264-0000
Rule 4354 (Glass Melting Furnaces)	460-460-7037-0000; 460-460-7038-0000; 460-460-7039-0000
Rule 4550 (Conservation Management Practices)	620-614-5400-0000; 620-615-5400-0000; 650-650-5400-0000; 650-651-5400-0000
Rule 4692 (Commercial Charbroiling)	690-680-6000-0000
Rule 4702 (Internal Combustion Engines)	010-040-0110-0000; 010-040-1200-0000; 020-040-0110-0000; 020-040-1200-0000; 030-040-0110-0000; 030-040-0124-0000; 030-040-1200-0000; 030-040-1210-0000; 040-040-0110-0000; 050-040-0012-0000; 050-040-0110-0000; 050-040-0124-0000; 050-040-1200-0000; 052-040-0110-0000; 052-040-1200-0000; 052-042-0110-0000; 052-042-1200-0000; 052-042-1200-0010; 052-042-1200-0011; 060-040-0110-0000; 060-040-0124-0000; 060-040-0142-0000; 060-040-0146-0000; 060-040-1100-0000; 060-040-1200-0000; 060-040-1210-0000; 060-995-1220-0000; 099-040-1200-0000
Rule 4703 (Stationary Gas Turbines)	010-045-0110-0000; 010-045-1200-0000; 020-045-0110-0000; 030-045-0110-0000; 040-045-0134-0000; 050-045-1200-0000; 060-045-0110-0000; 060-045-1200-0000
Rule 4802 (Sulfuric Acid Mist)	410-400-2058-0000
Rule 4901 (Wood Burning Fireplaces and Wood Burning Heaters)	610-600-0230-0000; 610-602-0230-0000
Rule 4902 (Residential)	610-608-0110-0000

Control Measure	Emission Inventory Codes
Water Heaters)	
Rule 4905 (Natural Gas – Fired, Fan Type Residential Central Furnace)	610-606-0110-0000
Rule 8011 (General Requirements)	There is no specific emissions inventory associated with Rule 8011.
Rule 8021 (Construction, Demolition, Excavation, Extraction, and Other Earthmoving Activities)	630-622-5400-0000; 630-624-5400-0000; 630-626-5400-0000; 630-628-5400-0000; 630-634-5400-0000
Rule 8031 (Bulk Materials)	430-436-7006-0000; 430-436-7078-0000; 430-995-7064-0000
Rule 8041 (Carryout and Trackout)	The EICs are included in Rule 8061 (Paved and Unpaved Roads).
Rule 8051 (Open Areas)	650-652-5400-0000
Rule 8061 (Paved and Unpaved Roads)	640-635-5400-0000; 640-637-5400-0000; 640-639-5400-0000; 640-641-5400-0000; 640-643-5400-0000; 645-638-5400-0000; 645-640-5400-0000; 645-644-5400-0000; 645-648-5400-0000
Rule 8071 (Unpaved Vehicle Traffic)	645-645-5400-0000; 645-647-5400-0000. The ARB Emissions Inventory database does not contain emissions data on unpaved vehicle and equipment traffic areas.
Rule 8081 (Ag Sources)	645-646-5400-0000
SC 001 (Source Category: Lawn Care Equipment)	860-901-1100-1152; 860-901-1100-1153; 860-901-1100-1166; 860-901-1100-1167; 860-901-1100-1168; 860-901-1100-1169; 860-901-1100-1174; 860-901-1100-1175; 860-901-1100-1184; 860-901-1100-1185; 860-901-1100-1332; 860-901-1100-1333; 860-901-1100-1344; 860-901-1100-1345; 860-901-1100-1362; 860-901-1100-1363; 860-901-1100-1374; 860-901-1100-1375; 860-901-1100-2984; 860-901-1100-2985; 860-901-1100-2994; 860-901-1100-2995; 860-901-1100-4044; 860-901-1100-4045; 860-901-1100-4064; 860-901-1100-4065; 860-901-1100-4094; 860-901-1100-4095; 860-901-1100-4102; 860-901-1100-4103; 860-901-1100-4112; 860-901-1100-4113; 860-901-1100-4124; 860-901-1100-4125; 860-901-1100-5672; 860-901-1100-5673; 860-901-1100-5684; 860-901-1100-5685; 860-901-1100-5692; 860-901-1100-5693; 860-901-1100-5704; 860-901-1100-5705; 860-901-1100-5724; 860-901-1100-5725; 860-901-1100-7604; 860-901-1100-7605; 860-901-1100-7614; 860-901-1100-7615; 860-901-1100-8104; 860-901-1100-8105; 860-901-1100-8112; 860-901-1100-8113; 860-901-1100-8344; 860-901-1100-8345; 860-901-1100-8352; 860-901-1100-8353; 860-901-1100-8364; 860-901-1100-8365; 860-901-1100-8372; 860-901-1100-8373; 860-901-1100-8384; 860-901-1100-8385; 860-901-1100-9074; 860-901-1100-9075; 860-901-1100-9542; 860-901-1100-9543; 860-901-1100-9554; 860-901-1100-9555; 860-901-1100-9834; 860-901-1100-9835; 860-902-1100-1152; 860-902-1100-1153; 860-902-1100-1166; 860-902-1100-1167; 860-902-1100-1168; 860-902-1100-1169; 860-902-1100-1174; 860-902-1100-1175;

Control Measure	Emission Inventory Codes
	860-902-1100-1184; 860-902-1100-1185; 860-902-1100-2984; 860-902-1100-2985; 860-902-1100-2994; 860-902-1100-2995; 860-902-1100-4044; 860-902-1100-4045; 860-902-1100-4064;
SC 001 (Source Category: Lawn Care Equipment)	860-902-1100-4065; 860-902-1100-4094; 860-902-1100-4095; 860-902-1100-4102; 860-902-1100-4103; 860-902-1100-4112; 860-902-1100-4113; 860-902-1100-4124; 860-902-1100-4125; 860-902-1100-5672; 860-902-1100-5673; 860-902-1100-5684; 860-902-1100-5685; 860-902-1100-5692; 860-902-1100-5693; 860-902-1100-5704; 860-902-1100-5705; 860-902-1100-5724; 860-902-1100-5725; 860-902-1100-7604; 860-902-1100-7605; 860-902-1100-7614; 860-902-1100-7615; 860-902-1100-8104; 860-902-1100-8105; 860-902-1100-8112; 860-902-1100-8113; 860-902-1100-8344; 860-902-1100-8345; 860-902-1100-8352; 860-902-1100-8353; 860-902-1100-8364; 860-902-1100-8365; 860-902-1100-8372; 860-902-1100-8373; 860-902-1100-8384; 860-902-1100-8385; 860-902-1100-9074; 860-902-1100-9075; 860-902-1100-9542; 860-902-1100-9543; 860-902-1100-9554; 860-902-1100-9555; 860-902-1100-9834; 860-902-1100-9835; 860-903-1100-1394; 860-903-1100-1395; 860-903-1100-1404; 860-903-1100-1405; 860-903-1100-4084; 860-903-1100-4085; 860-903-1100-5744; 860-903-1100-5745; 860-903-1100-5754; 860-903-1100-5755; 860-903-1210-1190; 860-903-1210-1200; 860-903-1210-1210; 860-903-1210-1220; 860-903-1210-1230; 860-903-1210-1240; 860-903-1210-1250; 860-903-1210-1350; 860-903-1210-1380; 860-903-1210-4050; 860-903-1210-4070; 860-903-1210-4130; 860-903-1210-4140; 860-903-1210-4150; 860-903-1210-5710; 860-903-1210-5730; 860-903-1210-8390; 860-903-1210-8400; 860-903-1210-8410
SC 002 (Energy Efficiency)	None
SC 003 (Fireworks)	None
SC 004 (Sand and Gravel Operations)	430-422-7078-0000; 430-426-0210-0000; 430-426-7078-0000; 430-426-7092-0000
SC 005 (Asphalt/Concrete Operations)	430-424-7006-0000; 430-424-7050-0000; 430-429-7016-0000; 430-430-7016-0000; 430-430-7018-0000; 430-436-7006-0000; 430-995-7006-0000; 430-995-7012-0000; 430-995-7016-0000; 430-995-7018-0000; 430-995-7050-0000; 430-995-7072-0000
SC 006 (Almond Hulling/Shelling Operations)	420-418-6003-0000
SC 007 (Pistachio Hulling/Shelling Operations)	The EIC is included in SC 006
SC 008 (Agricultural Material Screening/Shaking Operations)	None
SC 009 (Tub Grinding Operations)	None
SC 010 (Abrasive Blasting)	430-428-6084-0000; 430-428-7000-0000; 430-428-7036-0000; 430-428-7078-0000; 430-428-7084-0000; 430-428-7088-0000; 430-428-7090-0000

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