SAN JOAQUIN VALLEY UNIFIED AIR POLLUTION CONTROL DISTRICT

PM2.5 CONTINGENCY MEASURE STATE IMPLEMENTATION PLAN REVISION

May 18, 2023

Table of Contents

San Joaquin Valley UNIFIED AIR POLLUTION CONTROL DISTRICT

HEALTHY AIR LIVING™

1. INTRODUCTION

Under the federal Clean Air Act (CAA) and consistent with U.S. Environmental Protection Agency (EPA) guidance, attainment plans must include contingency measures that provide for additional emission reductions if the area fails to attain the air quality standard by the applicable deadline, meet a quantitative milestone, or show reasonable further progress (RFP) toward attainment of the standard. These measures are to be adopted and held in reserve to be automatically triggered under these scenarios. In regions such as the San Joaquin Valley (Valley) with mature air quality programs, contingency measures are inherently difficult to identify, particularly in light of several adverse court interpretations associated with recent EPA actions that have only made this requirement more stringent over time.

On November 26, 2021, in response to recent adverse court rulings on prior EPA actions, EPA took final action in the Federal Register to disapprove contingency measures in the *2018 Plan for the 1997, 2006, and 2012 PM2.5 Standards* (*2018 PM2.5 Plan*). These actions, detailed in Table 1, became effective on December 27, 2021.

Table 1 EPA Contingency Measure Disapprovals for PM2.5 National Ambient Air Quality Standards (NAAQS)

NAAQS	District Plan	Federal Register Disapproval Citation
1997 Annual	*2018 PM2.5 Plan* (revised in 2021)	86 FR 67329
2006 24-hour	*2018 PM2.5 Plan*	86 FR 67343
2012 Annual	*2016 PM2.5 Plan* (revised in the *2018 PM2.5 Plan*)	86 FR 67343

EPA disapproval or inaction causes regulatory uncertainty, leading to inefficiencies and confusion, and can also result in devastating consequences to public health and the economy. As a result of these EPA disapprovals, the Valley is currently under sanctions and Federal Implementation Plan (FIP) clocks for disapproved contingency measures. Under these clocks, permit offset sanctions would be imposed 18 months from the effective date of the final disapproval. Highway sanctions would be imposed six months after the permit offset sanctions. In addition, EPA would be required to finalize a FIP 24 months from the effective date of the final disapproval. The sanctions and FIP are not imposed if EPA approves a subsequent State Implementation Plan (SIP) submittal that corrects the identified deficiencies before the applicable deadline.

In response to EPA's contingency actions described above, the District and CARB are providing this SIP revision to revise the District's contingency measure commitment for the 1997, 2006, and 2012 PM2.5 standards. This strategy, developed in coordination with EPA, will be transmitted through CARB to EPA for approval and incorporation into the California SIP. This proposed contingency SIP revision would replace relevant portions of Appendices H of the *2018 PM2.5 Plan* and the *2021 Attainment Plan Revision for the 1997 Annual PM2.5 Standard* related to contingency measures.

2. WHAT IS A CONTINGENCY MEASURE?

Through an attainment plan, a region puts forth strategies to achieve air quality improvements by federal CAA mandated deadlines. Agencies strive to be thorough and scientific in air quality planning to ensure an area meets attainment of federal standards by the attainment date. However, given the large number of variables inherent in planning and air quality more generally, there is a possibility that the air quality benefits will not occur as quickly as expected. In air quality planning, a contingency measure is something that would reduce direct PM2.5 emissions or PM2.5 precursors in the event the region does not reach attainment by the applicable attainment date, fails to make RFP, fails to submit a quantitative milestone report, or fails to meet a quantitative milestone. The purpose of contingency measures is to achieve additional air quality benefits while the region and state formally revise the attainment plan pursuant to CAA requirements for plan revisions and attainment date extensions.[1]

Contingency measures "must be fully adopted rules or measures that can take effect without further action by the state or the EPA upon failure to meet milestones or attain by the attainment deadline."[2] Legal interpretations of what qualifies as approvable contingency measures under the CAA have changed over the years.

Prior to 2016, agencies could use "surplus" emissions reductions from fully adopted rules to satisfy the contingency requirement. These rules achieved continuing and new emissions reductions past the attainment deadline through phased-in implementation and ongoing technology deployment. However, in *Bahr v. EPA*, 836 F.3d 1218 (9th Cir. 2016)("*Bahr*"), the court rejected EPA's interpretation allowing for early implementation of contingency measures that provided additional emission reductions, and held instead that contingency measures may only consist of new measures that do not take effect until triggered by an applicable CAA failure.

For many years, air basins outside the Ninth Circuit were able to continue relying on emissions reductions from already-implemented measures to fulfill the contingency measure requirement. (*Louisiana Environmental Action Network v. EPA*, 283 F.3d 575 (5th Cir. 2004) ("*LEAN*"). However, in *Sierra Club v. EPA*, 21 F.4th 185 (D.C. Cir. 2021) the court cited and agreed with the *Bahr* case, superseding *LEAN* and now prohibiting all regions in the nation from relying on surplus emissions reductions from early implemented measures to satisfy contingency measure requirements. This 2021 *Sierra Club* decision (published after EPA's implementation rule for the 2012 PM2.5 NAAQS in 2016), coupled with increased nonattainment areas under increasingly stringent NAAQS, elevates the contingency measure problem to one of nation-wide significance.

---

[1] EPA. *Fine Particulate Matter National Ambient Air Quality Standards: State Implementation Plan Requirements; Final Rule*. 81 Fed. Reg. 164, pp. 58010-58162. (August 24, 2016). https://www.govinfo.gov/content/pkg/FR-2016-08-24/pdf/2016-18768.pdf

[2] EPA. *Fine Particulate Matter National Ambient Air Quality Standards: State Implementation Plan Requirements; Final Rule*. 81 Fed. Reg. 164, pp. 58010-58162. (August 24, 2016). https://www.govinfo.gov/content/pkg/FR-2016-08-24/pdf/2016-18768.pdf

In response to *Bahr* and as part of the 75 ppb 8-hour ozone SIP due in 2016, CARB developed the statewide Enhanced Enforcement Contingency Measure (Enforcement Contingency Measure) as a part of the *2018 Updates to the California State Implementation Plan* to address the need for a triggered action as a part of the contingency measure requirement. Additionally, the District developed a new contingency measure achieving additional reductions from architectural coatings if required by an applicable CAA failure. CARB and the District worked closely with EPA regional staff in developing the contingency measure package that included the Enforcement Contingency Measure, the District architectural coatings measure and emission reductions from implementation of CARB's mobile source emissions program. As part of the *San Joaquin Valley 2016 Ozone Plan for 2008 8-hour Ozone Standard* SIP action, EPA approved CARB's enforcement as a "SIP strengthening" measure. In this action, EPA also approved the District's architectural coatings measure and the implementation of the mobile source reductions along with a CARB emission reduction commitment as meeting the contingency measure requirement for this SIP.

Subsequently, the Association of Irritated Residents filed a lawsuit against EPA for its approval of various elements within the *San Joaquin Valley 2016 Ozone Plan for 2008 8-hour Ozone Standard*, including the contingency measure. The Ninth Circuit Court of Appeals issued its decision in *Association of Irritated Residents v. EPA*[3] (*AIR*) that EPA's approval of the contingency element was arbitrary and capricious because EPA departed from its long-standing policy of requiring a SIP's contingency measure element to provide for emissions reductions equating to at least one year's reasonable further progress (RFP) without providing a reasoned explanation for its change in policy. The Ninth Circuit Court of Appeals held that, in line with EPA's longstanding interpretation of what is required of a contingency measure and the purpose it serves, together with *Bahr*, all reductions needed to satisfy the CAA's contingency measure requirements must come from the contingency measure itself, and that the amount of reductions needed for contingency cannot be reduced based upon surplus emission reductions from ongoing programs. In light of the holding, the current contingency framework creates several regulatory absurdities:

- Early implementation of measures improves public health and contributes to progress towards attainment of more stringent NAAQS. Withholding emissions reductions for contingencies slows public health improvements in nonattainment and environmental justice areas.
- Withholding a measure from the District's attainment strategy that achieves further emission reductions and advances attainment is unreasonable given the District's nonattainment challenges.
- Regions that are nonattainment for multiple standards must meet different RFP milestones and attainment deadlines under each NAAQS. If a region must withhold emissions reductions (e.g. NOx reductions) to satisfy a contingency measure need for one NAAQS, then that region will hinder its ability to meet milestones and attainment deadlines under other NAAQS as well.

[3] *Association of Irritated Residents v. U.S. Environmental Protection Agency*, 10 F.4th 937 (9th Cir. 2021).

- There are multiple contingency years in each SIP, and areas like the Valley must identify contingencies for multiple SIPs and NAAQS. The scarcity of available contingency measures is compounded if an area needs to identify replacement contingency measures in the future.

2.1 EPA Draft Guidance for Contingency Measures

In light of the difficulty nonattainment areas face in addressing CAA contingency requirements, the District, CARB, and other agencies have urged EPA to provide updated federal guidance. In response, EPA developed the *Draft Guidance on the Preparation of State Implementation Plan Provisions that Address the Nonattainment Area Contingency Measure Requirements for Ozone and Particulate Matter* (Draft Guidance) on March 16, 2023.[4] The District, CARB, and other local/state air quality management agencies engaged with EPA in the development of this Draft Guidance to provide technical input and recommendations through workgroup meetings and ongoing staff discussions. The purpose of the Draft Guidance is to identify solutions and flexibility related to key issues that regions face in developing approvable contingency measures, including the scarcity of available measures, implementation timelines following a contingency trigger, and the amount of reductions needed, among other issues. The Draft Guidance contains three main concepts: (1) revising the quantity of emissions reductions that contingency measures should provide to account for declining emissions inventories over time; (2) allowing for an infeasibility justification if an area is unable to identify feasible contingency measures in sufficient quantities due to a scarcity of available, qualifying measures and/or (3) revising the time period within which emissions reductions from contingency measures should occur.

3. CONTINGENCY MEASURE EMISSION REDUCTION TARGETS

In its new Draft Guidance, EPA has recognized that the longstanding policy of requiring emission reductions of one year's worth of RFP for contingency measures is extremely challenging and infeasible for areas such as the Valley. EPA's Draft Guidance therefore puts forth a new approach to calculate the recommended quantity of emission reductions, which EPA has named One Year's Worth of Progress (OYW_P). Based on this Draft Guidance, the following table summarizes the NOx and PM2.5 emission reductions needed to demonstrate that OYW_P is being achieved through the contingency measure. In EPA's draft guidance, the OYW_P value is calculated as the average emission reductions expected per year over the planning time line, expressed as a percentage of the base year emission inventory, and then applying this percentage

[4] EPA. *Guidance on the Preparation of State Implementation Plan Provisions that Address the Nonattainment Area Contingency Measure Requirements for Ozone and Particulate Matter*. March 16, 2023. Retrieved from: https://www.epa.gov/system/files/documents/2023-03/CMTF%202022%20guidance%203-16-23.pdf

to the attainment year inventory to result in an emission reduction target for contingency. In mathematical form, this would be expressed as:

$$OYW_P = \frac{\frac{(base\ year\ EI - attainment\ year\ EI)}{(attainment\ year - base\ year)}}{base\ year\ EI} * (attainment\ year\ EI)$$

The steps for the calculations for the 1997, 2006, and 2012 PM2.5 standards are detailed below, consistent with EPA's Draft Guidance.

Step 1: Calculate the annual average reductions needed to attain for each relevant precursor.

	1997 Standard	2006 Standard	2012 Standard
PM2.5 Step 1a	$62.5\ tpd - 58.06\ tpd = 4.4\ tpd$	$62.5\ tpd - 56.1\ tpd = 6.4\ tpd$	$62.5\ tpd - 58.4\ tpd = 4.1\ tpd$
PM2.5 Step 1b	$4.4\ tpd\ \div 10\ years = 0.44\ tpd$	$6.4\ tpd\ \div 11\ years = 0.58\ tpd$	$4.1\ tpd\ \div 9\ years = 0.46\ tpd$
NOx Step 1a	$317.2\ tpd - 150.6\ tpd = 166.6\ tpd$	$317.2\ tpd - 115.0\ tpd = 202.2\ tpd$	$317.2\ tpd - 179.8\ tpd = 137.4\ tpd$
NOx Step 1b	$166.6\ tpd\ \div 10\ years = 16.7\ tpd$	$115.0\ tpd\ \div 11\ years = 18.4\ tpd$	$137.4\ tpd\ \div 9\ years = 15.3\ tpd$

Step 2: Calculate the annual percentage reduction needed to attain.

	1997 Standard	2006 Standard	2012 Standard
PM2.5	$0.44\ tpd\ \div 62.5 = 0.0071\ (or\ 0.71\%)$	$0.58\ tpd\ \div 62.5 = 0.0093\ (or\ 0.93\%)$	$0.46\ tpd\ \div 62.5 = 0.0073\ (or\ 0.73\%)$
NOx	$16.7\ tpd\ \div 317.2 = 0.0525\ (or\ 5.25\%)$	$18.4\ tpd\ \div 317.2 = 0.0579\ (or\ 5.79\%)$	$15.3\ tpd\ \div 317.2 = 0.0481\ (or\ 4.81\%)$

Step 3: Calculate the amount of reductions needed for OYW of progress.

	1997 Standard	2006 Standard	2012 Standard
PM2.5	$58.06\ tpd \times 0.71\% = \mathbf{0.41\ tpd}$	$56.1\ tpd \times 0.93\% = \mathbf{0.52\ tpd}$	$58.4\ tpd \times 0.93\% = \mathbf{0.43\ tpd}$
NOx	$150.6\ tpd \times 5.25\% = \mathbf{7.91\ tpd}$	$115.0\ tpd \times 5.79\% = \mathbf{6.66\ tpd}$	$179.8\ tpd \times 4.81\% = \mathbf{8.65\ tpd}$

The following table summarizes the amount of emissions reductions needed to achieve the target, for the respective PM2.5 NAAQS, based on the OYW_P approach outlined in the Draft Guidance.[5] EPA's Draft Guidance also notes "a state may use the ratio to substitute CM reductions of one precursor for a shortfall in CM reductions of another precursor." Note that the attainment plan approved by EPA for the 2012 PM2.5 standard was a Moderate impracticability plan, where the District and CARB demonstrated that attainment by the 2021 Moderate deadline was not possible, and that the Valley should be classified as Serous nonattainment. As such, the following

[5] EPA. *Guidance on the Preparation of State Implementation Plan Provisions that Address the Nonattainment Area Contingency Measure Requirements for Ozone and Particulate Matter*. March 16, 2023. Retrieved from: https://www.epa.gov/system/files/documents/2023-03/CMTF%202022%20guidance%203-16-23.pdf

contingency calculation tables below for the 2012 PM2.5 standard are based on the RFP year of 2022, as there is no established attainment year.

Table 2 Contingency Measure Reductions Needed under OYW$_P$ Approach

Standard	Base Year	Attainment Year	RFP Years	Quantitative Milestone Years	Contingency Annual Average Emission Reduction Targets (tons/day)	
					NOx	PM2.5
1997 Annual	2013	2023	2017, 2020	2017, 2020, 2023, 2026	7.91	0.41
2006 24-hour	2013	2024	2017, 2020, 2023	2017, 2020, 2023, 2026	6.66	0.52
2012 Annual	2013	--	2019, 2022	2019, 2022, 2025, 2028	8.65	0.43

Under the prior EPA contingency policy, the contingency reductions would need to be achieved in the year after which the contingency provision was triggered.[6] However, EPA's Draft Guidance on contingency measures allows emission reductions to be achieved within two years of the contingency triggering event.[7]

Additionally, EPA's Draft Guidance explains that, where areas are unable to identify and adopt feasible contingency measures that would reduce emissions by an amount sufficient to meet the OYW of progress, then it would be appropriate to submit contingency measures that result in less than that amount, using a reasoned justification approach demonstrating the lack of sufficient feasible measures to meet the recommended quantity of contingency measures.

4. OPPORTUNITIES FOR DISTRICT CONTINGENCY MEASURES

As discussed above, there are several regulatory absurdities to the current implementation of EPA's baseline contingency measure policy. The District can no longer rely on surplus emission reductions of already implemented measures to meet contingency measure requirements and must identify a new contingency measure that is only implemented upon the occurrence of a triggering event. In its *Bahr* opinion, the Ninth Circuit acknowledged that "[a]gencies are free to change their existing policies as long as they provide a reasoned explanation for the change."[8] However, the few recent contingency measures approved by EPA involved unique situations that often do not apply to the District. Another limiting factor is the District's narrow jurisdictional authority primarily over stationary and some area sources of emissions in the Valley,

[6] "Guidance on Issues Related to 15 Percent Rate-of-Progress Plans," Memorandum from Michael H. Shapiro to Regional Air Directors (August 23, 1993), available at: https://www3.epa.gov/ttn/naaqs/aqmguide/collection/cp2/19930823_shapiro_15pct_rop_guidance.pdf

[7] EPA. *Guidance on the Preparation of State Implementation Plan Provisions that Address the Nonattainment Area Contingency Measure Requirements for Ozone and Particulate Matter*. March 16, 2023. Retrieved from: https://www.epa.gov/system/files/documents/2023-03/CMTF%202022%20guidance%203-16-23.pdf

[8] *Bahr v. EPA*, 836 F.3d 1218, 1229

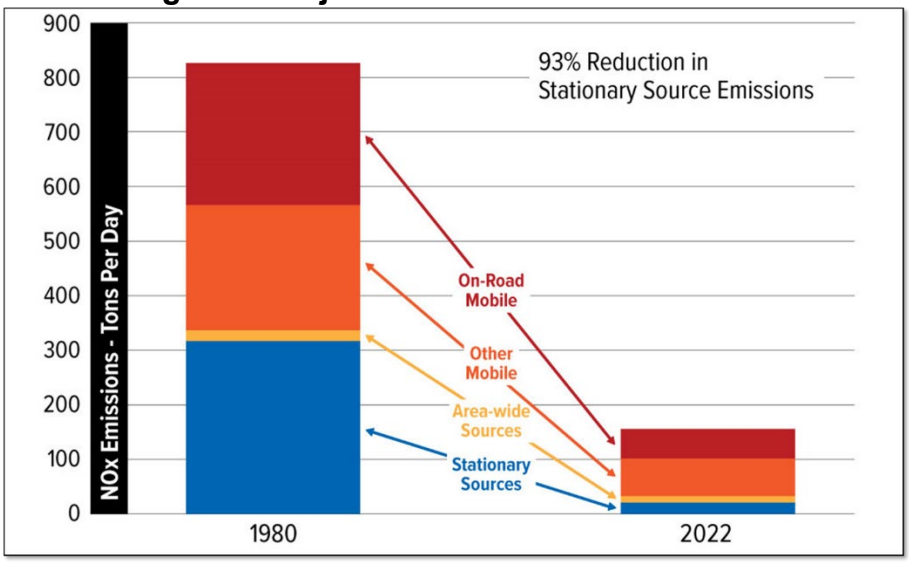
representing a comparatively small portion of total emissions within the Valley. The District has already implemented rules for these sources that meet or go beyond state and federal regulations, as detailed below, which leaves very few local District measures to explore as a contingency measure.

4.1 Stringency of District's Regulatory Program

The San Joaquin Valley's challenges in meeting national ambient air quality standards are unmatched anywhere in the nation due to the region's unique combination of topography and meteorology. Since 1992, the District has adopted over 650 rules to implement an aggressive on-going control strategy to reduce emissions in the Valley in order to reach attainment of the federal mandates, resulting in air quality benefits throughout the Valley.

Through these ongoing efforts by the District, and significant efforts by CARB to reduce emissions from mobile sources, NOx emissions across the Valley have been reduced by over 75%, while stationary source emissions, which are under the District's jurisdiction, have been reduced by over 93% since 1980. Although significant progress has been made in reducing emissions, substantial additional emissions reductions are still needed to meet all of the federal PM2.5 and ozone standards. These additional reductions will be needed across the Valley as the population across the region continues to grow, bringing additional vehicle emissions, goods movement emissions, and other emissions.

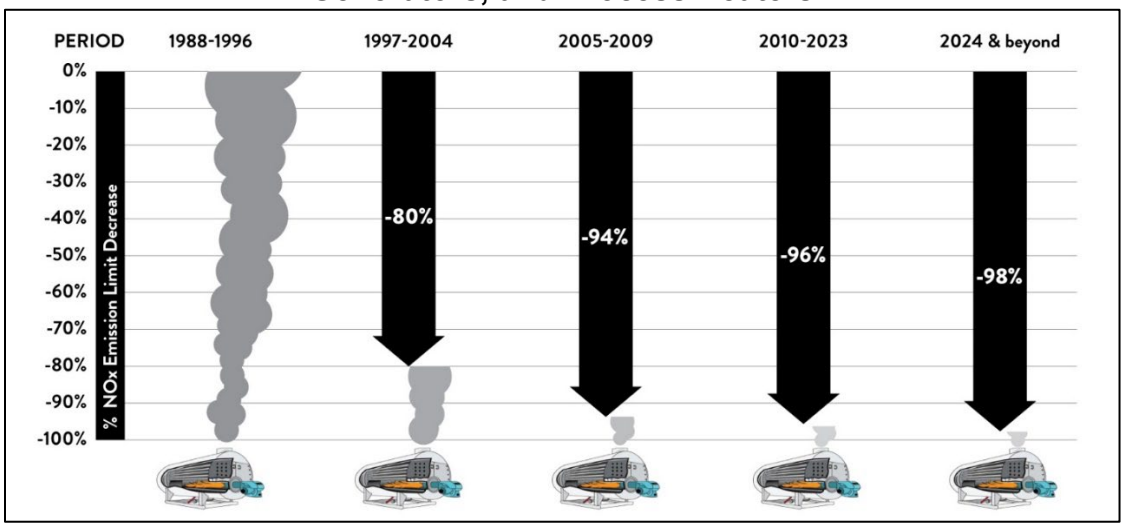
Figure 1 Major Reductions in Air Pollution



Through the history of the District's regulatory program, emissions from a variety of industries and area sources have been aggressively reduced compared to uncontrolled levels, with emissions reduced by well over 90% for various industrial stationary sources. For example, with respect to boilers, steam generators, and process heaters,

the following illustration summarizes the significant emissions reductions achieved relative to baseline emissions levels.

Figure 2 Significant Emissions Reductions from Industrial Boilers, Steam Generators, and Process Heaters



The stringency of the District's stationary source regulatory program has been affirmed through state and federal approvals of District plans and regulations, including establishing the District as implementing all feasible measures, best available control measures, most stringent measures, best available retrofit control technology, and other applicable requirements. As an example, within the District's *2018 PM2.5 Plan*, a thorough evaluation of District PM2.5 rules was performed, in order to satisfy Most Stringent Measure requirements for a region to be granted at attainment deadline extension. EPA agreed with this analysis in its February 2020 evaluation of Best Available Control Measures (BACM) and Most Stringent Measures (MSM) for the 2006 PM2.5 NAAQS. As a result, EPA determined that District rules for stationary and area sources meet or exceeded requirements necessary to implement BACM and MSM in the Valley.[9] EPA finalized its approval of this analysis in July 2020[10], certifying that the District's PM2.5 rules were the most stringent in the nation.

Furthermore, in response to a lawsuit filed by several organizations challenging EPA's approval of the *2018 PM2.5 Plan*, on April 13, 2022, the Ninth Circuit Court of Appeals upheld EPA's conclusion that the District is implementing Best Available Control Measures (BACM) and Most Stringent Measures (MSM), concluding that "*EPA undertook a rigorous analysis of compliance with BACM and MSM requirements.*"

[9] EPA. Technical Support Document, Evaluation of BACM/MSM, San Joaquin Valley PM2.5 Plan for the PM2.5 Plan for the 2006 PM2.5 NAAQS. (February 2020). Retrieved from: https://www.regulations.gov/document/EPA-R09-OAR-2019-0318-0005

[10] EPA. *Clean Air Plans; 2006 Fine Particulate Matter Nonattainment Area Requirements; San Joaquin Valley, California.* (July 22, 2020). Retrieved from: https://www.govinfo.gov/content/pkg/FR-2020-07-22/pdf/2020-14471.pdf

Additionally, on March 15, 2023, EPA issued requirements under a Federal Implementation Plan to address interstate transport requirements that establishes new national emissions limitations for a variety of industrial sources of pollution (power generating plants, internal combustion engines, glass manufacturing plants, etc.). In reviewing the emissions limits for industrial sources, the District's rules and regulations are already significantly more stringent than the limits included by EPA, highlighting the Valley's accomplishments at achieving emissions reductions and improving air quality across the region. The following table provides a comparison between the District's current emission limits and EPA's emission limits for the source categories identified in the Interstate Transport FIP.

Table 3 Sample Comparison of Current District and EPA Recommended Emission Limits in Interstate Transport FIP

Source Category	District Emission Limit	EPA Proposed National Emission Limit
Glass Melting Furnaces	Container Glass: 0.75 lb/ton Fiberglass: 1.3 to 3.0 lb/ton Flat Glass: 1.5 to 1.7 lb/ton	Container Glass: 4.0 lb/ton Pressed/Brown Glass or Fiberglass: 4.0 lb/ton Flat Glass: 7.0 lb/ton
Internal Combustion Engines in Pipeline Transportation of Natural Gas	Rich Burn: 0.15 g/bhp-hr Lean Burn: 0.6 g/bhp-hr	Four Stroke Rich Burn: 1.0 g/hp-hr Four Stroke Lean Burn: 1.5 g/hp-hr Two Stroke Lean Burn: 3.0 g/hp-hr
Boilers in Iron and Steel and Ferroalloy Manufacturing, Metal Ore Mining, Basic Chemical Manufacturing, Petroleum and Coal Products Manufacturing, and Pulp, Paper, and Paperboard Mills	Natural gas fired boilers 0.0061 lb/mmBtu	Coal: 0.20 lb/mmBtu Residual oil: 0.20 lb/mmBtu Distillate oil: 0.12 lb/mmBtu Natural Gas: 0.08 lb/mmBtu

Ongoing Stationary Source Regulatory Efforts

The District Governing Board adopted the 2018 Plan for the 1997, 2006, and 2012 PM2.5 Standards (*2018 PM2.5 Plan* or Plan) on November 15, 2018. The *2018 PM2.5 Plan* utilized extensive science and research, state of the art air quality modeling, and the best available information in developing a strategy for bringing the Valley into attainment with the 1997, 2006, and 2012 NAAQS for PM2.5 as expeditiously as practicable.

To achieve the significant emission reductions necessary for expeditious attainment, the *2018 PM2.5 Plan* includes stringent stationary and mobile source control measures, as well as incentive-based control measures to accelerate the deployment of new clean vehicles, equipment, and technologies across a variety of sectors. The vast majority of the District's emission reduction commitments are achieved through new regulatory measures.

The District has adopted numerous new industrial source regulations since adoption of the *2018 PM2.5 Plan* and is now close to meeting all of the Plan's control measure commitments, and is already exceeding the District's total aggregate emission reduction commitments for direct PM2.5 and NOx (Table 4). Additional regulatory development is underway. The significant direct PM2.5 emissions reductions from these measures will contribute greatly towards the Valley attaining the current federal PM2.5 and ozone air quality standards.

Table 4 New District Stationary Source Regulations since Adoption of *2018 PM2.5 Plan*

Measure	Status
Rule 4901 (Wood Burning Fireplaces and Wood Burning Heaters)	Adopted by Board June 2019
Rule 4311 (Flares)	Adopted by Board December 2020
Rules 4306/4320 (Boilers, Steam Generators, Process Heaters)	Adopted by Board December 2020
Rule 4692 (Commercial Underfired Charbroiling)	Enhanced Strategy adopted by Board December 2020
Rule 4103 (Phase-out of Agricultural Open Burning)	Adopted by Board June 2021
Rule 4702 (Internal Combustion Engines)	Adopted by Board August 2021
Residential Woodstove Replacement Federally Enforceable Measure	Adopted by Board November 2021
Rule 4354 (Glass Melting Furnaces)	Adopted by Board December 2021
Rule 4352 (Solid Fuel Fired Boilers, Steam Generators, Process Heaters)	Adopted by Board December 2021

In addition, the District recently adopted the *2022 Ozone Plan* in December of 2022, which contained a thorough control measure evaluation for 60 rules applicable to ozone formation. Each control measure evaluation for the District's NOx and volatile organic compound (VOC) rules included a contingency measure evaluation, concluding that all 60 control measures do not contain opportunities for a contingency measure, because the rules are already implementing the most stringent measure feasible and/or a contingency trigger was incompatible with the control technology required.

4.2 District Feasibility Analysis

As part of this evaluation, the District analyzed contingency measure opportunities for each source category. This evaluation included analysis of technological and economic feasibility of potential measures. Additionally, potential contingency measures identified through this process would need to be adopted and approved by EPA prior to adoption of its contingency measure FIP, and reductions would need to be achieved within one to two years of the contingency triggering event. Accordingly, the District evaluated whether each rule could be amended and approved by EPA in the timeframe needed. The District places great value on innovation and full public participation in the development and adoption of regulations. The District's rule development process involves extensive interaction with affected sources to find the most effective means of achieving emissions reductions and a rigorous public engagement and commenting process. For each rule, the District undergoes a robust process, which includes an evaluation of potential emission reduction opportunities, and a number of intricate analyses required by the California Health and Safety Code[11] related to cost effectiveness, emission reductions, environmental impacts, and socioeconomic impacts. Through this process, the District hosts numerous public workshops to solicit feedback from the public and affected stakeholders, and continues to invite public participation and comment for the entirety of the project.

The District's evaluation is provided in the table below.

[11] CH&SC §40920.6

Table 5 District Contingency Measure Evaluation by Rule

District Rule	Contingency Options	Technological and Economic Feasibility	Trigger Feasibility	FIP Timeline
NOx Rules				
Rule 4103 (Open Burning)	None; The District has already committed to phase out ag burning by January 1, 2025.[12]	-	-	-
Rule 4106 (Prescribed Burns)	Require mechanical removal, air curtain burners, and forest-specific biomass projects.	No; As stated in Appendix C of the *2022 Ozone Plan*, alternative control methods are not feasible. The District reanalyzed various alternative control methods such as mechanical removal, air curtain burners, and forest-specific biomass projects, which are infeasible due to the vast number of acres that require management and lack of access to remote areas in the forest. Due to recent increase in wildfires, the District continues to support reductions of forest fire fuel through prescribed burns. Therefore, this source category is not suitable for a contingency measure.	No; Any new regulation would need approximately two years (or more) of rule development to allow for a robust public process with all affected industries, stakeholders, and public. Agencies would need long lead time to design, plan, and deploy technologies. In addition, land agencies also need to ensure that they have appropriate budgets in place, which could take significant time. The lead time required would not conform with the required trigger timeline. It also would be infeasible to implement new requirements within 60 days and achieve reductions within one to two years.	No; Due to the need for a robust public process, the District would not be able to adopt a contingency measure and receive EPA approval prior to adoption of the final contingency FIP.
Rule 4301 (Fuel Burning Equipment)	None; Other District rules with more stringent NOx requirements for specific types of fuel burning equipment supersede this rule. See the evaluations for Rules 4306, 4307,	-	-	-

[12] SJVAPCD. *Final Supplemental Report and Recommendations on Agricultural Burning.* (June 17, 2021). Retrieved from: https://ww2.valleyair.org/media/aldmsd0b/final-supplemental-report-and-recommendations-on-agricultural-burning.pdf

District Rule	Contingency Options	Technological and Economic Feasibility	Trigger Feasibility	FIP Timeline
	4308, 4309, 4320, and 4352.			
Rule 4306 and 4320 (Advanced Emission Reduction Options for Boilers, Steam Generators, and Process Heaters >5 MMBtu/hr)	Refer to the District's analysis below in Section 4.2 for Emissions from Oil and Gas Production Combustion Equipment.	-	-	-
Rule 4307 (Boilers, Steam Generators and Process Heaters 2 – 5 MMBtu/hr)	Require use of technologies such as SCRs, ultra-low NOx burners, and EMx.	No; As stated in Appendix C of the *2022 Ozone Plan*, the potential emission reduction opportunities are not cost effective. Various control technologies that were further evaluated for their potential to reduce emissions as a contingency measure include SCRs, ultra-low NOx burner, and EMx. • Retrofitting a range of SCR options has annualized costs ranging from $2,458,692 to $17,142,547. These options range from $126,420 to $815,897 per ton of emissions reduced • Retrofitting a range of ultra-low NOx burner options has an annualized costs as high as $4,942,190, which would have a cost effectiveness of $322,200 per ton of emissions reduced • Replacement of an older unit with a new boiler meeting the 9 ppmv NOx unit has an annualized costs up to $11,243,043, with a cost effectiveness of $732,976 per ton of emissions reduced • The District researched post-combustion controls such as EMx, the second generation of the SCONOx technology that reduces NOx, SOx, CO, and VOC emissions. Per EmeraChem, manufacturer/vendor of the technology, this technology has not been achieved in practice (AIP) for natural gas fired boilers. SCONOx and EMx systems have only been used by power plants for the control of turbine emissions. The cost of an EMx system would be anywhere from $3 to $5 million, or	No; Any new regulation would need approximately two years (or more) of rule development to allow for a robust public process with all affected industries, stakeholders, and public. Operations would need long lead time to design, plan, and install control technology. Lead time required would not conform with the required trigger timeline. It also would be infeasible to implement new requirements within 60 days and achieve reductions within one to two years.	No; Due to the need for a robust public process, the District would not be able to adopt a contingency measure and receive EPA approval prior to adoption of the final contingency FIP.

District Rule	Contingency Options	Technological and Economic Feasibility	Trigger Feasibility	FIP Timeline
		even up to $8 million in some cases for large power plant installations. Moreover, an EMx system is ideal for a new installation, but becomes extremely challenging and sometimes nearly impossible to retrofit to an existing unit. In fact, cost-effectiveness analyses conducted by the District for the installation of SCONOx/EMx units on large power plant turbine installations within the Valley have shown that this technology is not cost-effective. Given the high cost-effectiveness demonstrated for turbines and lack of demonstrated practice with boilers, this technology is not feasible or cost-effective for reducing emissions from this category. While cost-effectiveness was further reviewed, there are a number of additional feasibility considerations and complexities that potentially render the utilization of the above technologies as infeasible, including physical constraints, control effectiveness for the wide variety of potential applications, and other considerations.		
Rule 4308 (Boilers, Steam Generators and Process Heaters 0.075 to less than 2.0 MMBtu/hr)	Require use of technologies such as SCRs, ultra-low NOx burners, and EMx.	No; As stated in Appendix C of the *2022 Ozone Plan*, the technologies involved with reducing emissions from this source category are not cost effective and this source category is not suitable for a contingency measure. These potential controls are also not cost effective as implementation of: • Selective Catalytic Reduction (SCR) systems reduce NOx emissions by 15 ppmv @ 3% O_2 at a cost effectiveness of at least $216,858/ton of emissions reduced • Ultra-low NOx burner system reduces NOx emissions from 20 ppmv @ 3% O2 to 9 ppmv @ 3% O2 at a cost effectiveness of $91,746/ton of emissions reduced	No; Any new regulation would need approximately two years (or more) of rule development to allow for a robust public process with all affected industries, stakeholders, and public. Operations would need long lead time to design, plan, and install control technology. Lead time required would not conform with the required trigger timeline. It also would be infeasible to implement new requirements within 60 days and achieve reductions within one to two years.	No; Due to the need for a robust public process, the District would not be able to adopt a contingency measure and receive EPA approval prior to adoption of the final contingency FIP.

District Rule	Contingency Options	Technological and Economic Feasibility	Trigger Feasibility	FIP Timeline
		• EMx systems, as explained under Rule 4307, are not cost effective and most likely not technologically feasible for these small units While cost-effectiveness was further reviewed, there are a number of additional feasibility considerations and complexities that potentially render the utilization of the above technologies as infeasible, including physical constraints, control effectiveness for the wide variety of potential applications, and other considerations.		
Rule 4309 (Dryers, Dehydrators, and Ovens)	Require use of technologies such as low NOx burners.	No; As stated in Appendix C of the *2022 Ozone Plan*, alternative control technology such as low NOx burners would reduce NOx emissions, however, requiring the use of these burners has proven to have a negative impact on product quality such as drying onions and changing onion color due to higher carbon monoxide emissions. The District does not see implementing low NOx burners as feasible due to affecting the facilities ability to carry out normal business until the technologies are further improved.	No; Any new regulation would need approximately two years (or more) of rule development to allow for a robust public process with all affected industries, stakeholders, and public. Operations would need long lead time to design, plan, and install control technology. Lead time required would not conform with the required trigger timeline. It also would be infeasible to implement new requirements within 60 days and achieve reductions within one to two years.	No; Due to the need for a robust public process, the District would not be able to adopt a contingency measure and receive EPA approval prior to adoption of the final contingency FIP.
Rule 4311 (Flares)	None; no technologies currently available to achieve lower limits.	No; The District recently adopted amendments to Rule 4311 in December 2020 after going through a robust public process of over 3 years. As stated in the Appendix B of the 2020 Rule 4311 staff report, the control level implemented in the recent rule amendment (December 2020) required substantial costs and the emission levels selected are the most stringent levels.[13] The District did not identify any new level of control	No; Any new regulation would need approximately two years (or more) of rule development to allow for a robust public process with all affected industries, stakeholders, and public. Operations would need long lead time to design, plan, and install control technology. Lead time	No; Due to the need for a robust public process, the District would not be able to adopt a contingency measure and receive EPA approval prior to adoption of the final contingency FIP.

[13] SJVAPCD. *Adopt Proposed Amendments to Rule 4311 (Flares).* (December 17, 2020). Retrieved from: https://www.valleyair.org/Board_meetings/GB/agenda_minutes/Agenda/2020/December/final/12.pdf

District Rule	Contingency Options	Technological and Economic Feasibility	Trigger Feasibility	FIP Timeline
		more stringent than what is currently required under Rule 4311. The 2020 amendments require operators to install the cleanest ultra-low NOx flaring technology available. Further reductions from this source category would require control technologies with greater complexity and costs, which have yet to be identified and would be less cost effective than the previous rule amendment. Notably, the most recent amendments to these rules required over 3 years of analysis and public engagement. Additionally, operations are still in the process of complying with the recent rule amendments, and imposing more stringent requirements on these facilities at this time would be infeasible.	required would not conform with the required trigger timeline. It also would be infeasible to implement new requirements within 60 days and achieve reductions within one to two years.	
Rule 4313 (Lime Kilns)	There are currently no lime kilns operating in the Valley, and there are no opportunities for emission reductions from Rule 4313. Therefore, this source category is not suitable for a contingency measure.	-	-	-
Rule 4352 (Solid Fuel Fired Boilers, Steam Generators, and Process Heaters)	Require use of additional or alternative control technologies beyond existing stringent controls.	No; The District recently adopted amendments to Rule 4352 in December 2021 after going through a robust public process of a year and a half. Appendix C of the 2021 Rule 4352 Staff Report evaluated alternative control technologies applicable to sources subject to Rule 4352.[14] District analysis found that all alternative control technology that could reduce emissions further require technology that has prohibitively high capital costs and is not cost effective. In addition, many of these technologies have not been implemented at	No; Any new regulation would need approximately two years (or more) of rule development to allow for a robust public process with all affected industries, stakeholders, and public. Operations would need long lead time to design, plan, and install control technology. Lead time required would not conform with	No; Due to the need for a robust public process, the District would not be able to adopt a contingency measure and receive EPA approval prior to adoption of the final contingency FIP.

[14] SJVAPCD. *Adopt Proposed Amendments to Rule 4352 (Solid Fuel Fired Boilers, Steam Generators, and Process Heaters)*. (December 16, 2021). Retrieved from: https://www.valleyair.org/Board_meetings/GB/agenda_minutes/Agenda/2021/December/final/12.pdf

District Rule	Contingency Options	Technological and Economic Feasibility	Trigger Feasibility	FIP Timeline
		facilities subject to Rule 4352; therefore, these control technologies are not commercially tested and proven.	the required trigger timeline. It also would be infeasible to implement new requirements within 60 days and achieve reductions within one to two years. Additionally, operations are currently investing in control technologies to meet recently amended rule limits.	
Rule 4354 (Glass Melting Furnaces)	Require use of additional or alternative control technologies beyond existing stringent controls.	No; As stated in Appendix C of the 2021 Rule 4354 Staff Report, the District reviewed alternative control technologies, including, but not limited to, oxy-fuel fired furnaces and natural gas furnaces equipped with a SCR, and found no additional feasible control technologies for this source category.[15] Alternative control technologies, require substantial capital, operation, and maintenance costs associated with implementation. In addition, significant amount of space is also required for certain types of controls, making implementation of these technologies infeasible. Capital costs are estimated to range from $2,123,053 to $28,307,370 while annual operation and maintenance costs range from $595,088 to $3,676,829. Additionally, as a comparison, EPA recently finalized their interstate transport FIP which included new national emissions limits that are significantly higher (less stringent) than the District's rule limits.	No; Any new regulation would need approximately two years (or more) of rule development to allow for a robust public process with all affected industries, stakeholders, and public. Operations would need long lead time to design, plan, and install control technology. Lead time required would not conform with the required trigger timeline. It also would be infeasible to implement new requirements within 60 days and achieve reductions within one to two years. Additionally, operations are currently investing in control technologies to meet recently amended rule limits.	No; Due to the need for a robust public process, the District would not be able to adopt a contingency measure and receive EPA approval prior to adoption of the final contingency FIP.
Rule 4641 (Cutback, Slow Cure, and Emulsified Asphalt, Paving and Maintenance Operations)	There are no identified NOx and PM2.5 emission reduction opportunities associated with Rule 4641. Therefore, this source category is not	-	-	-

[15] SJVAPCD. *Adopt Proposed Amendments to Rule 4354 (Glass Melting Furnaces)*. (December 16, 2021). Retrieved from: https://www.valleyair.org/Board_meetings/GB/agenda_minutes/Agenda/2021/December/final/11.pdf

District Rule	Contingency Options	Technological and Economic Feasibility	Trigger Feasibility	FIP Timeline
	suitable for a contingency measure.			
Rule 4692 (Commercial Charbroiling)	Refer to the District's analysis below in Section 4.2 for Commercial Charbroiling.	-	-	-
Rule 4702 (Internal Combustion Engines)	Require use of additional or alternative control technologies beyond existing stringent controls.	No; The District recently adopted amendments to Rule 4702 per commitments in the *2018 PM2.5 Plan* in August 2021 after going through a robust public process. The 2021 Rule 4702 staff report included evaluations of additional control technology including SCRs, electrification and solar power, and other control technologies.[16] • SCR systems require significant capital, up to $300,000 to purchase a single unit and up to $60,000 of annual operation and maintenance costs • Introducing an electric engine/solar system has a cost effectiveness ranging from $150,000 to $260,000 per ton of emissions reduced In addition to cost effectiveness, there are a number of additional feasibility considerations and complexities that potentially render the utilization of the above technologies as infeasible, including physical constraints, control effectiveness variation for the wide range of potential applications, and other considerations.	No; Any new regulation would need approximately two years (or more) of rule development to allow for a robust public process with all affected industries, stakeholders, and public. Operations would need long lead time to design, plan, and install control technology. Lead time required would not conform with the required trigger timeline. It also would be infeasible to implement new requirements within 60 days and achieve reductions within one to two years. Additionally, operations are currently investing in control technologies to meet recently amended rule limits.	No; Due to the need for a robust public process, the District would not be able to adopt a contingency measure and receive EPA approval prior to adoption of the final contingency FIP.
Rule 4703 (Stationary Gas Turbines)	Require use of additional or alternative control technologies beyond existing stringent controls.	No; As stated in Appendix C of the *2022 Ozone Plan,* the District has found that further control from sources subject to Rule 4703 is not currently feasible or cost effective. • Retrofitting a SCR system on units producing less than 3 megawatts (to comply with 2 ppmvd NOx @	No; Any new regulation would need approximately two years (or more) of rule development to allow for a robust public process with all affected industries, stakeholders, and public.	No; Due to the need for a robust public process, the District would not be able to adopt a contingency measure and receive

[16] SJVAPCD. *Proposed Amendments to Rule 4702 (Internal Combustion Engine)*. (July 20, 2021). Retrieved from: http://www.valleyair.org/workshops/postings/2021/08-19-21-r4702/DraftStaffReport.pdf

District Rule	Contingency Options	Technological and Economic Feasibility	Trigger Feasibility	FIP Timeline
		15% O_2) incurs an estimated $439,278 of annual costs, which costs $348,633 per ton of emissions reduced. • Retrofitting a SCR system on units producing between 3 to 10 megawatts (to comply with 2 ppmvd NOx @ 15% O_2) incurs an estimated $716,998 of annual costs, which costs $770,965 per ton of emissions reduced. • Retrofitting a SCR system on units producing greater than 10 megawatts (simple cycle unit to comply with 2.5 ppmvd NOx @ 15% O_2) incurs an estimated $1,737,092 of annual costs, which costs $232,231 per ton of emissions reduced. • Retrofitting SCRs on units producing greater than 10 megawatts (combined cycle to comply with 2 ppmvd NOx @ 15% O_2) incurs an estimated $2,785,635 of annual costs, which costs $141,116 per ton of emissions reduced. While cost-effectiveness was further reviewed, there are a number of additional feasibility considerations and complexities that potentially render the utilization of the above technologies as infeasible, including physical constraints, control effectiveness for the wide variety of potential applications, and other considerations.	Operations would need long lead time to design, plan, and install control technology. Lead time required would not conform with the required trigger timeline. It also would be infeasible to implement new requirements within 60 days and achieve reductions within one to two years.	EPA approval prior to adoption of the final contingency FIP.
Rule 4902 (Residential Water Heaters)	Adopt electrification requirements earlier than CARB measure.	No; CARB currently has an existing commitment that will require electrification and achieve emission reductions statewide starting in 2030. The District evaluated opportunities to advance the implementation timeframe of electrification requirements in the Valley. Manufacturers need time to ramp up production of zero-emission technologies to meet the expected demand. Further, any such standard would have to be developed in collaboration with energy and building code regulators and the District would need to ensure it was consistent with all State and local efforts. The District would need to work carefully with communities to consider any housing cost or affordability impacts. The District would	No; This measure would require a very robust public process that would take at least two years (or more). Manufacturers would require long lead time to design and produce the amount of units needed. Lead time required would not conform with the required trigger timeline. It also would be infeasible to implement new requirements within 60 days and achieve reductions within one to two years.	No; Due to the need for a robust public process, the District would not be able to adopt a contingency measure and receive EPA approval prior to adoption of the final contingency FIP.

District Rule	Contingency Options	Technological and Economic Feasibility	Trigger Feasibility	FIP Timeline
		need to engage with community-based organizations and other key stakeholders to incorporate equity considerations for low-income and environmental justice communities where feasible. Given the need for triggerable and potentially short-term reductions, the long lead time associated with this potential measure, the attrition-based nature of implementation, and the existing CARB measure in place that would conflict with a local contingency measure, this measure is deemed infeasible. In an effort to identify potential emission reduction opportunities, the District's 2022 Ozone Plan includes a further study commitment to evaluate current and upcoming work from CARB and other agencies related to reducing emissions from residential and commercial combustion sources, and evaluate the feasibility of implementing zero emission or low-NOx requirements for these sources in the Valley. Through this effort, the District will also evaluate opportunities to advocate for funding under the Inflation Reduction Act, Bipartisan Infrastructure Law, and other funding sources, which are prioritizing funding opportunities for electrification of appliances to reduce greenhouse gas emissions.		

Rule 4905 (Natural Gas – Fired, Fan Type Residential Central Furnace)	Adopt electrification requirements earlier than CARB measure.	No; CARB currently has an existing commitment that will require electrification and achieve emission reductions statewide starting in 2030. The District evaluated opportunities to advance the implementation timeframe of electrification requirements in the Valley. Manufacturers need time to ramp up production of zero-emission technologies to meet the expected demand. Further, any such standard would have to be developed in collaboration with energy and building code regulators and the District would need to ensure it was consistent with all State and local efforts. The District would need to work carefully with communities to consider any housing cost or affordability impacts. The District would need to engage with community-based organizations and other key stakeholders to incorporate equity considerations for low-income and environmental justice communities where feasible. Given the need for triggerable and potentially short-term reductions, the long lead time associated with this potential measure, the attrition-based nature of implementation, and the existing CARB measure in place that would conflict with a local contingency measure, this measure is deemed infeasible. In an effort to identify potential emission reduction opportunities, the District's 2022 Ozone Plan includes a further study commitment to evaluate current and upcoming work from CARB and other agencies related to reducing emissions from residential and commercial combustion sources, and evaluate the feasibility of implementing zero emission or low-NOx requirements for these sources in the Valley. Through this effort, the District will also evaluate opportunities to advocate for funding under the Inflation Reduction Act, Bipartisan Infrastructure Law, and other funding sources, which are prioritizing funding opportunities for electrification of appliances to reduce greenhouse gas emissions.	No; This measure would require a very robust public process that would take at least two years (or more). Manufacturers would require long lead time to design and produce the amount of units needed. Lead time required would not conform with the required trigger timeline. It also would be infeasible to implement new requirements within 60 days and achieve reductions within one to two years.	No; Due to the need for a robust public process, the District would not be able to adopt a contingency measure and receive EPA approval prior to adoption of the final contingency FIP.

District Rule	Contingency Options	Technological and Economic Feasibility	Trigger Feasibility	FIP Timeline
Direct PM2.5 Rules				
Rule 4204 (Cotton Gins)	Require use of additional or alternative control technologies beyond existing stringent controls.	No; As stated in Appendix C of the District's *2018 PM2.5 Plan*, the District has reviewed studies conducted by the United States Department of Agriculture-Agricultural Research Service and found only 16% of PM10 particles were in the PM2.5 size fraction. Furthermore, the District did not find additional feasible emission reduction opportunities from baghouse filters and 1D-3D cyclones with expansion chambers. Baghouse filters are unable to effectively control cotton fibers at the high air velocities and potentially high humidity needed at these facilities. 1D-3D cyclones with expansion chambers were found to be ineffective against the small particle sizes of PM2.5. Therefore, the most effective controls are currently in place. Additionally, there are a number of additional feasibility considerations and complexities that potentially render the utilization of the above technologies as infeasible, including physical constraints, control effectiveness for the wide variety of potential applications, and other considerations.	No; Any new regulation would need approximately two years (or more) of rule development to allow for a robust public process with all affected industries, stakeholders, and public. Operations would need long lead time to design, plan, and install control technology. Lead time required would not conform with the required trigger timeline. It also would be infeasible to implement new requirements within 60 days and achieve reductions within one to two years.	No; Due to the need for a robust public process, the District would not be able to adopt a contingency measure and receive EPA approval prior to adoption of the final contingency FIP.
Rule 4550 (Conservation Management Practices)	None; this measure is an "on-the-way" measure. The District committed to evaluate emission reduction opportunities for this source category in the *2018 PM2.5 Plan*, including opportunities to reduce emissions from fallowed land and promote the selection of conservation tillage as a CMP, in coordination with	-	-	-

District Rule	Contingency Options	Technological and Economic Feasibility	Trigger Feasibility	FIP Timeline
	agricultural stakeholders and the District's AgTech committee. Rule development is ongoing and there is a significant amount of work needed to ensure that impacts of the Sustainable Groundwater Management Act (SGMA) are understood along with ensuring that measures are technologically feasible and cost-effective; therefore, this source category is not suitable for a contingency measure.			
Rule 4901 (Wood Burning Fireplaces and Wood Burning Heaters)	Refer to the District's analysis below in Section 4.2 for Wood Burning Fireplaces and Wood Burning Heaters.	-	-	-

District Rule	Contingency Options	Technological and Economic Feasibility	Trigger Feasibility	FIP Timeline
Rule 8011 (General Requirements)	There are no emission reduction opportunities associated with Rule 8011.	-	-	-
Rule 8021 (Construction, Demolition, Excavation, Extraction, and Other Earthmoving Activities)	The District identified one opportunity for Open Areas in Rule 8051, as discussed in Section 4.2 below.	The District has evaluated all potential requirements achieved in practice in other areas or included in other state implementation plans. As demonstrated in Appendix C of the 2018 PM2.5 Plan, Regulation VIII currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds RACM, BACM, and MSM requirements for this source category. As discussed below in Section 4.2, the District will evaluate a potential contingency measure that further increases the stringency of Rule 8051 for rural areas.	As discussed below in Section 4.2, the District will evaluate a potential contingency measure that further increases the stringency of Rule 8051 for rural areas.	As discussed below in Section 4.2, the District will evaluate a potential contingency measure that further increases the stringency of Rule 8051 for rural areas.
Rule 8031 (Bulk Materials)				
Rule 8041 (Carryout and Trackout)				
Rule 8051 (Open Areas)				
Rule 8061 (Paved and Unpaved Roads)				
Rule 8071 (Unpaved Vehicle Traffic)				
Rule 8081 (Ag Sources)				

Despite the scarcity of measures suitable as a contingency measure, the District has continued to engage with CARB, EPA, SCAQMD, and other agencies on issues related to contingency measures. As a part of the overall contingency measure evaluation, the District performed a thorough analysis of all potential contingency measure opportunities under the District's regulatory authority (summarized in Table 6). Through this evaluation, and in coordination with CARB and EPA in developing this contingency submission, the District has identified potential contingency opportunities for a limited number of sources, as discussed below.

Wood Burning Fireplaces and Wood Burning Heaters

The District's residential wood burning emission reduction strategy includes wood burning curtailments implemented through District Rule 4901 (Wood Burning Fireplaces and Wood Burning Heaters), in conjunction with the District's incentive grant program for fireplace and woodstove change-outs, and robust public education and outreach efforts. This approach is designed to improve public health by reducing toxic wood smoke emissions in Valley neighborhoods during the peak PM2.5 winter season (November through February), and has proven to be extremely effective in advancing the District's objectives to attain the PM2.5 federal standards and protect public health. Commitments in the District's *2018 Plan for the 1997, 2006, and 2012 PM2.5 Standards* (*2018 PM2.5 Plan*) included rulemaking for Rule 4901 to further lower wood burning curtailment levels, as well as enhancements to the District's incentive grant funding levels, public outreach and education, enforcement, and air quality forecasting programs.

Through the District's Residential Wood Smoke Reduction Program, which is based on Rule 4901, the District has declared and enforced episodic wood burning curtailments, also called "No burn" days, since 2003. The District's Residential Wood Smoke Reduction Program and District Rule 4901 reduce harmful species of PM2.5 when and where those reductions are most needed, in impacted urbanized areas when the local weather is forecast to hamper particulate matter dispersion.

Rule 4901 was first adopted in 1993, and has been subsequently amended four times. The 1993 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 and added episodic wood burning curtailments when air quality was forecast to be at 150 or higher on the air quality index (AQI), which was equivalent to a PM2.5 concentration of 65 µg/m³ at the time; added restrictions on the installation of wood burning devices in new residential developments, based on housing density; and added requirement that during the transfer of a residential property, sellers provide a statement of compliance to the District and buyer for residential real properties with non-compliant wood burning devices.

In 2008, the rule was amended and lowered the mandatory curtailment level to a PM2.5 concentration of 30 µg/m^3, and added an attainment plan contingency measure that would lower the wood burning curtailment level to 20 µg/m^3 if EPA were to find that the Valley did not attain the 1997 PM2.5 NAAQS in 2014.

In 2014, Rule 4901 was amended again and lowered the No Burn threshold for high polluting wood burning heaters and fireplaces from 30 µg/m^3 to 20 µg/m^3 and established a separate No Burn threshold for cleaner certified wood burning devices. The amendment doubled the number of No Burn days for high polluting units that were the source of over 95% of the wintertime residential wood smoke emissions.

In 2019, the District amended Rule 4901 to lower the curtailment threshold from 20 to 12 µg/m^3 for older, higher-polluting wood burning heaters, open hearth fireplaces, and non-registered wood burning heaters in the Hot Spot counties of Madera, Fresno, and Kern. Within these same Hot Spot counties, the cleaner, registered wood burning heaters are allowed to burn when air quality is forecast to be between 12 and 35 µg/m^3. In these counties, no wood burning is allowed when air quality is forecast to be above 35 µg/m^3. In the remaining Valley counties, the previous curtailment thresholds remain in place. As part of this action, the District increased the incentive amounts offered through the *Fireplace and Woodstove Change-Out Program* to cover nearly the entire cost of replacing high polluting wood burning units with cleaner devices, such as natural gas inserts and electric heat pumps, offering up to $5,000 in incentives based on the device installed. Through the program, the District has funded the installation of natural gas devices at more than 21,000 Valley households. To complement the regulatory and incentives changes, the District has implemented an education and outreach campaign to increase public awareness of the program, along with focused rule enforcement efforts in Hot Spot counties and in areas of concern. The District also continues to investigate and employ the latest air quality modeling tools and techniques to support the air quality forecasting component of the program.

In addition, consistent with the District's *2018 PM2.5 Plan*, the District added a contingency provision to Rule 4901 for the 1997, 2006, and 2012 PM2.5 standards. This provision would require that, on and after sixty days following the effective date of EPA final rulemaking that the Valley has failed to attain the 1997, 2006, or 2012 NAAQS by the applicable attainment date specified in the EPA-approved *2018 PM2.5 Plan*, the PM2.5 curtailment levels for any county that has failed to attain the applicable standard shall be lowered to the curtailment levels in place for Hot Spot counties as follows:

- Lower the "No Burning Unless Registered" threshold (Level One) from the current level of 20 µg/m^3 to 12 µg/m^3, and
- Lower the "No Burning for All" threshold (Level Two) from the current level of 65 µg/m^3 to 35 µg/m^3.

Following these amendments, EPA recognized in their February 2020 evaluation of BACM and MSM for the 2006 PM2.5 NAAQS that Rule 4901 implements BACM and

MSM levels of control.[17] In July 2020, EPA took final action to approve the 2019 amendments to Rule 4901 and provide SIP credit for emissions reductions achieved through the strategy.[18]

In an effort to identify contingency measure opportunities for the District's wood burning curtailment strategy, the District reviewed curtailment levels required by other regions. As demonstrated in Table 6, the District requires the most stringent wood burning curtailment thresholds in the nation, as recognized by EPA in their February 2020 evaluation of BACM and MSM for the 2006 PM2.5 NAAQS.[19] The District also evaluated PM2.5 wood burning contingency strategies in analogous rules, and found that the District's existing contingency curtailment threshold is the most stringent. Notably, the District's regulatory thresholds are lower than the contingency thresholds established by other areas.

Table 6 Curtailment Levels and Contingency Measures from Analogous Rules

	San Joaquin Valley APCD	South Coast AQMD Rule 445	Imperial County APCD Rule 429	Sacramento Metropolitan AQMD Rule 421	Bay Area AQMD Reg 6 Rule 3
Current Curtailment Thresholds	**Level 1** 12 µg/m^3 or 20 µg/m^3 based on county **Level 2** 35 µg/m^3 or 65 µg/m^3 based on county	30 µg/m^3	35 µg/m^3	**Stage 1** 31 µg/m^3 **Stage 2** 35 µg/m^3 **Voluntary** 25 µg/m^3	35 µg/m^3
Contingency Measure Curtailment Thresholds	**Level 1** 12 µg/m^3 **Level 2** 35 µg/m^3	As low as 26 µg/m^3 once fully triggered	30 µg/m^3	None	None

District Contingency Commitment for District Rule 4901 (Wood Burning Fireplaces and Wood Burning Heaters)

Despite significant reductions in population exposure to unhealthy pollution concentrations, emissions from residential wood burning remains a high contributor to PM2.5 levels in the San Joaquin Valley. The District has evaluated all District rules for opportunities to address contingency measure requirements under the Federal CAA,

[17] EPA. Technical Support Document, Evaluation of BACM/MSM, San Joaquin Valley PM2.5 Plan for the PM2.5 Plan for the 2006 PM2.5 NAAQS. (February 2020). Retrieved from: https://www.regulations.gov/document/EPA-R09-OAR-2019-0318-0005
[18] EPA. *Air Plan Approval; California; San Joaquin Valley Unified Air Pollution Control District*. 85 Fed. Reg. 141, pp. 44206-44209. (July 22, 2020). Retrieved from: https://www.govinfo.gov/content/pkg/FR-2020-07-22/pdf/2020-14298.pdf
[19] EPA. Technical Support Document, Evaluation of BACM/MSM, San Joaquin Valley PM2.5 Plan for the PM2.5 Plan for the 2006 PM2.5 NAAQS. (February 2020). Retrieved from: https://www.regulations.gov/document/EPA-R09-OAR-2019-0318-0005

and is proposing to amend Rule 4901 to include a revised contingency measure provision for the PM2.5 NAAQS.

The proposed contingency measure provision would establish a sequence of increasingly stringent contingency curtailment thresholds for all counties that would be triggered upon 60 days after the issuance of a final determination by EPA, pursuant to 40 CFR §51.1014(a), that the District has failed to meet any of the following elements for any of the PM2.5 NAAQS to:

1. Meet any RFP requirement;
2. Meet any quantitative milestone in an approved attainment plan;
3. Submit a quantitative milestone report; or
4. Attain the applicable PM2.5 NAAQS by the applicable attainment date.

The following table depicts the sequence of increasingly stringent contingency curtailment thresholds to be enforced following each contingency trigger.

Table 7 District Contingency Curtailment Thresholds

Contingency Concept	**Hot-Spot County (µg/m^3)**		**Non Hot-Spot County (µg/m^3)**	
	Level 1	**Level 2**	**Level 1**	**Level 2**
Current Requirements	12	35	20	65
Contingency Measure 1	12	35	12	35
Contingency Measure 2	11	35	11	35

Hot-spot counties: Madera, Fresno, Kern
Non Hot-spot counties: San Joaquin, Stanislaus, Merced, Kings, Tulare

The District proposes to amend Rule 4901 to incorporate the following applicability language and contingency measure:

5.2 Applicability

Section 5.7.3 shall not become applicable until the effective date of the federal Environmental Protection Agency's (EPA) final and full approval of the California State Implementation Plan (SIP) as meeting the contingency measure requirements of the Clean Air Act section 172(c)(9) for San Joaquin Valley for the applicable PM2.5 National Ambient Air Quality Standards (NAAQS).

5.7.3 Contingency Provision

The effective date of this provision shall be 60 days after the issuance of a final determination by EPA, pursuant to 40 CFR § 51.1014(a), that the San Joaquin

Valley has failed to meet one or more of the following Trigger Elements of the applicable PM2.5 NAAQS:

(1) Any Reasonable Further Progress requirement;
(2) Any quantitative milestone;
(3) Submission of a quantitative milestone report; or
(4) Attainment of the applicable PM2.5 NAAQS by the applicable attainment date.

The Contingency Provisions for the Level One and Level Two Episodic Wood Burning Curtailment shall be implemented in the following order: Paragraph (A) shall be implemented, upon the effective date of the first of any determination by EPA of failure to meet a Triggering Element; and paragraph (B) shall be implemented upon the effective date of any subsequent determination by EPA of failure to meet a Triggering Element as follows:

(A) Level One curtailment threshold of 12 µg/m3 and Level Two curtailment threshold of 35 µg/m3, upon failure to comply with any one of the Trigger Elements, will be in place for all Valley counties;
(B) Level One curtailment threshold of 11 µg/m3 and Level Two curtailment threshold of 35 µg/m3 will be in place for all Valley counties, upon failure to comply with any two of the Trigger Elements.

Estimated Contingency Emission Reductions

Rule 4901 already includes the most stringent residential wood combustion control strategy in the nation, and this proposed contingency measure further enhances the stringency of this rule. The District has performed an analysis of recent ambient air quality data and estimate these amendments would achieve the emission reductions found in the following table. The analysis and emissions reduction estimates are largely based on the methodology that was used in the 2019 amendments to Rule 4901[20], which was approved by EPA.[21] See Appendix C for additional details on the District's emission reduction analysis.

The following table estimates the expected increase in curtailment days that would occur if the contingency thresholds are triggered. The values represent the collective increase in Level One and Level Two curtailment days.

[20] SJVAPCD. *Appendix B Emission Reduction Analysis for Proposed Amendments Residential Wood Burning Emission Reduction Strategy, pp. B-1 – B-14*. (June 20, 2019). Retrieved from: https://www.valleyair.org/Board_meetings/GB/agenda_minutes/Agenda/2019/June/final/13.pdf
[21] EPA. *Air Plan Approval; California; San Joaquin Valley Unified Air Pollution Control District; Final Rule*. 85 Fed Reg. 141, pp. 44206-44209. (July 22, 2020). Retrieved from: https://www.federalregister.gov/documents/2020/07/22/2020-14298/air-plan-approval-california-san-joaquin-valley-unified-air-pollution-control-district

Table 8 Additional Curtailments by Contingency Trigger (Days)

County	First Trigger		Second Trigger	
	Level One (12 µg/m^3)	Level Two (35 µg/m^3)	Level One (11 µg/m^3)	Level Two (35 µg/m^3)
Fresno	0.00	0.00	3.66	-
Kern (SJV)	0.00	0.00	3.35	-
Kings	5.65	22.60	3.32	-
Madera	0.00	0.00	4.71	-
Merced	37.77	2.34	4.68	-
San Joaquin	29.91	5.65	2.66	-
Stanislaus	25.93	8.31	3.32	-
Tulare	22.52	14.79	5.38	-

*The expected additional curtailment is calculated using a 3-year average of District air quality data from 2019-2022

In total, the emission reductions achievable from these proposed amendments to Rule 4901 for purposes of qualifying contingency measures are 0.69 tpd of PM2.5 and 0.10 tpd NOx on an annual average basis. These amendments, once adopted by the District's Governing Board and approved by EPA into the SIP, would contribute towards satisfying the contingency measure requirements for NOx and PM2.5 for the PM2.5 NAAQS.

Dust from Open Areas

The District's Regulation VIII series (Fugitive PM10 Prohibitions) was adopted in November 2001, and subsequently amended in 2004. This rule series contains a comprehensive suite of rules designed to reduce fugitive PM10 emissions from a range of sources, including dust from open areas (Rule 8051).

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, Rule 8051 was amended to add applicability thresholds for rural and urban areas.

In 2018, the Imperial County Air Pollution Control District (ICAPCD) amended Rule 804 (Open Areas) to incorporate a contingency measure for their 2018 SIP for the 2012 PM2.5 standard. The contingency measure is triggered if ICAPCD fails to meet RFP, submit a quantitative milestone report, or meet a quantitative milestone pursuant to the 2018 Plan, and would lower the rural area threshold to include all rural areas having 0.5 acres or more that contain at least 1000 square feet of disturbed surface area. Notably, ICAPCD did not include this measure as a contingency that would be triggered if the area failed to meet attainment. However, despite the absence of this contingency measure to address to address all necessary triggering events, EPA took action in August 2019 to approve the rule as meeting contingency measure requirements.[22]

[22] EPA. *Air Plan Approval; California; Imperial County Air Pollution Control District*. 84 Fed. Reg. 168, pp. 45418-45419. (August 29, 2019). Retrieved from: https://www.govinfo.gov/content/pkg/FR-2019-08-29/pdf/2019-18589.pdf

Through ongoing engagement with EPA on the District's contingency submission, EPA has suggested that the District evaluate a potential contingency measure that further increases the stringency of Rule 8051 for rural areas. The District is committing to evaluate potential amendments to Rule 8051 to address contingency requirements, as necessary to ensure EPA approvability of the District's contingency submission. This potential measure could include lowering the rural acreage threshold (e.g. 2 acres), with at least 1,000 square feet of disturbed surface area, and, unlike ICAPCD's measure that is only triggered under a limited set of circumstances, would be triggered for any of the contingency triggering events for any of the PM2.5 NAAQS.

Any potential contingency measure associated with this source category would need to be developed through a public process and adopted by the District Governing Board for submission to EPA. The District and EPA's current analysis has not indicated significant quantifiable emissions reductions from with this measure; however, the District will continue to evaluate the emission reduction potential during the development of this potential measure. The District has already held two workshops to discuss this potential measure.

Commercial Charbroiling

Since 2002, the District has required the installation and operation of particulate matter control devices on chain-driven commercial charbroilers through District Rule 4692. Through current Rule 4692 requirements, affected chain-driven commercial charbroilers are required to have emissions control devices that achieve 83% control efficiency for particulate matter and 86% control efficiency for VOC. However, the unavailability of a feasible and cost-effective control technology has been the barrier to the District's attempt to impose similar requirements for underfired charbroiling operations. Other air districts in California have encountered similar difficulties in identifying and requiring compliant control technologies for underfired charbroilers.

The District has contributed substantial time and effort into researching the emissions produced by under fired charbroilers in order to form a sound approach to controlling the emissions. Since 2009, the District has partnered with the SCAQMD, Bay Area Air Quality Management District (BAAQMD), and EPA to further the research and evaluation of emission control technologies for underfired charbroilers. Through this effort, underfired charbroiler technology assessments have been conducted at UC-Riverside College of Engineering's Center for Environmental Research & Technology (CE-CERT). The District provided in-kind technical support and the research was funded with over $500,000 in contributions provided by SCAQMD, BAAQMD, and EPA. This effort led to the establishment of published testing methodology, SCAQMD Method 5.1, which has been used as a benchmark methodology to standardize the testing of control efficiencies of kitchen exhaust pollution control units.

To assist with better understanding of cooking operations from underfired charbroilers in the Valley, and as an early measure in support of the District's commitment in the 2018

PM2.5 Plan, Rule 4692 was amended on June 21, 2018, to add reporting and registration requirements for commercial underfired charbroiler units, including Permit-Exempt Equipment Registration (PEER) requirements for units with a meat throughput greater than 400 pounds/week, or greater than 10,800 pounds/year, not to exceed 875 pounds/week.

Upon adoption of the regulatory amendment, the District conducted outreach to affected restaurants, with the vast majority of restaurants subject to the reporting requirement now having submitted the required information. To date, the District has received over 4,100 one-time reports, of which 878 restaurants have reported operation of an underfired charbroiler. Of these 878 restaurants, 145 have reported a cooking throughput of at least 400 lbs of meat per week and have subsequently obtained a required PEER.

Additionally, the District created the Restaurant Charbroiler Technology Partnership (RCTP) program with the goal of reducing PM2.5 emissions from underfired commercial charbroilers. The program was initially allocated with $750,000 of incentive funding to fully cover all emissions control device installation costs as well as two years of device maintenance. RCTP initially struggled to find restaurants interested in participating in the program despite the program's willingness to cover all associated costs. Despite the District's efforts in promoting available funding under the RCTP program, the District has faced difficulty in finding restaurants willing to partner with the District to demonstrate new technologies. To date, only one restaurant, the Habit Burger Grill, has successfully completed two years of demonstration of a Molitron wet scrubber in their Stockton restaurant. Initially, the project experienced hood fan sizing issues, resulting in the restaurant being smoked out and forced to close temporarily. The Habit Burger Grill has subsequently installed these control devices on additional new restaurants, with some of these installations in the Valley.

In 2019, the District made an even larger concerted effort to conduct outreach to restaurants in the San Joaquin Valley regarding incentives available through RCTP. Through this outreach effort, the District received only 15 RCTP interest cards out of the over 4,200 restaurants that were contacted to comply with the 2018 Rule 4692 reporting and registration requirements. After discussing RCTP with these restaurants in more detail, none of these restaurants considered moving forward after this additional outreach.

In addition, the District tailored its approach and made direct contact with five prominent Valley restaurants, which resulted in a great deal of interest to evaluate the feasibility of installing the underfired emission control technology on their existing operations, with the understanding that all costs of the technology and two year maintenance would be covered through the RCTP program. District staff conducted multiple site visits to these operations, working with the restaurant owner/operator, engineering consultants, and technology vendors. Initial control system designs, quotes from vendors, and installation quotes from contractors were obtained and the feasibility of the technologies were fully assessed for each of the restaurants. However, after conducting a lengthy

detailed analysis, none of the restaurants moved forward with the demonstration due to feasibility issues related to the installation of the control devices and local permitting challenges, as further described below, and concerns about the cost of maintenance after the funded two-year demonstration period concluded under RCTP.

Although a variety of technologies for capturing emissions from underfired charbroilers have been tested over the years, ESPs and mechanical or media filtration are the most widely installed technologies for controlling particulate emissions from commercial underfired charbroilers. Below are general descriptions of each technology.

- **Electrostatic Precipitator (ESP):** This technology uses electrostatic processes to capture particles on electrically charged plates. ESPs are complex technology, but highly automated, and the operation costs include electricity and water usage. In addition, wastewater collection and discharge requirements must be met, which involves washing collection plates. ESPs are more expensive to install initially, but have lower maintenance costs than the mechanical filtration units (generally about half of the maintenance costs of the filter units) and have a more effective control of the small particulates emitted by charbroiling.

- **Filtration (Mechanical or Media):** This technology uses groups of mechanical filters to capture particles. It is mechanically simpler than other technologies and the operation costs include electricity and filter replacements. Mechanical filtration units have been widely installed as pollution control devices for kitchen emissions, but maintenance of these units may be cost-prohibitive for mid-to high-volume underfired charbroiling operations due to the ongoing expense of changing the filters, and the large footprint of the units can make installation potentially infeasible.

- **Regenerative Filters:** Regenerative filters capture particles often on a catalyst surface, which then safely removes the particles during the regeneration process, thus allowing the filter to continue capturing particles with little maintenance or filter replacements. Regenerative filters are an emerging technology that has yet to be commercially proven in this source category. The District has had discussions with PureFlame and KhanTec to evaluate the feasibility of their technology. Notably, both technologies lack UL 8782 certification, and do not have installations in the United States.

- **Wool Filters:** Wool filters are another form of media filtration that uses wool instead of traditional filter media. A significant portion of PM2.5 produced by underfired charbroilers measure less than one micron, however, wool filters lack the ability to filter submicron particles at a high control efficiency thus rendering wool filters less efficient at reducing PM2.5.

The evaluation of installing emissions control technology on existing Valley restaurants through RCTP provided many insights as to the cost and technological feasibility of

available controls. In addition to supporting and evaluating Valley-based underfired charbroiler control technology demonstrations, District staff has conducted an extensive review and assessment of underfired charbroiler control technology installations. This review included reaching out to other regulatory agencies in California and across the nation, technology manufacturers, and restaurants both inside and outside of the Valley to better understand the control technologies available for underfired charbroilers and real-world costs and experiences related to these technologies. While the District's evaluation has been successful in identifying potential underfired charbroiling control technologies, many questions remain with respect to understanding the feasibility and cost of these technologies, and whether restaurants can successfully operate and maintain these systems, as described in more detail below:

- **Installation cost of controls can be prohibitively expensive:** The cost of control units themselves are expensive, ranging from $42,500 up to $149,303 for the device itself. This does not take into account additional ducting, exhaust fan upgrades, or operation and maintenance costs. Recent discussions with control device manufacturers indicated that maintenance costs are significant and can quickly outweigh purchase costs within a few year. This fact is also supported by the previous District demonstration project, which required $23,956 of annual maintenance.

- **Retrofitting controls on existing restaurants can be prohibitively expensive and technologically infeasible:** Based on discussions with restaurant operators, technology vendors, and other regulatory agencies, it can be extremely difficult and cost-prohibitive to add controls on existing restaurants. The installation process may require structural, electrical, or water-line modifications that substantially increase total project costs compared to new restaurants. In addition to significant purchase and installation costs, the installation process may require the restaurant to temporarily shut down, resulting in loss of revenue. The District's control strategy seeks to not disrupt business from being carried out, therefore adding another layer of cost and complexity to manage for existing restaurants. Furthermore, the existing restaurant may not have the authority to make changes to the building if the space is leased and the landlord is unwilling to accommodate any changes.

- **Maintenance of controls can be prohibitively expensive:** Regular maintenance of control devices is critical to ensure control effectiveness is maintained. All commercial technologies applicable to control underfired charbroilers are designed to capture PM2.5 and require regular maintenance to remove particles, ensure proper airflow, and maintain control efficiency. ESPs require regular cleaning of the plates capturing particles, as ESPs lose control efficiency when these plates are covered in grease particles and filters clog over time. Discussions with manufacturers indicate that maintenance costs are dependent on the control technology implemented and the type and volume of food cooked, and that most facilities require maintenance on a weekly to monthly basis.

- **Maintenance requires specially trained staff that may not be accessible to all restaurants:** Control device cleaning can be a complex process, requiring specially trained staff. Many manufacturers recommend that their staff or a trusted professional company perform maintenance. Training restaurant staff to perform this task are often not be feasible, and service companies capable of performing the maintenance may not be readily available nearby. Travel costs are another factor that needs be taken into account when determining maintenance costs. Any delays in required maintenance could cause significant economic impacts to restaurants.

- **Regenerative filters lack UL 8782 certification:** Regenerative filters appear to be a promising technology that seek to limit the amount of maintenance required to control PM2.5 since the device is self-cleaning by design. However, regenerative filters have not been commercially demonstrated to control underfired charbroiler emissions in the US. The lack of UL 8782 certification currently prevents two manufacturers, PureFlame and KhanTec, from currently entering the market. The District has had previous working relationship with KhanTec and struggled to install their device due to fire safety concerns since the device had not received UL 8782 certification. Discussions with PureFlame also present the same concerns, as well as lacking a fire suppression system. The District cannot recommend using a control device that may become a safety hazard.

Cost Analysis for New Restaurants

District Rule 4692 (Commercial Charbroiling) reduces emissions by requiring catalytic oxidizers for chain-driven charbroilers that meet rule applicability thresholds.[23] Charbroiler exhaust transfers through the catalytic oxidizer with little loss of temperature. As high-temperature exhaust goes through the heated catalyst, particulate matter (PM) and VOC are oxidized to carbon dioxide and water vapor. This chemical reaction releases energy that heats the catalyst and transfers it to a heat recovery system. Rule 4692 requires emission controls for chain-driven charbroilers that cook 400 pounds of meat or more per week.

A variety of technologies for capturing emissions from underfired charbroilers have been tested over the years, including electrostatic precipitators (ESP), mechanical or media filtration, and wet scrubbers. ESPs and mechanical or media filtration are the most widely installed technologies for controlling PM from commercial underfired charbroilers. However, District analysis found no cost-effective technologies have been demonstrated as achieved in practice to date. As such, the rule currently does not have control requirements specific to underfired charbroilers.

[23] SJVAPCD. *Rule 4692 (Commercial Charbroiling)*. Retrieved from: https://www.valleyair.org/rules/currntrules/r4692.pdf

This analysis uses the meat throughput data from each facility subject to Permit-Exempt Equipment Registration (PEER), which cook the most meat on an underfired charbroiler. According to the District PEER data, 157 restaurants cooked at least 10,800 pounds of meat annually. Using the District's commercial cooking methodology[24], the median PM2.5 emissions from each of these restaurants was 808 pounds annually.

The District conducted a cost analysis using the methods in EPA's *Cost Manual*.[25] The *Cost Manual* has relative estimates of all costs associated with ESPs including purchase price, installation, engineering, fabrication, contractors, and many more. The *Cost Manual* begins with the purchase price, then estimates all other costs based on a percentage of the purchase price.

The total capital investment required for ESPs was calculated using the formula in Table 3.16 of the *Cost Manual*. The formula from Table 3.16 was used to evaluate the lower and upper end of ESP purchase costs of $42,500 and $149,303 respectively. The *Cost Manual* estimates the total capital investment of $112,336 needed for ESPs with a purchase cost of $42,500. The total capital investment increases to $394,638 for devices with a $149,303 purchase cost. Notably, these capital costs do not include site preparation or building modifications, which would require even further investment from the facility.

When combined with operation and maintenance costs, even less expensive ESP devices are not cost effective solutions to reducing emissions from this source category. Based on previous District experience and discussions with manufacturers, the District estimates that $12,000 to $24,000 of annual operation and maintenance costs are required to keep pollution control devices performing properly. Maintenance typically includes but is not limited to media filter replacements, carbon filter replacements, duct or hood cleaning, or ESP plate cleaning. As one example, the District's demonstration of a wet scrubber with media filtration through the RCTP had reported $23,956 of annual maintenance costs. Notably, regular maintenance is required to keep ESPs control efficiency, which can drop to below 30% if not properly maintained. Although facilities are required to install a control device, it is only effective if maintenance is performed regularly. The District has recently had discussions with various vendors that have integrated automated cleaning functions; however, these units still require professional cleaning on a regular basis.

[24] SJVAPCD. *2006 Area Source Emissions Inventory Methodology 690 – Commercial Cooking Operations.* Retrieved from: https://www.valleyair.org/Air_Quality_Plans/EmissionsMethods/MethodForms/Current/CommercialCooking2006.pdf

[25] EPA. *Section 6 Particulate Matter Controls Chapter 3 Electrostatic Precipitators*. (September 1999). Retrieved from: https://www.epa.gov/sites/default/files/2020-07/documents/cs6ch3.pdf

Table 9 Direct Costs

	EPA Cost Manual Formula	Low Estimate	High Estimate
ESP + auxiliary equipment	1.0 A	$42,500	$149,303
Instrumentation	0.1 A	$4,250	$14,930
Sales Tax	0.03 A	$1,275	$4,479
Freight	0.05 A	$2,125	$7,465
Direct Cost Total	**B = 1.18 A**	**$50,150**	**$176,178**

Table 10 Direct Installation Costs

	EPA Cost Manual Formula	Low Estimate	High Estimate
Foundations and Supports	0.04 B	$2,006	$7,047
Handling and Fabrication	0.50 B	$25,075	$88,089
Electrical	0.08 B	$4,012	$14,094
Piping	0.01 B	$502	$1,762
Insulation for Ductwork	0.02 B	$1,003	$3,524
Painting	0.02 B	$1,003	$3,524
Direct Installation Costs Total	**0.67 B**	**$33,601**	**$118,039**

Table 11 Indirect Costs

	EPA Cost Manual Formula	Low Estimate	High Estimate
Engineering	0.20 B	$10,030	$35,236
Construction	0.20 B	$10,030	$35,236
Contractor	0.10 B	$5,015	$17,618
Start-up	0.01 B	$502	$1,762
Performance Test	0.01 B	$502	$1,762
Model Study	0.02 B	$1,003	$3,524
Contingencies	0.03 B	$1,505	$5,285
Total Indirect Costs	**0.57 B**	**$28,586**	**$100,421**

Table 12 Other Costs

	EPA Cost Manual Formula	Low Estimate	High Estimate
Site Preparation	SP	As Required	As Required
Buildings	Bldg	As Required	As Required

Table 13 Total Capital Investment

	EPA Cost Manual Formula	Low Estimate	High Estimate
Total	2.24 x B	**$112,336** *+ SP and Bldg*	**$394,638** *+ SP and Bldg*

The cost effectiveness was calculated twice to give a low and high total capital investment estimate by summing annualized one-time costs (annualized over a 10-year period using a 4 percent discount rate) and annual operation and maintenance costs. The District estimates a cost effectiveness of $74,424 per ton of PM2.5 controlled for

ESP devices costing $42,500. These costs inflate to $209,180 per ton of PM2.5 controlled for ESP devices costing $149,303. As expected, the elevated purchase costs leads to excessive costs that will not be feasible for restaurant owners to incur an annual cost ranging from $25,850 to $72,655 of annual costs to control emissions. The average Valley restaurant only expects to profit $44,000 annually, which would require the owner to sacrifice approximately 2.80 to 9.87 year's worth of profits to cover the total capital investment.[26]

Table 14 Cost Effectiveness Analysis for Underfired Charbroiler Controls

	Purchase Costs	Total Capital Investment	O&M (annual)	Annualized Cost	Cost Effectiveness (PEER Median Emissions)
Lowest Cost Estimate	$42,500	$112,336	$12,000	$25,850	**$74,424**
Highest Cost Estimate	$149,303	$394,638	$24,000	$72,655	**$209,180**

Cost Analysis for Existing Restaurants

Based on discussions with restaurant operators, technology vendors, and other regulatory agencies, it can be extremely difficult and cost-prohibitive to add controls on existing restaurants. The installation may require structural, electrical, or water-line modifications that may not be feasible. This makes installation costs much higher for existing restaurants compared to new restaurants that can integrate emissions controls into the design. The existing structure may not have the necessary space or structural support for the control unit. Furthermore, the existing restaurant may not have the authority to make changes to the building if the space is leased and the property owner is unwilling to accommodate. EPA's Cost Manual estimates that the total capital investment for existing restaurants would be 1.3 to 1.5 times more expensive than the total capital investment for new restaurants, with an estimated total capital investment ranging from $146,036 to $591,957, which would be far less cost effective than the already high cost effectiveness values shown previously for new restaurants.

Regulations in Other Regions

District staff conducted a thorough search and review of regulations adopted by other agencies for underfired charbroiling emissions and contacted these agencies to better understand the requirements and how they have been implemented. Areas with underfired regulations include New York City Department of Environmental Protection (NYC DEP) and Bay Area Air Quality Management District (BAAQMD).

The NYC DEP regulation, adopted in May 2016, requires the installation of control devices certified to provide at least 75% emissions reductions for new restaurants with

[26] SJVAPCD. *Adopt Proposed Commercial Underfired Charbroiling Emission Reduction Strategy*. December 17, 2020. Retrieved from: https://www.valleyair.org/Board_meetings/GB/agenda_minutes/Agenda/2020/December/final/11.pdf

underfired charbroilers that cook 875 pounds or more of meat per week. Based on staff-level discussions, NYC DEP is currently not enforcing the rule requirements, and has not issued any notices to comply. Notably, conversations and discussions with vendors indicated control requirements in the New York City area are the result of nuisance complaints and building code requirements.

BAAQMD Regulation 6, Rule 2 (Commercial Cooking Equipment) applies to new and existing restaurants with underfired charbroilers that purchase more than 1,000 pounds of beef per week, with an aggregate grill surface area of ten (10) square feet or more, to control emissions using a certified control device and registration of charbroilers and associated control devices. The rule exempts low-use charbroilers that grill less than 800 pounds of beef per week. No restaurants have been subjected to requirements under this regulation given wide ranging exemptions, enforceability challenges, and lack of certified control devices.

In addition to these under fired regulations, a select number of areas regulate chain-driven charbroilers but do not include underfired charbroiler requirements, similar to the District's control strategy. Chain-driven charbroiler emissions are far easier to control with catalytic oxidizers that are not applicable to under fired charbroilers and the District's strategy has successfully limited PM2.5 emissions from chain-driven devices.

District Commercial Underfired Charbroiling Emission Reduction Strategy

In recognition of the above mentioned challenges, the District Governing Board adopted a multipronged strategy to promote emission reductions from this category, while minimizing the impact on restaurants during the COVID-19 pandemic. This strategy, approved by the Governing Board in December 2020, will require significant effort by the District through creating enhancements to the RCTP program, developing and providing guidance to local agencies for the development of ordinances, providing education to local agencies on the health impact of commercial cooking emissions, working with CARB as they consider developing a statewide Suggested Control Measure, working with CARB/EPA in making improvements to the emissions inventory for commercial underfired charbroiling, and formalizing the restaurant workgroup to stay in touch with current industry conditions and to continue to develop and deploy underfired charbroiler technology. Benefiting from any information gained through these efforts, the District will continue evaluating potential amendments to Rule 4692 to achieve additional emissions reductions from existing restaurants with underfired charbroilers, as technologically and economically feasible. In addition to this effort, the District continues to coordinate with CARB and EPA on feasibility of technology, and advocates for EPA and CARB to establish a new state/federal underfired charbroiler technology certification and demonstration program. To help address community impacts associated with commercial underfired charbroiling operations, this program would establish uniform certification requirements for vendors of emissions control technologies, and support the real-life demonstration of these technologies. Currently, there is no uniform certification program in place, and no technologies have been certified under regional programs. Given the community-level importance of reducing

emissions from large underfired charbroiling operations, establishing a uniform certification and demonstration program would significantly accelerate the development and deployment of these technologies.

Conclusion

Considering all of the analysis presented above, the District concludes that a contingency measure provision for new or existing restaurants is not feasible at this time for the following reasons:

- Installation cost of controls can be prohibitively expensive
- Retrofitting controls on existing restaurants can be prohibitively expensive and technologically infeasible
- Maintenance of controls can be prohibitively expensive
- Maintenance requires specially trained staff that may not be accessible to all restaurants
- Regenerative filters lack UL 8782 certification
- Limited areas that have regulations in place do not enforce their rules or include exemptions

However, the District will continue evaluating future potential amendments to Rule 4692 to achieve additional emissions reductions from restaurants with underfired charbroilers, as technologically and economically feasible.

Dust Emissions from Almond Harvesting

Since 2018, the District has been operating a program to replace conventional nut harvesting equipment with new, low-dust equipment, initially starting as a pilot program and converting to a full program in late 2020.[27] The Low-Dust Nut Harvester program built upon more than a decade of significant investment made in the San Joaquin Valley to develop low-dust nut harvesting technologies and to understand the potential benefits in reducing particulate matter (PM) emissions from the use of these new technologies. Studies, conducted in partnership with the District, USDA-NRCS, and agricultural stakeholders and overseen by the San Joaquin Valley wide Air Pollution Study Agency have demonstrated that low-dust harvesting technology can be effective at reducing localized PM emissions associated with harvesting activities. The most recent study, conducted in 2017, indicated that low-dust harvesting technology can reduce localized PM emissions by more than 40%, and in some cases up to nearly 80%. Additionally, working with agricultural stakeholders, a scientific survey was conducted that concluded that a significant portion of nut crop growers and custom harvesters were interested in demonstrating new lower-emitting harvest technologies if provided with meaningful financial incentives. The results from studies conducted in the Valley show that, when compared to traditional harvesting equipment, low-dust harvest technology is successful in reducing PM emissions in Valley nut harvesting operations, without affecting crop

[27] SJVAPCD. *Low Dust Nut Harvester Program*. Retrieved from: https://ww2.valleyair.org/grants/low-dust-nut-harvester-replacement-program/

yield, while providing potential labor and energy savings. These results were used to develop the District's incentive program including calculating the efficacy, cost-effectiveness, and quantification of emission reductions.

While incentives have played a critical role in the success of the transition to low-dust harvesting technologies, the District evaluated the potential of requiring the replacement of conventional harvesting technology with low dust harvesting technology as a means of reducing PM2.5 emissions from harvesting activities. Pursuant to CAA requirements and EPA's Draft Guidance, the measure would need to be implemented and achieve reductions within one year (up to two years) of a contingency trigger.

Based on conversations with manufacturers, there is a significant amount of time manufacturers need to build low-dust nut harvesters, with a minimum 1 year of required lead time, to deliver one low-dust nut harvester. This does not take into account the need to manufacture harvesters to meet the significant increase in demand to implement this practice Valley-wide. Manufacturers will have to hire new qualified technical staff to ramp up production. Adding to this challenge, due to the supply chain issues that are plaguing the industry, it will take even longer for manufacturers to ramp up production and be able to meet the needs. There are also dust reduction benefits from driving the harvesting equipment slower, leading to needing to balance speed with having to buy more equipment. Covering more acreage per harvesting equipment will not only result in more emissions, but can also lead to more rapid decline in equipment quality, shortening the time to replacement. Considering these factors, manufacturers simply will not be able to manufacture a sufficient amount of harvesters within the implementation time period required under the contingency guidance by EPA. Therefore, a regulatory measure would take significantly longer than the one to two years to achieve reductions pursuant to EPA's draft guidance to fully implement upon a contingency trigger, and is not a suitable contingency measure.

In addition, as with many industries and businesses, the almond industry has continued to evolve and has in recent years started to alter their practices to address shifting industry practices/standards. A major shift that has occurred is the decision made by almond processors to no longer accept materials from almond producers that contain debris, such as sticks, leaves and dirt that is collected as part of the almond harvesting process. This excess material requires additional processing by the almond processors and results in significant wear and tear of the processer's equipment. In response, almond producers have had to adapt to the changing environment and undergo more processing of their almonds before they deliver their products to the processers. Specifically, almond producers have had to invest in additional equipment, conditioners, that are specifically designed to remove this debris. The conditioners work similar to the harvesters by picking up the almonds in the rows by separating and removing the debris and laying the almonds back down in the row to dry. Once the almonds are dry, the harvesting equipment is then used to pick up the nuts. Since the methodology has changed significantly in the almond industry, the overall impact on total emissions from using conditioners in the harvesting process is unclear, including the overall efficacy of the low-dust nut harvesters using this approach. Therefore, the District believes that

more work is needed to better understand the emissions profile of this new method and recommends additional research be undertaken in collaboration with USDA-NRCS and agricultural stakeholders prior for any regulatory consideration.

There are also significant challenges in regards to the cost of this equipment and the ability of growers to afford these new low-dust harvesters without incentive dollars that have been the primary vehicle for the conversion to low-dust new technology. The average cost of a new low-dust nut harvester ranges from approximately $80,000 to $100,000 for new pull-behind harvesters, to $180,000 to $500,000 for self-propelled and off-ground harvesters. Notably, the wholesale price of almonds is the lowest it has been in years, significantly limiting the amount of money growers and custom harvesters have for purchasing this expensive equipment.

Based on the District's analysis for this source category, this is not a feasible source category for a contingency measure at this time for the following reasons:

- Long lead time needed to meet significant increased demand including supply chain issues and need to hire additional qualified technical staff
- Prohibitively high cost of equipment
- Need to conduct additional research to better understand the changing landscape in harvesting techniques and associated emissions

Although this measure is not appropriate for addressing contingency measure requirements, the District will continue to support the use of low-dust harvesting technologies and provide incentives through our Low-Dust Nut Harvester Incentive Program and advocate for more state and federal funding. Additionally, the District will continue to work with USDA-NRCS, CARB, and industry stakeholders to identify potential research opportunities to further understand emissions from nut harvesting activities.

Emissions from Oil and Gas Production Combustion Equipment

District Rules 4306 and 4320 apply 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 these rules is to limit NOx, carbon monoxide (CO), and PM emissions from boilers, steam generators, and process heaters of this size range. Facilities with units subject to these rules represent a wide range of industries, including but not limited to electrical utilities, cogeneration, oil and gas production, petroleum refining, manufacturing and industrial processes, food and agricultural processing, and service and commercial facilities. Rule 4320 establishes technology-forcing limits separate from Rule 4306.

The District Governing Board adopted amendments to Rules 4306 and 4320 on December 17, 2020. Based on a comprehensive technical analysis, in-depth review of local, state, and federal regulations, and a robust lengthy public process that took two years to complete, the District adopted several modifications to Rules 4306 and 4320 to reduce emissions from boilers, process heaters, and steam generators in the Valley.

Modifications to Rule 4306 and 4320 include lowered NOx emissions limits for a variety of unit classes and categories and established dates for emission control plans, authorities to construct, and compliance deadlines.

Rule 4306 is one of the most stringent regulations in the country for the subject type of units and goes above and beyond federal standards of RACT, and meets the Most Stringent Measure (MSM) requirements pursuant to the CAA and as approved by EPA. Rule 4320 goes one step further by establishing even lower emission limits, well beyond MSM levels due to the technology forcing nature of the Rule. Although the District is already implementing the most stringent requirements, the District evaluated opportunities for potential contingency measures, as detailed below.

Direct Control of PM2.5 from Boilers and Steam Generators

The District conducted technological and economic feasibility analyses for direct control of PM2.5 emissions from boilers and steam generators (Appendix I). These analyses show that the typical exhaust PM2.5 concentration from natural gas (NG)-fired boilers and steam generators is significantly below the recommended range of inlet loading concentrations for all of the PM2.5 emission control technologies assessed. Additionally, with the exception of wet ESP and Venturi Scrubbers, these control technologies offer poor control of condensable PM2.5 and therefore poor control of total PM2.5 emissions from natural gas-fired boilers and steam generators. Furthermore, this analysis shows that the cost of direct PM2.5 control on natural gas-fired boilers and steam generators with these technologies ranges between $494,482 and $6,783,207 per ton of PM2.5 emissions reduced. Therefore, use of these emission control technologies to control direct PM2.5 emissions from NG-fired boilers and steam generators is either not technologically feasible or not cost effective.

Electrification of Oilfield Steam Generators

Currently, there are no electric steam generators capable of meeting the demands of conventional steam generators. One of the largest electric generators produces 4,882 lb/hr @ 135 pounds per square inch gauge (psig). This flow rate is only 1/10 of the rate needed from one conventional steam generator and the pressure rating of 135 psig is far below the needed pressure of 800 – 900 psig.

Furthermore, a typical conventional natural gas-fired steam generator is rated (designed) to burn up to 62.5 million Btu/hr of natural gas and consumes approximately 50 million Btu/hr (i.e. 80% firing rate). This will require, on average, 13.75 MW of electricity to replace one conventional steam generator. Therefore, the electricity needs to replace one conventional steam generator with electric steam generation would be the equivalent electricity demand of over 10,000 homes. To replace conventional steam generators operating in the San Joaquin Valley with electric steam generation would require approximately 5,160 MW, which would be the equivalent electricity demand of 3,800,000 homes. The immense amount of power needed to electrify all steam generators in the District would require significant infrastructure upgrades to California's

power grid. Therefore, electric steam generators are not technologically feasible at this time.

Solar Powered Oilfield Steam Generation

Emissions from oilfield steam generators that provide steam to reduce the viscosity of oil in thermally enhanced oil recovery operations have been significantly reduced through decades of increasingly stringent rule requirements. Instead of fuel oil, steam generators today are powered by natural gas or field gas which are significantly cleaner. To ensure that all potential emission reduction opportunities are evaluated, the District performed a comprehensive review of solar powered steam generators.

In the Valley, small pilot projects have been conducted to demonstrate the feasibility of solar powered steam generation technologies and found that such technologies were not feasible:

Berry Petroleum Company: In February 2011, Berry Petroleum Company installed a small pilot test facility designed to use solar energy to pre-heat feed water for the existing natural gas fired steam generators. The system consisted of mirrors in a glass greenhouse (supplied by Glasspoint Solar). The mirrors were designed to focus solar energy onto a pipe carrying water to heat the water. The heated water is then sent to the input of the steam generators. The facility had a designed heat production of 300 kW. This project operated for a short time and was ultimately shut down based on the following shortcomings:

1) Significant heat loss: The heat losses to the water from the pipe runs from the solar installation to the actual steam generator locations were such that the water delivered to the steam generators was ambient or only slightly warmer.
2) Excessively large footprint requirement: The footprint of the solar steam generators needed to provide the thermal output of one 85 MMBtu steam generator would be excessively large.
3) Inconsistent steam quality: The inability of the solar steam generators to consistently generate the quality of steam that is needed for injection that is currently supplied by the steam generators.
4) Unreliable power: The solar steam generators would still need to be supplemented by gas fired steam generators at night and during cloudy days.

Chevron: This company installed a pilot solar thermal steam plant near Coalinga, consisting of 7,600 mirrors that would direct solar energy towards a single solar collector tower (supplied by Brightsource Energy). The heat collected in the tower would turn water into steam. The installation had a footprint of 100 acres. This system discontinued operation in 2014. Although information from Chevron on their findings on the performance of this project is unavailable, based on news articles[28], the system was

[28] Natural Gas Intelligence. *Potential for Solar-Assisted EOR in California Oilfield Still Unfulfilled*. September 4, 2015. http://www.naturalgasintel.com/articles/103562-potential-for-solar-assisted-eor-in-

excessively costly. A news article referencing the manufacturer's SEC filings stated the company realized a 40 million dollar loss on the project.

Aera Energy: Despite the above-described challenges, in 2019, Aera Energy in collaboration with GlassPoint Solar considered the installation of a large 770-acre solar steam generation system adjacent to an Aera Energy oil production operation in western Kern County. However, in April of 2020, GlassPoint cancelled the project due to a lack of funding. This system would have generated the steam equivalent to approximately 10 gas-fired steam generators. The solar steam generators would still need to be supplemented by gas-fired steam generators at night and during cloudy days.

Based on discussions with Aera Energy, the project heavily relied on solar tax credits, the generation and sale of low carbon fuel standard credits, and the reduction in costs of greenhouse gas allowances for Aera. According to Aera Energy, there is no economic benefit to implementing such technologies. In fact, without the LCFS credits, the cost of steam using this solar technology would be as much as three times the current cost.

The project also faced technical challenges, similar to the above pilot projects. Furthermore, the gas-fired steam generators that are required to supplement the system could face difficulty meeting current rule limits due to the need to ramp up and down. There has not been a successful large scale implementation of such technologies. In summary, solar powered oilfield steam generators are not yet feasible and still face significant technical and economic challenges as outlined below:

- Costs: The use of solar steam generation rely on a complex set of funding sources to make the operations economically feasible, including the Federal 30% tax credit, the value of California low-carbon fuel standards credits that may be generated as a result of using solar steam generation to produce oil, and a reduction in the costs for the oil producer of AB32 cap-and-trade credits required for their operations in California. The value of the GHG credits generated varies based on the price of credits on the open market. As the value of the credits is not fixed, the economic viability of a project may change depending on the value of the credits prior to construction and during operation. Even with available credits, the costs continue to be a challenge.

- Land Availability: Adequate open land next to the steam injection wells is needed to house the solar collectors. Both the amount of land and the distance of the land to the injection point are important factors. It is estimated that to create the steam needed to replace one steam generator would require 60 acres of solar generation. Finding the required amount of land available next to oilfield operations may be difficult. The solar systems have to be close to the steam

california-oilfield-still-unfulfilled and https://gigaom.com/2011/10/12/brightsources-solar-steam-project-went-way-over-budget/

injection wells. Otherwise, additional solar capacity will need to be developed to account for the heat loss because of travel distance.

- Variability of Solar Steam Generation Output: Solar steam generation plants need sunny days to be able to collect enough energy to make steam. During cloudy days and also during the night, the solar equipment would not make enough steam. Oilfield operators will need to supplement the solar operation with natural gas fired steam generators for when the solar equipment is not producing enough steam. On partly cloudy days, the natural gas steam generators would need to cycle on and off depending on the cloud cover. This may cause operational difficulties as the gas fired steam generators are tuned to operate at constant load. A variable load could cause emissions variability and potentially have emissions higher than that allowed in permit limits and/or District prohibitory rules.

The District will continue to work with operators of boilers, steam generators, and process heaters to develop, demonstrate, and deploy new emission control technologies. As part of this continued effort, the District will evaluate any advancements in addressing the above feasibility issues.

Evaluation of Lower Emission Limits for Boilers and Steam Generators

The District's rules which set emission requirements for boilers, steam generators, and process heaters (Rules 4306/4320) are already the most stringent in the nation. Rule 4306 was adopted on September 18, 2003, amended in March 2005, October 2008, and most recently in December 2020. Prior to the adoption of Rule 4306, these sources were controlled by Rule 4305, which was first adopted on December 16, 1993, and amended four times before the adoption of the more stringent Rule 4306. Prior to the 2020 amendments, NOx emissions from boilers, steam generators, and process heaters subject to these rules had already been reduced by 96%. Rule 4320 was first adopted on October 16, 2008 and also recently amended in December 2020. The purpose of Rule 4320 is to establish more stringent, technology forcing NOx, CO, SO2, and PM10 emission limits.

In February 2020, EPA determined that District Rule 4306 satisfied Most Stringent Measure (MSM) requirements. Despite this finding, the District strengthened Rule 4306 even further through the amendments in December 2020, thus solidifying that Rule 4306 goes beyond MSM requirements. Rule 4320 goes one step further by establishing even lower emission limits, well beyond MSM levels due to the technology-forcing nature of the Rule. District Rule 4320 is the first of its kind rule in the nation specifically intended to advance the state of technology, forcing sources and manufacturers to ultimately reach those lower levels in the future, while allowing for flexibility in still achieving significant emission reductions and meeting beyond MSM limits outlined in Rule 4306 as the advanced technologies evolve.

The 2020 amendments to these rules took over two years to develop, and included a robust public process consisting of numerous public workshops and rigorous analyses on technological and economic impacts to the various industries, small and large. This extensive process included establishing compliance dates that take into consideration high capital costs and needed transition periods. Stationary sources are still in the process of complying with these recently adopted requirements, and the amendments are technology-forcing in nature. Any additional changes to these rules would require another robust public process, which would likely require another two years in order to allow for public and stakeholder engagement, assess costs and potential reductions, and assess true impacts to the industry. Because of the significant amount of time and nature of reviewing and evaluating potential amendments to technology based rules, these rules are not suitable for contingency measures.

In addition, over the past few years since the 2020 amendments, operators have been planning and preparing to comply with the stringent requirements of Rules 4306/4320 that become effective as early as December 2023. Projects such as these take years to implement due to the time needed to ensure appropriate funding is in place to purchase equipment, ordering and procuring equipment that can take a long time to fabricate due to customized designs needed for each facility, lead times due to external factors such as demand and supply chain issues, and securing skilled contractors that can ultimately install the equipment.

Therefore, it is not reasonable to impose additional requirements to a source category that is already significantly controlled, exceeding MSM requirements, especially within the implementation deadlines allowed by the contingency guidance. Requiring additional controls well beyond MSM will require even more planning, budgeting, and investment, and operations would most likely face a number of technological and economic challenges. These operators would not be able to recoup the costs incurred for complying with the 2020 rule requirements before having to expend more money to comply with a contingency measure requirement.

There are also a number of feasibility issues that need to be taken into consideration when requiring further controls beyond the Most Stringent Measure emission limitations established under Rule 4306 (such as those required under technology-forcing Rule 4320). These issues include high and often unanticipated costs, wide variability in source operations and associated control technology considerations (i.e. load swings), practical challenges such as space constraints, and other feasibility issues. Some examples of key feasibility challenges and considerations include:

- While many operations have successfully installed selective catalytic reduction (SCR) and other latest generation control systems through Rule 4306/4320 implementation and New Source Review BACT requirements, these control technologies have not yet been proven to be technologically feasible and cost-effective as retrofit options for all source categories and applications, such as oilfield steam generators. For many facilities, this technology is not an option due to space constraints and other physical limitations.

- SCR has significant initial capital costs, requires large footprints that impact other operations (resulting in significant additional costs), and requires additional construction costs to accommodate the large size of the catalyst and the storage of the injection reagent (such as anhydrous ammonia).
- The temperature required for SCR units to function effectively (400-800 F) in relation to existing exhaust temperatures (i.e. ~250 F for oilfield steam generators) poses significant and potential insurmountable feasibility and cost challenges to operators. For example, in many situations, steam generators would have to be cut open to retrofit an SCR unit into the convection section of the steam generator to operate the SCR system at the correct temperature. This would cause heat loss, preventing the production of the steam necessary for the oil field operation.
- Additional feasibility limitations associated with the installation of SCR for oil field steam generators include space limitations within installed infrastructure, and concerns with the storage of anhydrous ammonia in the remotely located, unsecure oil fields where these types of units operate.

Additionally, due to the technology advancing nature of Rule 4320, EPA has never credited Rule 4320 with any emission reductions and has iterated that in their BACM TSD for the 2006 PM2.5 approval. Therefore, in addition to the reasons summarized above, given the lack of EPA-recognized SIP-creditable emissions reductions from Rule 4320, amendments to Rule 4320 are not feasible for contingency purposes.

Conclusion

The District concludes that this source category is not an appropriate contingency measure due to the following reasons:

- Analyses provided by the District shows that further controls are either technologically infeasible, or not cost effective
- District is already requiring the most stringent feasible controls, exceeding MSM requirements
- Significant time is needed to plan and prepare for the installation of equipment including budgeting appropriate funds for large projects (2-3 years), which is incompatible with a contingency trigger
- Operations are in the process of investing in and installing technologies to meet recently amended rule limits
- A contingency trigger is incompatible with the technologies involved in reducing emissions from this category, as operations would need time to plan and install technology and reductions would not be achieved within one to two years of a contingency trigger

Therefore, for the reasons outlined above, a contingency measure is not feasible for this source category.

5. OPPORTUNITIES FOR STATEWIDE CONTINGENCY MEASURES

[This section provided by the California Air Resources Board]

Contingency measures are required by the Clean Air Act to be implemented quickly if triggered when an area fails to make reasonable further progress or attain the National Ambient Air Quality Standards (NAAQS) by the required date. Over the last few years, multiple court decisions by the United States Court of Appeals for the Ninth Circuit (Ninth Circuit) and in other parts of the country have effectively disallowed the SIP-approved approach which the California Air Resources Board (CARB), the local air districts and the rest of the country have historically used to meet contingency measure requirements. The United States Environmental Protection Agency (U.S. EPA) released new draft guidance on March 17, 2023[29] to provide states direction in response to the court decisions. Unfortunately, the draft guidance does not comprehensively address all of the issues related to contingency measures and will not be final for months. Timely, comprehensive, and practical final guidance is needed for CARB, and other air agencies across California and the U.S., to ensure that the significant resources devoted to creating, adopting, and implementing a contingency measure result in a measure that meets federal requirements and which can be approved into the State Implementation Plan (SIP).

California faces the most difficult air quality challenges in the nation and, accordingly, leads the country with the most stringent air pollution control programs. Historically, U.S. EPA guidance required contingency measures to achieve approximately one year's worth of emission reductions in the context of reasonable further progress (RFP). Although the new draft guidance proposes a change to the way that one year's worth of emissions reductions is calculated such that it connects more directly to attainment inventories (termed now as "one year's worth of progress") and thereby reduces the amount needed for contingency measures, CARB's control programs are advanced, and primarily-federally regulated sources contribute over half of the mobile source NOx emissions. Thus, opportunities for a triggered contingency measure that can be implemented by the State and result in one year's worth of progress in the required time frame are not readily available. Further, if any measure that could achieve this level of emission reductions existed, it would be adopted to improve air quality and support attainment of the NAAQS and would not be withheld for contingency purposes. California continues to work toward meeting contingency measure requirements, while U.S. EPA finalizes its draft guidance.

5.1 Background

The Clean Air Act specifies that SIPs must provide for contingency measures, defined in section 172(c)(9) as "specific measures to be undertaken if the area fails to make reasonable further progress, or to attain the national primary ambient air quality standard by the attainment date…." The Clean Air Act is silent though on the specific

[29] See 88 Fed.Reg. 17571-17572 (March 23, 2023).

level of emission reductions that must flow from contingency measures. In the absence of specific requirements for the amount of emission reductions required, in 1992, U.S. EPA conveyed that the contingency measures should, at a minimum, ensure that an appropriate level of emissions reduction progress continues to be made if attainment of RFP is not achieved and additional planning by the State is needed (57 Federal Register 13510, 13512 (April 16, 1992)). Further, U.S. EPA ozone guidance states that "contingency measures should represent one year's worth of progress amounting to reductions of 3 percent of the baseline emissions inventory for the nonattainment area". U.S. EPA, though, has accepted contingency measures that equal less than one year's worth of RFP when the circumstances fit under "U.S. EPA's long-standing recommendation that states should consider 'the potential nature and extent of any attainment shortfall for the area' and that contingency measures 'should represent a portion of the actual emissions reductions necessary to bring about attainment in the area.'"[30]

Historically, U.S. EPA allowed contingency measure requirements to be met via excess emission reductions from ongoing implementation of adopted emission reduction programs, a method that CARB has used to meet contingency measure requirements and U.S. EPA has approved in the past. In 2016, in *Bahr v. U.S. Environmental Protection Agency*[31] *(Bahr),* the Ninth Circuit determined U.S. EPA erred in approving a contingency measure that relied on an already-implemented measure for a nonattainment area in Arizona, thereby rejecting U.S. EPA's longstanding interpretation of section 172(c)(9). U.S. EPA staff interpreted this decision to mean that contingency measures must include a future action triggered by a failure to attain or failure to make RFP. This decision was applicable to the states covered by the Ninth Circuit. In the rest of the country, U.S. EPA still allowed contingency measures using their pre-Bahr stance. In January 2021, in *Sierra Club v. Environmental Protection Agency*[32], the United States Court of Appeals for the D.C. Circuit, ruled that already implemented measures do not qualify as contingency measures for the rest of the country (*Sierra Club*).

In response to *Bahr* and as part of the 75 ppb 8-hour ozone SIPs due in 2016, CARB developed the statewide Enhanced Enforcement Contingency Measure (Enforcement Contingency Measure) as a part of the *2018 Updates to the California State Implementation Plan* to address the need for a triggered action as a part of the contingency measure requirement. CARB worked closely with U.S. EPA regional staff in developing the contingency measure package that included the triggered Enforcement Contingency Measure, a district triggered measure and emission reductions from implementation of CARB's mobile source emissions program. However, as part of the *San Joaquin Valley 2016 Ozone Plan for 2008 8-hour Ozone Standard* SIP action, U.S. EPA wrote in their final approval that the Enforcement Contingency Measures did not

[30] See, e.g. 78 Fed.Reg. 37741, 37750 (Jun. 24, 2013), approval finalized with 78 Fed.Reg. 64402 (Oct. 29, 2013).
[31] *Bahr v. U.S. Environmental Protection Agency,* (9th Cir. 2016) 836 F.3d 1218.
[32] *Sierra Club v. Environmental Protection Agency,* (D.C. Cir. 2021) 985 F.3d 1055.

satisfy requirements to be approved as a "standalone contingency measure" and approved it only as a "SIP strengthening" measure. U.S. EPA did approve the district triggered measure and the implementation of the mobile reductions along with a CARB emission reduction commitment as meeting the contingency measure requirement for this SIP.

Subsequently, the Association of Irritated Residents filed a lawsuit against the U.S. EPA for their approval of various elements within the *San Joaquin Valley 2016 Ozone Plan for 2008 8-hour Ozone Standard*, including the contingency measure. The Ninth Circuit issued its decision in *Association of Irritated Residents v. EPA*[33] (*AIR*) that U.S. EPA's approval of the contingency element was arbitrary and capricious and rejected the triggered contingency measure that achieves much less than one year's worth of RFP. Most importantly, the Ninth Circuit said that, in line with U.S. EPA's longstanding interpretation of what is required of a contingency measure and the purpose it serves, together with *Bahr*, all reductions needed to satisfy the Clean Air Act's contingency measure requirements need to come from the contingency measure itself and the amount of reductions needed for contingency should not be reduced by the fact of surplus emission reductions from ongoing programs absent U.S. EPA formally changing its historic stance on the amount of reductions required. U.S. EPA staff has interpreted *AIR* to mean that triggered contingency measures must achieve the entirety of the required one year's worth of emission reductions on their own. In addition, surplus emission reductions from ongoing programs cannot reduce the amount of reductions needed for contingency.

In response to *Bahr* and *Sierra Club*, in 2021, U.S. EPA convened a nation-wide internal task force to develop guidance to support states in their development of contingency measures. The draft guidance released in March 2023 is currently undergoing a public review process. The draft guidance proposes a new method for how to calculate one year's worth of progress for the targeted amount of reductions needed for contingency, and provides new clarification on the reasoned justification that would be needed for measures to be approved with a lesser amount of reductions. Per the draft guidance, the reasoned justification would need to include an infeasibility analysis detailing why there are insufficient measures to meet one year's worth of progress.

Since *Bahr*, CARB and air districts across California have worked closely with our U.S. EPA regional office in developing contingency measures with little success. CARB will continue to work closely with our regional U.S. EPA partners and is committed to meeting the Clean Air Act requirements for contingency measures. U.S. EPA needs to finalize national guidance on this complex issue to ensure states can effectively develop approvable contingency measures consistent with the new guidance.

[33] *Association of Irritated Residents v. U.S. Environmental Protection Agency*, (9th Cir. 2021) 10 F.4th 937

5.2 CARB's Opportunities for Contingency Measures

Much has changed since U.S. EPA's 1992 guidance on contingency measures. Control programs across the country have matured as have the health-based standards. Ozone standards have strengthened in 1997, 2008 and 2015 with attainment dates out to 2037. California has the only three extreme ozone nonattainment areas in the country. Thus, control measures are needed for meeting the NAAQS as expeditiously as possible, rather than being held in reserve.

To address contingency measure requirements given the courts' decisions and draft U.S. EPA guidance, CARB and local air districts would need to develop a measure or measures that, when triggered by a failure to attain or failure to meet RFP, will achieve one year's worth of progress for the given nonattainment area unless it is determined that it is infeasible to achieve one year's worth of emission reductions. Given CARB's wide array of mobile source control programs, the relatively limited portion of emissions primarily regulated by the local air districts, and the fact that primarily-federally regulated sources are expected to account for approximately 52 percent of statewide nitrogen oxides (NOx) emissions by 2037[34], finding triggered measures that will achieve the required reductions is nearly impossible. That said, even discounting the amount to reflect the proportion of sources that are primarily federally regulated, additional control measures that can be identified by CARB that would achieve the required emissions reductions needed for a contingency measure are scarce or nonexistent.

Adding to the difficulty of identifying available control measures, not only does the suite of contingency measures need to achieve a large amount of reductions, but they will also need to achieve these reductions in the year following the year in which the failure to attain or meet RFP has been identified. Although the newly released draft guidance proposes allowing for up to two years to achieve those reductions, control measures achieving the level of reductions required often take more than two years to implement and will likely not result in immediate reductions. In California's 2022 State SIP Strategy, CARB's three largest NOx reduction measures, In-Use Locomotive Regulation, Advanced Clean Fleets, and Transportation Refrigeration Unit II, rely on accelerated turnover of older engines/trucks and a shift to zero-emission equipment. Buildup of infrastructure and equipment options limits the availability to have significant emission reductions in a short amount of time. Options for a technically and economically feasible triggered measure that can be implemented and achieve the necessary reductions in the time frame required are scarce in California and may not be possible.

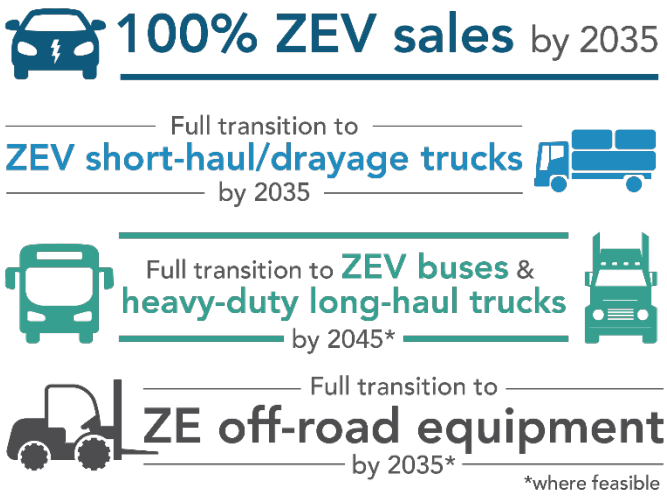
CARB has over 50 years of experience reducing emissions from mobile sources like cars and trucks, as well as other sources of pollution under State authority. The Reasonably Available Control Measures for State Sources analysis illustrates the reach of CARB's current programs and regulations, many of which set the standard nationally for other states to follow. Few sources CARB has primary regulatory authority over remain without a control measure, and all control measures that are in place support the

[34] Source: CARB 2022 CEPAM v1.01; based on 2037 emissions totals.

attainment of the NAAQS. There is a lack of additional control measures that would be able to achieve the necessary reductions for a contingency measure. Due to the unique air quality challenges California faces, should such additional measures exist, CARB would pursue those measures to support expeditious attainment of the NAAQS and would not reserve such measures for contingency purposes. Nonetheless, CARB continues to explore options for potential statewide contingency measures utilizing its authorities and applying U.S. EPA's draft guidance.

A central difficulty in considering a statewide contingency measure under CARB's authority, is that CARB is already fully committed to driving sources of air pollution in California to zero emissions everywhere feasible and as expeditiously as possible. In 2020, Governor Newsom signed Executive Order N-79-20 (Figure 3) that established a first-in-the-nation goal for 100 percent of California sales of new passenger cars and trucks to be zero emission by 2035. The Governor's order set a goal to transition 100 percent of the drayage truck fleet to zero- e-mission by 2035, all off-road equipment where feasible to zero-emission by 2035, and the remainder of the medium and heavy-duty vehicles to zero-emission where feasible by 2045.

Figure 3 Governor Newson Executive Order N-79-20



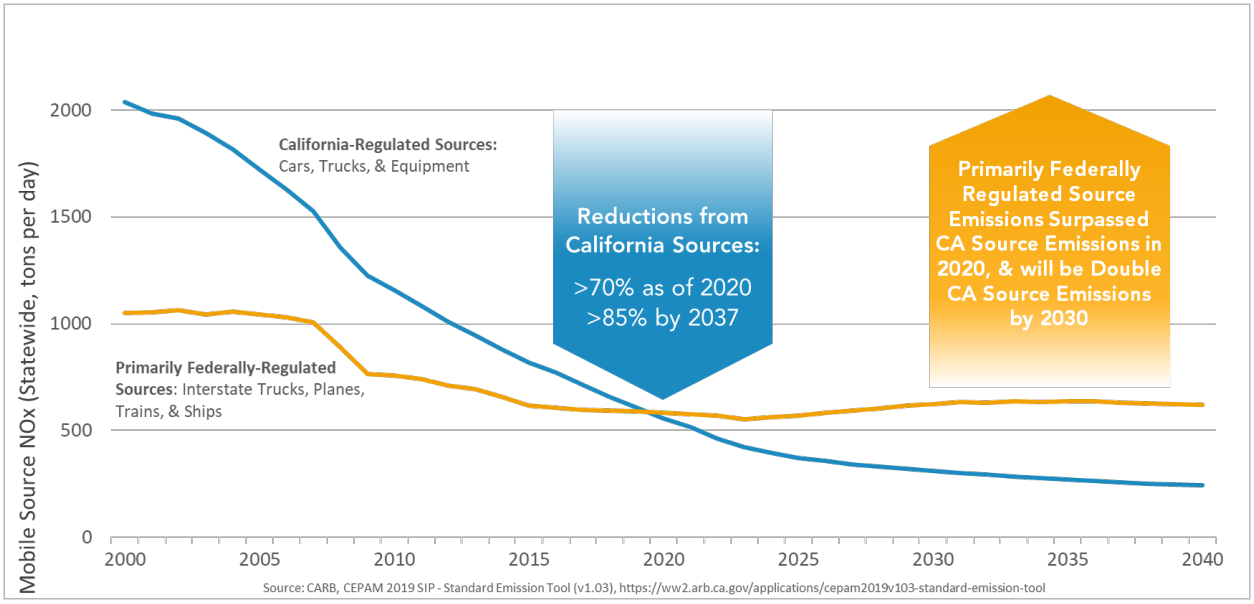
California is committed to achieving these goals and CARB is pursuing an aggressive control program in conjunction with other state and local agencies to turn the Executive Order into reality. Thus, CARB's programs not only go beyond emissions standards and programs set at the federal level, but many include zero-emissions requirements or otherwise, through incentives and voluntary programs, that drive mobile sources to zero-emissions, as listed in Table 15 below. CARB is also exploring and developing a variety of new measures to drive more source categories to zero-emissions and reduce emissions even further, as detailed in CARB's 2022 State SIP Strategy. With most source categories being driven to zero-emissions as expeditiously as possible, opportunities for having triggered measure that could reduce emissions by the amount required for contingency measures are scarce.

Table 15 Emissions Sources and Respective CARB Programs with a Zero-Emissions Requirement/Component

Emission Source	Regulatory Programs
Light-Duty Passenger Vehicles and Light-Duty Trucks	• Advanced Clean Cars Program (I and II), including the Zero Emission Vehicle Regulation • Clean Miles Standard
Motorcycles	• On-Road Motorcycle Regulation*
Medium Duty-Trucks	• Advanced Clean Cars Program (I and II), including the Zero Emission Vehicle Regulation • Zero-Emission Powertrain Certification Regulation • Advanced Clean Trucks Regulation • Advanced Clean Fleets Regulation*
Heavy-Duty Trucks	• Zero-Emission Powertrain Certification Regulation • Advanced Clean Trucks Regulation • Advanced Clean Fleets Regulation*
Heavy-Duty Urban Buses	• Innovative Clean Transit • Advanced Clean Fleets Regulation*
Other Buses, Other Buses – Motor Coach	• Zero-Emission Airport Shuttle Regulation • Advanced Clean Fleets Regulation*
Commercial Harbor Craft	• Commercial Harbor Craft Regulation
Recreational Boats	• Spark-Ignition Marine Engine Standards*
Transport Refrigeration Units	• Airborne Toxic Control Measure for In-Use Diesel-Fueled Transport Refrigeration Units (Parts I and II*)
Industrial Equipment	• Zero-Emission Forklifts* • Off-Road Zero-Emission Targeted Manufacturer Rule*
Construction and Mining	• Off-Road Zero-Emission Targeted Manufacturer Rule*
Airport Ground Support Equipment	• Zero-Emission Forklifts*
Port Operations and Rail Operations	• Cargo Handling Equipment Regulation • Off-Road Zero-Emission Targeted Manufacturer Rule*
Lawn and Garden	• Small Off-Road Engine Regulation • Off-Road Zero-Emission Targeted Manufacturer Rule*
Ocean-Going Vessels	• At Berth Regulation
Locomotives	• In-Use Locomotive Regulation*

*Indicates program or regulation is in development

There are few sources of air pollution remaining in California that are not already being aggressively controlled by CARB or the local air districts, and as mentioned previously, those sources that are not as well controlled are primarily-federally regulated sources. This includes interstate trucks, ships, locomotives, aircraft, and certain categories of off-road equipment, constituting a large source of potential emissions reductions. Since these are primarily regulated at the federal and, in some cases, international level, options to implement a contingency measure with reductions approximately equivalent to one year's worth of progress are limited.



Additionally, CARB is currently working across the agency on efforts to advance racial equity and alleviate the environmental burdens priority communities in California experience. For contingency, like with all of our programs, any measure considered must be evaluated to understand whether there could be any disparate impacts on priority communities. Given the existing disproportionate impacts overburdened communities already face, CARB must ensure that any new measure adopted does not have a disproportionate impact or place any further burden on these communities.

5.3 Measure Analysis

Despite these challenges, CARB is analyzing control measures for all sources under CARB authority to identify potential contingency measure options. CARB currently has programs in place or under development for most of these sources, and we are evaluating a variety of regulatory mechanisms within our existing and new programs for potential contingency triggers.

Criteria for Contingency Feasibility

CARB has evaluated potential options for a contingency measure within each of CARB's regulations (Table 16) using three criteria to determine its feasibility given the contingency measure requirements under the Clean Air Act, recent court decisions and U.S. EPA draft guidance. First, each measure was evaluated on whether it could be implemented within 60 days of being triggered and achieve the necessary reductions within 1-2 years of being triggered. Second, the technological feasibility of each option was considered to assess whether the measure would be technically feasible to implement. Measure requirements may be unavailable or cost prohibitive to implement, especially in the time frame required for contingency. Lastly, CARB evaluated whether the timeline for adoption would be compatible with the current consent decree deadline of September 30, 2024[35]. The contingency measure must be adopted by CARB and submitted to and fully approved by U.S. EPA by this date. A statewide measure needing a full regulatory process typically requires five years for development and adoption by CARB and additional time for U.S. EPA's approval process.

Challenges for CARB Measures

Based on CARB's feasibility analysis, there are a few common components of CARB regulations that limit the options for contingency measures. CARB regulations that require fleet turnover or new engine standards require a long lead time for implementation. Engine manufacturers would need lead time to design, plan, certify, manufacture, and deploy cleaner engines to meet a new or accelerated engine standard, while fleet regulations necessitate that manufacturing is mature so that there is enough supply available to meet that demand. Fleet regulations also require vehicle and equipment owners and operators to plan, purchase and deploy new, often zero-emission, equipment which may require changes to their business operations and the installation of new infrastructure. Thus, measures that require fleet turnover or new engine standards are not appropriate to be used as a triggered contingency measure.

CARB regulations are also technology forcing, which makes it difficult to amend regulations or pull compliance timelines forward with only 1-2 years notice as industry needs time to plan, develop, and implement these new technologies. It would be infeasible to require industry to turn over their fleets within one year if the technology is not readily available at a reasonable cost. Further, because they are technology forcing, many CARB regulations require an interim technology or implementation review and assessment to ensure that the requirements are achievable; as a part of these reviews, CARB routinely considers whether regulations can be accelerated or strengthened. CARB regulations are the most stringent air quality control requirements in the country, so there are few opportunities to require additional stringency. CARB is driving sources under our authority to zero-emission everywhere feasible to ensure attainment of air quality standards across the State, and to support near-source toxics reductions and

[35] See 87 Fed.Reg. 71631 (Nov. 23, 2022).

climate targets. However, the zero-emissions targets also eliminates opportunities for contingency based on more stringent standards.

Lastly, many of CARB's options for a contingency measure would require a full rulemaking process and would not be adopted by CARB and approved by U.S. EPA within the timeframe specified, making many of the options infeasible. Based on the U.S. EPA Federal Implementation Plan (FIP) timeline, CARB would need to find a measure that could realistically be adopted within the next year. However, most CARB measures must go through a regulatory process for adoption that can take approximately five years from start to finish.

Table 16 Assessment of Potential CARB Contingency Measures

Emission Source	Regulatory Programs	Latest Amendment Requirements	Contingency Options	Trigger Feasibility	Technological Feasibility	Timing for San Joaquin Valley FIP
Light-Duty Passenger Vehicles and Light-Duty Trucks	Advanced Clean Cars Program (I and II), including the Zero Emission Vehicle (ZEV) Regulation	Amended 8/25/22 Requires 100% ZEV new vehicle sales by 2035 and increasingly stringent standards for gasoline cars and passenger trucks.	Pulling compliance timelines forward. Setting more stringent standards.	No; standards need years of lead time to be developed, certified, and implemented; infeasible to implement new standard or manufacturing requirements within 60 days and achieve reductions within one year.	No; current standards and requirements are technology forcing and most stringent in the nation, including a zero-emission requirement. Further stringency would not be feasible.	No; requires a regulatory process; infeasible to adopt and have U.S. EPA approve by FIP deadline.
	Clean Miles Standard	Adopted 5/20/21 Set eVMT (electric miles traveled) and greenhouse gas (GHG) requirements for Transportation Network Companies (TNCs).	Pulling forward timeline to achieve 100% eVMT.	No; standards and fleet requirements need lead time to be implemented; infeasible to implement new standard or purchasing requirements within 60 days and achieve reductions within one year.	No; zero-emissions technology requirement is most stringent standard; TNCs are only a small portion of on-road vehicles, depending on area, may not achieve many reductions.	No; requires a regulatory process; infeasible to adopt and have U.S. EPA approve by FIP deadline.
	On Board Diagnostics II (OBD)	Amended July 22, 2021 Required updates to program to address cold start emissions and diesel particulate matter (PM) monitoring. Many of the regulatory changes included phase-ins that are not 100% until 2027.	Removing or pulling phase-in timelines forward. Setting more stringent OBD requirements.	No; OBD requirements need significant lead time to be developed, adopted, and implemented; infeasible to fully implement new requirements within 60 days and achieve similar reductions within one year.	No; the OBD requirements require sufficient lead time to implement with significant development time needed for hardware/ software changes and verification/validation testing.	No; requires a regulatory process; infeasible to adopt and have U.S. EPA approve by FIP deadline.
	California Smog Check Program	Amended 2010 via legislation Smog Check Program enhancements, including new technologies and test methods.	Require annual Smog Check. Require annual Smog Check for only high mileage vehicles.	No; Smog Check requirements need significant lead time to be developed, adopted, and implemented; infeasible to fully implement new requirements within 60	Yes, but would disproportionately impact low-income populations and disadvantaged communities.	No; any potential changes could require a regulatory process with California Bureau of Automotive Repair; infeasible to adopt and have U.S. EPA approve by FIP deadline.

				days and achieve similar reductions within one year.		
	Reformulated Gasoline	Amended May 2003 Required removal of methyl tert-butyl ether (MTBE) and included refinery limits and cap limits.	Require more stringent standards. Change cap limits and refinery limits.	No; fuel standards need years of lead time to be developed, certified, and implemented; infeasible to implement new standard within 60 days and achieve reductions within one year.	No; current standards and requirements are some of most stringent in the world; not feasible to require further stringency of specifications and develop or manufacture in a compressed timeline.	No; infeasible to develop and certify according to newer specifications; infeasible to achieve reductions within one year. Requires a regulatory process; infeasible to adopt and have U.S. EPA approve by FIP deadline.
Motorcycles	On-Road Motorcycle Regulation*	Proposed hearing: 2023 May require exhaust emissions standards (harmonize with European standards), evaporative emissions standards, and Zero Emission Motorcycle sales thresholds.	Pulling compliance timelines forward. Require more stringent emissions standards.	No; standards need years of lead time to be developed, certified, and implemented; infeasible to implement new standard within 60 days and achieve reductions within one year.	No; Any increase to the stringency of proposed standards would require an additional 1 to 2 years of lead time for 1) CARB staff to evaluate feasibility, and 2) manufacturers to develop and certify compliant motorcycles.	No; requires a regulatory process; infeasible to adopt and have U.S. EPA approve by FIP deadline.
Medium Duty-Trucks	Clean Diesel Fuel	Amended 2013 Established more stringent standards for diesel fuel.	Require more stringent fuel standard.	No; fuel standards need years of lead time to be developed, certified, and implemented; infeasible to implement new standard within 60 days and achieve reductions within one year.	No; infeasible to require more stringent standards in compressed timeline.	No; Requires a regulatory process; infeasible to adopt and have U.S. EPA approve by FIP deadline.
	Heavy-Duty Engine and Vehicle Omnibus Regulation	Adopted 8/27/20 Established new low NOx and lower PM tailpipe standards and lengthened the useful life and emissions warranty of in-use	Require more stringent standard, make optional idling standard required. Update testing	No; standards need years of lead time to be implemented; infeasible to implement new sales requirement within 60 days and achieve reductions within one year.	No; infeasible to require more stringent standards in compressed timeline.	No; Requires a regulatory process; infeasible to adopt and have U.S. EPA approve by FIP deadline.

		heavy-duty diesel engines.	requirements or corrective action procedures.			
	Advanced Clean Trucks Regulation	Adopted 6/25/20 Established manufacturer zero-emission truck sales requirement and company and fleet reporting.	Move up timeline for ZEV sales requirement. Reduce threshold for compliance.	No; manufacturer sales requirements need years of lead time to be implemented; infeasible to implement new sales requirement within 60 days. Sales requirement would not happen immediately or within one year of trigger; infeasible to achieve reductions within one year.	No; current sales requirement is technology forcing and most stringent in the nation.	No; Requires a regulatory process; infeasible to adopt and have U.S. EPA approve by FIP deadline.
	Advanced Clean Cars Program (I and II*), including the Zero Emission Vehicle Regulation	Amended 8/25/22 Requires 100% ZEV new vehicle sales by 2035 and increasingly stringent standards for gasoline cars and passenger trucks.	Pulling compliance timelines forward. Setting more stringent standards.	No; standards need years of lead time to be developed, certified, and implemented; infeasible to implement new standard or manufacturing requirements within 60 days and achieve reductions within one year.	No; current standards and requirements are technology forcing and most stringent in the nation, including a zero-emission requirement. Further stringency would not be feasible.	No; requires a regulatory process; infeasible to adopt and have U.S. EPA approve by FIP deadline.
	Advanced Clean Fleets Regulation*	Proposed CARB hearing in 2023 would establish zero-emission purchasing requirements for medium- and heavy-duty vehicle fleets (including state and local agencies, and drayage fleets, high priority, and federal fleets); would also require 100% zero-	Pulling compliance timelines forward. Reduce threshold for compliance.	No; fleet requirements need years of lead time to be implemented; infeasible to implement new purchasing requirements within 60 days. Purchasing requirement and turnover would not happen immediately; infeasible to achieve reductions within one year. Because of near term compliance deadlines,	No; current fleet requirements are technology forcing and most stringent in the nation, eventually requiring zero-emissions only.	No; requires a regulatory process; infeasible to adopt and have U.S. EPA approve by FIP deadline.

		emission new vehicle sales starting 2040.		moving forward deadlines would not result in many reductions.		
Heavy-Duty Trucks	Heavy-Duty Low NOx Engine Standards	See Omnibus.	More stringent standards were set with Omnibus Regulation.	No; engine standards need years of lead time to be developed, certified, and implemented; infeasible to implement new standard or purchasing requirements within 60 days and achieve reductions within one year.	No; infeasible to require more stringent technology forcing standards in compressed timeline if technology/ alternatives are not widely available.	No; Requires a regulatory process; infeasible to adopt and have U.S. EPA approve by FIP deadline.
	Optional Low-NOx Standards for Heavy-Duty Diesel Engines	Amended 8/27/20 as a part of Omnibus to lower the optional low NOx emission standards for on-road heavy-duty engines.	Make option required.	No; engine standards need years of lead time to be developed, certified, and implemented; infeasible to implement new standard or purchasing requirements within 60 days and achieve reductions within one year.	No; infeasible to require more stringent technology forcing standards in compressed timeline if technology/ alternatives are not widely available.	No; Requires a regulatory process; infeasible to adopt and have U.S. EPA approve by FIP deadline.
	Heavy-Duty Inspection and Maintenance Regulation	Adopted 12/9/21 Requires periodic vehicle emissions testing and reporting on nearly all heavy-duty vehicles operating in California.	Increase frequency of testing.	No; increased I/M requirements need significant lead time to be developed, adopted, and implemented; infeasible to fully implement new requirements within 60 days and achieve similar reductions within one year.	Yes, but costs would disproportionally impact small businesses and low-income populations.	No; Requires a regulatory process; infeasible to adopt and have U.S. EPA approve by FIP deadline.

	Heavy-Duty OBD	Amended July 22, 2021 Required updates to program to address cold start emissions and diesel PM monitoring. Many of the regulatory changes included phase-ins that are not 100% until 2027.	Removing or pulling phase-in timelines forward. Setting more stringent OBD requirements.	No; OBD requirements need significant lead time to be developed, adopted, and implemented; infeasible to fully implement new requirements within 60 days and achieve similar reductions within one year.	No; the OBD requirements require sufficient lead time to implement with significant development time needed for hardware/ software changes and verification/validation testing.	No; Requires a regulatory process; infeasible to adopt and have U.S. EPA approve by FIP deadline.
	Heavy-Duty Engine and Vehicle Omnibus Regulation	Adopted 8/27/20 Established new low NOx and lower PM Standards and lengthened the useful life and emissions warranty of in-use heavy-duty diesel engines.	Require more stringent standard, make optional idling standard required. Update testing requirements or corrective action procedures.	No; standards need years of lead time to be developed, certified, and implemented; infeasible to implement new standard or sales requirements within 60 days and achieve reductions within one year.	No; infeasible to require more stringent technology forcing standards in compressed timeline.	No; Requires a regulatory process; infeasible to adopt and have U.S. EPA approve by FIP deadline.
	Cleaner In-Use Heavy-Duty Trucks (Truck and Bus Regulation)	Adopted 12/17/10 Requires heavy-duty diesel vehicles that operate in California to reduce exhaust emissions. By January 1, 2023, nearly all trucks and buses will be required to have 2010 or newer model year engines to reduce PM and NOx.	None	-	-	-
	Zero-Emission Powertrain Certification Regulation	Adopted 12/6/19 Establishes certification requirements for zero-emission powertrains.	None	-	-	-

	Advanced Clean Trucks Regulation	Adopted 6/25/20 Established manufacturer zero-emission truck sales requirement and company and fleet reporting.	Move up timeline for ZEV sales requirement. Reduce threshold for compliance.	No; manufacturer sales requirements need years of lead time to be implemented; infeasible to implement new sales requirement within 60 days. Sales requirement would not happen immediately or within one year of trigger; infeasible to achieve reductions within one year.	No; current sales requirement is technology forcing and most stringent in the nation.	No; Requires a regulatory process; infeasible to adopt and have U.S. EPA approve by FIP deadline.
	Advanced Clean Fleets Regulation*	Proposed CARB hearing in 2023. Would establish zero-emission purchasing requirements for medium- and heavy-duty vehicle fleets (including state and local agencies, and drayage fleets, high priority, and federal fleets); would also require 100% zero-emission new vehicle sales starting 2040.	Pulling compliance timelines forward. Reduce threshold for compliance.	No; fleet requirements need years of lead time to be implemented; infeasible to implement new purchasing requirements within 60 days. Purchasing requirement and turnover would not happen immediately; infeasible to achieve reductions within one year. Because of near term compliance deadlines, moving forward deadlines would not result in many reductions.	No; current fleet requirements are technology forcing and most stringent in the nation, eventually requiring zero-emissions only.	No; requires a regulatory process; infeasible to adopt and have U.S. EPA approve by FIP deadline.
Heavy-Duty Urban Buses	Innovative Clean Transit	Adopted 12/14/2018 Requires all public transit agencies to gradually transition to a 100% zero-emission bus fleet.	Move compliance timelines forward. Remove various exemptions or compliance options.	No; fleet requirements need years of lead time to be implemented; infeasible to implement new purchasing requirements within 60 days. Purchasing requirement and turnover would not happen immediately; infeasible to achieve reductions within one year.	No; current requirements are technology forcing and most stringent (zero-emission requirement). Further stringency is not possible; expediting timelines would not be feasible.	No; Requires a regulatory process; infeasible to adopt and have U.S. EPA approve by FIP deadline.

	Advanced Clean Fleets Regulation*	Proposed CARB hearing in 2023. Would establish zero-emission purchasing requirements for medium- and heavy-duty vehicle fleets (including state and local agencies, and drayage fleets, high priority, and federal fleets); would also require 100% zero-emission new vehicle sales starting 2040.	Pulling compliance timelines forward. Reduce threshold for compliance.	No; fleet requirements need years of lead time to be implemented; infeasible to implement new purchasing requirements within 60 days. Purchasing requirement and turnover would not happen immediately; infeasible to achieve reductions within one year. Because of near term compliance deadlines, moving forward deadlines would not result in many reductions.	No; current fleet requirements are technology forcing and most stringent in the nation, eventually requiring zero-emissions only.	No; requires a regulatory process; infeasible to adopt and have U.S. EPA approve by FIP deadline.
Other Buses, Other Buses – Motor Coach	Zero-Emission Airport Shuttle Regulation	Adopted 6/27/19 Requires airport shuttles to transition to zero-emission fleet.	Pull compliance timelines forward. Remove reserve airport shuttle exemption.	No; fleet requirements need years of lead time to be implemented; infeasible to implement new purchasing requirements within 60 days. Purchasing requirement and turnover would not happen immediately; infeasible to achieve reductions within one year.	No; current requirements are technology forcing and most stringent (zero-emission requirement). Further stringency is not possible. Not many shuttles in area, would not achieve many reductions.	No; Requires a regulatory process; infeasible to adopt and have U.S. EPA approve by FIP deadline.
	Advanced Clean Fleets Regulation*	Proposed CARB hearing in 2023. Would establish zero-emission purchasing requirements for medium- and heavy-duty vehicle fleets (including state and local agencies, and drayage fleets, high priority, and federal fleets); would also require 100% zero-	Pulling compliance timelines forward. Reduce threshold for compliance.	No; fleet requirements need years of lead time to be implemented; infeasible to implement new purchasing requirements within 60 days. Purchasing requirement and turnover would not happen immediately; infeasible to achieve reductions within one year. Because of near term compliance deadlines,	No; current fleet requirements are technology forcing and most stringent in the nation, eventually requiring zero-emissions only.	No; requires a regulatory process; infeasible to adopt and have U.S. EPA approve by FIP deadline.

		emission new vehicle sales starting 2040.		moving forward deadlines would not result in many reductions.		
Commercial Harbor Craft	Commercial Harbor Craft (CHC) Regulation	Amended 3/24/22 Established more stringent standards, all CHC required to use renewable diesel, expanded requirements, and mandates zero-emission and advanced technologies.	Set more stringent standards. Pull compliance timelines forward.	No; Technology requirements and standards need years of lead time to be developed, certified, and implemented; infeasible to implement new standard or requirements within 60 days and achieve reductions within one year.	No; standards set are technology forcing and most stringent; not technologically feasible to require increased stringency in compressed timeline.	No; Requires a regulatory process; infeasible to adopt and have U.S. EPA approve by FIP deadline.
Recreational Boats	Spark-Ignition Marine Engine Standards*	Proposed hearing: 2029 Would establish catalyst-based emission standards and percentage of zero-emission technologies for certain applications.	Set more stringent standard.	No; standards need years of lead time to be developed, certified, and implemented; infeasible to implement new standard within 60 days and achieve reductions within one year.	No; standards being set will be most stringent feasible, including zero-emission requirement); would not save a more stringent standard for contingency	No; Requires a regulatory process; infeasible to adopt and have U.S. EPA approve by FIP deadline.

Transport Refrigeration Units	Airborne Toxic Control Measure for In-Use Diesel-Fueled Transport Refrigeration Units (TRUs) (Parts I and II*)	Amended 2/24/22 (Part I), Part II proposed CARB hearing in 2025 Requires diesel-powered truck TRUs to transition to zero-emission, PM emission standard for newly manufactured non-truck TRUs. Part II would establish zero-emission options for non-truck TRUs.	Set more stringent standards. Pull compliance timelines forward	No; standards and fleet requirements need years of lead time to be implemented; infeasible to implement new standard or purchasing requirements within 60 days and achieve reductions within one year.	No; current requirements are technology forcing and most stringent (zero-emission requirement). Further stringency is not possible; expediting timelines would not be feasible; would not save a more stringent standard for contingency	No; Requires a regulatory process; infeasible to adopt and have U.S. EPA approve by FIP deadline.
Industrial Equipment	Large Spark-Ignition (LSI) Engine Fleet Requirements Regulation	Amended July 2016 Extended recordkeeping requirements, established labeling, initial reporting, and annual reporting requirements.	Set more stringent performance standards	No; standards and fleet requirements need years of lead time to be implemented; infeasible to implement new standard or purchasing requirements within 60 days and achieve reductions within one year.	No; Infeasible to require further stringency within one year given timeline for technology development and certification. See Zero-Emission Forklifts below.	No; Requires a regulatory process; infeasible to adopt and have U.S. EPA approve by FIP deadline.
	Off-Road Regulation	Amended 11/17/22 Requires phase out of oldest and highest-emitting engines, restricts addition of Tier 3 and 4i engines, mandates renewable diesel for all fleets.	Pull phase-out or compliance timelines forward	No; fleet requirements need years of lead time to be implemented; infeasible to implement new purchasing and turnover requirements within 60 days and achieve reductions within one year.	No; Infeasible to require further stringency within one year given timeline for technology development and certification.	No; Requires a regulatory process; infeasible to adopt and have U.S. EPA approve by FIP deadline.
	Zero-Emission Forklifts*	Proposed CARB hearing in 2023. Would require model-year phase-out and reporting requirements and manufacturer sales restrictions.	Pull phase-out or compliance timelines forward	No; standards requirements need years of lead time to be developed, certified, and implemented; infeasible to implement new standard within 60 days and achieve reductions within one year.	No; standards being set will be technology forcing and most stringent feasible, including zero-emission requirement; would not save a more stringent standard for contingency	No; Requires a regulatory process; infeasible to adopt and have U.S. EPA approve by FIP deadline.

	Off-Road Zero-Emission Targeted Manufacturer Rule*	Proposed CARB hearing in 2027. Would require manufacturers of off-road equipment and/or engines to produce for sale zero-emission equipment and/or powertrains as a percentage of their annual statewide sales volume.	Pull forward compliance timelines or increase percentage sales requirements	No; Manufacturing and sales requirements need years of lead time to be implemented; infeasible to pull forward standards within 60 days and achieve reductions within one year.	No; standards being set will be technology forcing and most stringent feasible, including zero-emission requirement; would not save a more stringent standard for contingency	No; Requires a regulatory process; infeasible to adopt and have U.S. EPA approve by FIP deadline.
Construction and Mining	Off-Road Zero-Emission Targeted Manufacturer Rule*	Proposed CARB hearing in 2027. Would require manufacturers of off-road equipment and/or engines to produce for sale zero-emission equipment and/or powertrains as a percentage of their annual statewide sales volume.	Pull forward compliance timelines or increase percentage sales requirements	No; Manufacturing and sales requirements need years of lead time to be implemented; infeasible to pull forward standards within 60 days and achieve reductions within one year.	No; standards being set will be technology forcing and most stringent feasible, including zero-emission requirement; would not save a more stringent standard for contingency	No; Requires a regulatory process; infeasible to adopt and have U.S. EPA approve by FIP deadline.
	Off-Road Regulation	Amended 11/17/22 Requires phase out of oldest and highest-emitting engines, restricts addition of Tier 3 and 4i engines, mandates renewable diesel for all fleets.	Pull phase-out or compliance timelines forward	No; fleet requirements need years of lead time to be implemented; infeasible to implement new purchasing and turnover requirements within 60 days and achieve reductions within one year.	No; Infeasible to require further stringency within one year given timeline for technology development and certification.	No; Requires a regulatory process; infeasible to adopt and have U.S. EPA approve by FIP deadline.
Airport Ground Support Equipment	Zero-Emission Forklifts*	Proposed CARB hearing in 2023. Would require model-year phase-out and reporting requirements and manufacturer sales restrictions.	Pull phase-out or compliance timelines forward	No; standards requirements need years of lead time to be developed, certified, and implemented; infeasible to implement new standard within 60 days and achieve reductions within one year.	No; standards being set will be technology forcing and most stringent feasible, including zero-emission requirement; would not save a more stringent standard for contingency	No; Requires a regulatory process; infeasible to adopt and have U.S. EPA approve by FIP deadline.

	Large Spark-Ignition (LSI) Engine Fleet Requirements Regulation	Amended July 2016 Extended recordkeeping requirements, established labeling, initial reporting, and annual reporting requirements.	Set more stringent performance standards	No; standards and fleet requirements need years of lead time to be implemented; infeasible to implement new standard or purchasing requirements within 60 days and achieve reductions within one year.	No; Infeasible to require further stringency within one year given timeline for technology development and certification.	No; Requires a regulatory process; infeasible to adopt and have U.S. EPA approve by FIP deadline.
	Off-Road Regulation	Amended 11/17/22. Requires phase out of oldest and highest-emitting engines, restricts addition of Tier 3 and 4i engines, mandates renewable diesel for all fleets.	Pull phase-out or compliance timelines forward	No; fleet requirements need years of lead time to be implemented; infeasible to implement new purchasing and turnover requirements within 60 days and achieve reductions within one year.	No; Infeasible to require further stringency within one year given timeline for technology development and certification.	No; Requires a regulatory process; infeasible to adopt and have U.S. EPA approve by FIP deadline.
Port Operations and Rail Operations	Cargo Handling Equipment Regulation*	Proposed CARB hearing in 2025. Amendments to transition to zero-emission technology.	None	No; Standards requirements need years of lead time to be developed, certified, and implemented; infeasible to implement new standard within 60 days and achieve reductions within one year. Fully implemented in 2017 and relies on other engine standards, making it infeasible to trigger without regulatory process changing other standards.	No; Considering regulation to move towards zero-emissions. Currently assessing availability of technologies.	No; Requires a regulatory process; infeasible to adopt and have U.S. EPA approve by FIP deadline.
	Off-Road Zero-Emission Targeted Manufacturer Rule*	Proposed CARB hearing in 2027. Would require manufacturers of off-road equipment and/or engines to produce for sale zero-emission equipment and/or powertrains as a percentage of their	Pull forward compliance timelines or increase percentage sales requirements	No; Manufacturing and sales requirements need years of lead time to be implemented; infeasible to pull forward standards within 60 days and achieve reductions within one year.	No; standards being set will be technology forcing and most stringent feasible, including zero-emission requirement; would not save a more stringent standard for contingency	No; Requires a regulatory process; infeasible to adopt and have U.S. EPA approve by FIP deadline.

		annual statewide sales volume.				
Lawn and Garden	Small Off-Road Engine (SORE) Regulation	Amended 12/9/21 Requires most newly manufactured SORE to meet emission standards of zero starting in model year (MY) 2024.	Move up implementation deadlines	No; Standards requirements need years of lead time to be implemented; infeasible to pull forward standards within 60 days. Purchasing would not happen immediately or within one year of trigger; infeasible to achieve reductions within one year.	No; current standards and requirements are a technology forcing zero-emission certification requirement. Further stringency would not be possible.	No; Zero emission standard starts in MY 2024. Requires a regulatory process; infeasible to adopt and have U.S. EPA approve by FIP deadline.
Ocean-Going Vessels	At Berth Regulation	Amended 8/27/20 Expands requirements to roll-on roll-off vessels and tankers, smaller fleets, and new ports and terminals.	Remove option to use alternate control technology or set more stringent alternate control technology requirements. Reduce threshold for 'low activity terminals' exemption.	No; control technology requirements need years of lead time to be implemented; infeasible to pull forward standards within 60 days and achieve reductions within one year.	No; regulation already requires use of shorepower or alternate control technology for every visit.	No; Requires a regulatory process; infeasible to adopt and have U.S. EPA approve by FIP deadline.

	Ocean-going Vessel Fuel Regulation	Amended 2011 Extended clean fuel zone and included exemption window.	Set more stringent requirements	No; fleet requirements need years of lead time to be implemented; infeasible to implement new purchasing and turnover requirements within 60 days and achieve reductions within one year.	No; not feasible to require further stringency in a compressed timeline.	No; Requires a regulatory process; infeasible to adopt and have U.S. EPA approve by FIP deadline.
Locomotives	In-Use Locomotive Regulation*	Proposed CARB hearing in April 2023, Requires each operator to deposit funds into spending account for purchasing cleaner locomotive technology, sets idling limits, and requires registration and reporting. Starting in 2030, only locomotives less than 23 years old can operate in the state. Newly built passenger, switch, and industrial locomotives must operate in a zero emission configuration, and in 2035 newly built freight line haul locomotives.	Move up implementation deadlines. Set stricter idling requirements.	No; Fleet requirements need years of lead time to be implemented; infeasible to pull forward standards within 60 days and reductions within one year. No, for idling requirements.	No; current standards and requirements are technology forcing, include a zero-emission requirement. Further stringency would not be possible. No, for idling requirements, CARB is committing to re-evaluate the requirement during next assessment.	No; Requires a regulatory process; infeasible to adopt and have U.S. EPA approve by FIP deadline.
Areawide Sources	Zero-Emission Standard for Space and Water Heaters	Proposed CARB hearing in 2025. Beginning in 2030, 100% of sales of new space heaters and water heaters would need to meet a zero-emission standard.	Set trigger for more stringent standards or timelines.	No; Standards requirements need years of lead time to be implemented; infeasible to pull forward standards within 60 days. Purchasing would not happen immediately or within one year of trigger; infeasible	No; current standards and requirements are a technology forcing zero-emission certification requirement. Further stringency would not be possible.	No; Requires a regulatory process; infeasible to adopt and have U.S. EPA approve by FIP deadline.

				to achieve reductions within one year.		

5.4 Summary

At this time, CARB is including a zero-emission component in most of our regulations, both those already adopted and those that are in development, and the vast majority of these regulations are statewide in scope. Beyond the wide array of sources CARB has been regulating over the last few decades, and especially considering those we are driving to zero-emission, there are few sources of emissions left for CARB to implement additional controls upon under its authorities for PM2.5 contingency purposes in the San Joaquin Valley. The few source categories that do not have control measures are primarily-federally and internationally regulated.

Given the courts' decisions over the last few years, CARB will need to implement contingency measures that, when triggered, would achieve one year's worth of progress, or at least the relevant portion equivalent to the contribution of sources primarily regulated at the State and local level, unless a reasoned justification for achieving less emission reductions can be provided. Considering the air quality challenges California faces, if a measure achieving such reductions were feasible, CARB would implement the measure to support expeditious attainment of the NAAQS as the Clean Air Act requires rather than withhold it for contingency measure purposes. Further, should there be a measure achieving the required emission reductions, the measure would likely take more than 1-2 years to implement during which time the expected emission benefits would be reduced due to natural turnover of equipment.

At this time, CARB has not identified feasible contingency measures for the 15 ug/m^3 and 12 ug/m^3 annual and 35 ug/m^3 24-hour NAAQS in the San Joaquin Valley. CARB continues to assess opportunities for identifying feasible contingency measures.

6. SUMMARY OF CONTINGENCY MEASURE REDUCTIONS

Based on the evaluation of potential contingency measures that could contribute towards the Valley meeting the Clean Air Act requirements, the following table summarizes and compares the emission reduction requirements under the OYW_P approach and what is being achieved through the proposed measures.

Table 17 Comparison of Emission Reductions from Selected Measures to Requirements under RFP and OYWP

PM2.5 Standard	PM2.5 (tons/day)		NOx (tons/day)	
	OYW_P Approach	Selected Measures	OYW_P Approach	Selected Measures
1997 Annual	0.41	0.69	7.91	0.1
2006 24-hour	0.52	0.69	6.66	0.1
2012 Annual	0.43	0.69	8.65	0.1

In comparing the emission reductions that would be achieved through the selected contingency measures against the requirements of the OYW_P approach, it is clear that there is a surplus in PM2.5 emission reductions, and a shortfall in NOx emission reductions. However, through PM2.5 and NOx interpollutant trading ratios that have

been established through photochemical modeling analysis that has been conducted for the San Joaquin Valley, the surplus in PM2.5 emission reductions can be traded for NOx emission reductions. Recent modeling analysis for PM2.5 in the Valley has shown that emission reductions in direct PM2.5 is 6 times more effective than NOx emission reductions when observing the change in the Valley's PM2.5 design value measured in $\mu g/m^3$.[36] This means that an emission reduction of 1 ton per day of direct PM2.5 is as effective at reducing the Valley's PM2.5 design value as 6 tons per day of NOx emission reductions.

By using this ratio, the remaining NOx emissions reductions needed to completely fulfill the OYW_P requirements would be reduced. The following table, which assumes that the OYW_P approach will be finalized by EPA, display how using this trading ratio would be used to close the required NOx emission reduction gap.

Table 18 Surplus PM2.5 Emission Reductions Traded for NOx

PM2.5 Standard	PM2.5 (tons/day)			NOx (tons/day)				
	OYW_P Approach (A)	Selected Measures (B)	Balance (C: B-A)	OYW_P Approach (D)	Selected Measures (E)	Initial Balance (F: E-D)	PM2.5 Surplus to NOx (6:1 Plan ratio) (G: C*6)	Remaining Balance *(including mobile source emissions)* (F+G)
1997 Annual	0.41	0.69	0.28	7.91	0.10	(7.81)	1.68	(6.13)
2006 24-hr	0.52	0.69	0.17	6.66	0.10	(6.56)	1.02	(5.54)
2012 Annual	0.43	0.69	0.26	8.65	0.10	(8.55)	1.56	(6.99)

Through this approach, the Valley's contingency submittal fulfills the direct PM2.5 emission reduction requirements, and through trading surplus PM2.5 emission reductions for NOx, the remaining NOx reductions required has been reduced. As shown earlier in the document, there are no other technically feasible measures that can be implemented and that fit within the constraints of contingency measure requirements to further minimize this emission reduction need for NOx. Based on the analysis here and the technical infeasibility analysis earlier in this document, the Valley fulfills the contingency measure requirements for the federal PM2.5 standards.

6.1 Jurisdictional Considerations on Fulfilling OYW_P Requirements

As the District only has jurisdiction over a portion of the sources of direct PM2.5 and NOx sources in the Valley, it is important to consider what the OYW_P calculation and obligation would be for contingency measures emission reductions when only focused on what the District can control. This approach would result in an OYW_P value over which the District can take direct action to satisfy, while relying on state and EPA actions on sources over which they have jurisdictional control to address the overall OYW_P called for under EPA guidance.

[36] SJVAPCD. *Progress Report and Technical Submittal for the 2012 PM2.5 Standard San Joaquin Valley.* October 19, 2021. https://ww2.arb.ca.gov/sites/default/files/2021-11/SJV_Progress_Report_Technical_Submittal_2012_PM25_Standard.pdf

Following the approach already used and described in Section 3 of this document, the penultimate step of the calculation for OYW_P is calculating the tons per day change per year over the planning timeline as a percentage of the base year; however, in this jurisdictional approach, we would then apply this percentage to the District controlled attainment inventory in the future year. This would focus the analysis on the proportional portion of the total attainment future year inventory over which the District has jurisdiction.

Through this approach, contingency measure emission reduction obligations for direct PM2.5 and NOx are decreased, and thereby, the surplus in direct PM2.5 emission reductions is increased, as well as the resulting NOx emission reductions when the interpollutant trading ratio is applied. The following table displays the results of these calculations.

Table 19 Surplus PM2.5 Emission Reductions Traded for NOx for Sources under District's Jurisdiction

PM2.5 Standard	PM2.5 (tons/day)			NOx (tons/day)				
	OYW_P Approach (A)	Selected Measures (B)	Balance (C: B-A)	OYW_P Approach (D)	Selected Measures (E)	Initial Balance (F: E-D)	PM2.5 Surplus to NOx (6:1 Plan ratio) (G: C*6)	Remaining Balance (F+G)
1997 Annual	0.35	0.69	0.34	1.87	0.10	(1.77)	2.02	0.25
2006 24-hr	0.46	0.69	0.23	1.94	0.10	(1.84)	1.41	(0.43)
2012 Annual	0.36	0.69	0.33	1.73	0.10	(1.63)	1.96	0.33

As a result of this analysis focused specifically on District emissions jurisdictional control, through the District's proposed contingency commitments, the direct PM2.5 and NOx OYW_P targets are fully or almost fully addressed, highlighting the need to achieve continued fair-share emissions reductions from mobile sources, particularly with respect to federally-regulated mobile sources.

7. FEDERAL CONTINGENCY MEASURE OPPORTUNITIES

As described above, for decades, the District has promulgated and implemented measures to reduce emissions from sources of air pollution under its regulatory authority. The District has also deployed innovative measures to reduce emissions from mobile and indirect sources of air pollution that fall outside its traditional regulatory authority with stationary sources. The District continues to seek additional local emissions reductions, but the Valley has reached a point where attainment of the health-based standards established under the Federal Clean Air Act is not viable without significant quantifiable and enforceable reductions in emissions from mobile sources that fall exclusively under federal jurisdiction such as interstate heavy-duty trucks, locomotives, aircraft, and other mobile sources. The South Coast air basin and

other nonattainment areas find themselves in similar situations. With newly established federal air quality standards, many other regions throughout the nation will also face similar difficulties.

Under current law, local jurisdictions could be subject to devastating federal sanctions even though failure to attain the standards may be due to emissions from sources under federal jurisdiction. These federal sanctions include:

- Permitting barriers for new and expanding businesses (2:1 offset requirement)
- Loss of billions of federal highway funds and numerous jobs lost in the San Joaquin Valley
- Federal takeover and loss of local control
- Expensive federal nonattainment penalties

CARB's primary regulatory authority is the regulation of mobile sources of emissions. Mobile sources are the largest contributor to criteria pollutant and air toxic emissions (e.g. diesel particulate matter) in the San Joaquin Valley and throughout the State. In recent Valley attainment plans for PM2.5 and ozone, a large piece of the overall emissions reduction commitment has come from mobile source measures under the jurisdiction of CARB. CARB's progress in developing and implementing these measures has contributed to the substantial improvements in Valley air quality, and will continue to do so in the future.

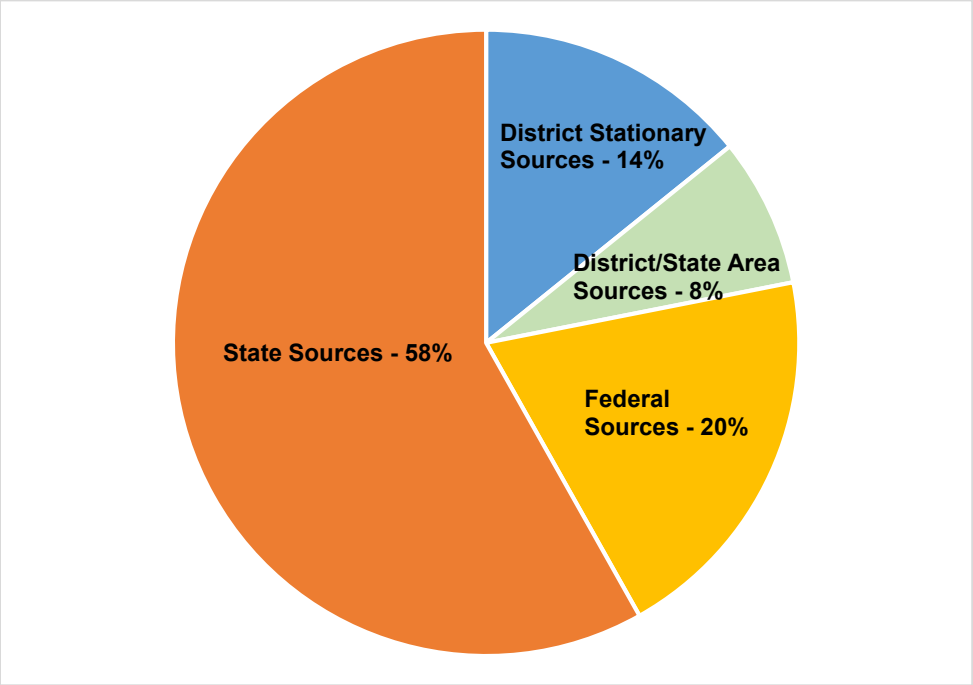
Although CARB has promulgated stringent mobile source measures for vehicles and fleets in California, emissions from interstate heavy-duty trucks, locomotives, and other federal mobile sources have not been reduced as significantly. Considering the continuing emissions reductions from sources regulated by the District and CARB, and the remaining challenges under federal air quality standards, it is increasingly critical that the federal government take action to reduce emissions from sources under federal regulatory control.

As an example of this, and as displayed in Section 5, the level of NOx emissions from mobile sources across the state is now dominated by federal sources under the jurisdiction of the federal EPA, highlighting the importance of the advocacy for tighter national emissions standards for interstate sources like heavy-duty trucks, locomotives, aircraft, and other sources. Ongoing emissions reductions from these sources will be key for the Valley to improve air quality and meet the latest federal air quality standards.

Specifically for the San Joaquin Valley, and focusing on the current NOx emission inventory for 2023, the figure below shows that emissions from stationary sources and under the jurisdiction of the District make up 14% of the total NOx emissions inventory for the region. Area sources of NOx, which fall under the jurisdiction of both the District and CARB, make up 8% of the emissions, while the remaining 78% of the NOx emissions in the Valley come from mobile sources. As the chart indicates, sources under federal jurisdiction makes up a significant portion of the overall NOx pollution in the region, now at 20% of the total. As what is occurring statewide, a similar shift could

occur in the Valley, where as ongoing mobile source emission reductions under the state jurisdiction are being achieved through CARB's strategies, the NOx emissions under federal jurisdiction will continue to become a larger portion of the remaining pollution in the region, highlighting the critical importance of EPA regulatory action on these sources.

Figure 4 San Joaquin Valley 2023 NOx Emissions by Category



With stringent planning requirements and shortened attainment timeframes under the Clean Air Act for PM2.5, securing additional NOx reductions from federal mobile sources is vital. In light of EPA currently reviewing the PM2.5 standards to potentially establish more stringent standards, which would establish a new tight planning and attainment deadline cycle, increasing the stringency of federal emissions standards and providing funding support for interstate mobile sources will become even more important.

Significant State and Federal Funding Opportunities

Through strong collaboration with state agencies and residents, businesses, public agencies, community-based organizations, and other stakeholders, the San Joaquin Valley has served as a center of innovation for many of the state's recent transformative clean air, low carbon strategies. As a related important opportunity that could play a major role in assisting the San Joaquin Valley and other Extreme ozone and Serious PM2.5 nonattainment areas, recent state and federal budget and funding actions have created unprecedented opportunities for investing in transformational clean technology changes across the mobile source sector. At the federal level, recent authorizations under the Infrastructure Investment Jobs Act (IIJA) and Inflation Reduction Act (IRA)

provide wide-ranging funding for a variety of important clean technology and infrastructure programs. Notably, IRA includes an estimated $369 billion in funding for climate and energy-related programs, and over $20 billion in new funding for sustainable agriculture and programs of importance to the San Joaquin Valley. Given the Valley's air quality challenges, EPA and other federal agencies must prioritize these new funding opportunities for Serious and Extreme nonattainment areas, and provide opportunities for incentive-based contingency measures, taking into consideration that areas such as the Valley have limited additional opportunities for regulatory strategies given the level of stringency of District rules.

Current EPA Actions to Reduce Emissions under Federal Jurisdiction

In addition to the analysis and commitments within this document, the District and CARB urge the federal government to develop contingency measures for federal sources, which make up a significant portion of the District's emissions inventory, and will continue to become more significant over the coming years. To provide context on the make-up of the remaining sources of emissions in the Valley, mobile sources now account for over 80% of PM2.5-forming NOx emissions in the region, with statewide mobile source emissions under federal jurisdiction now surpassing those under California jurisdiction. It is becoming critically important for the EPA to be strong partners in reducing emissions in California and the Valley to meet the current air quality standards, including helping in meeting contingency requirements for the region.

As the District continues to work with CARB and EPA on addressing federal air quality standards, there are a number of time-sensitive opportunities for achieving significant additional emissions reductions from mobile sources, including opportunities for reductions from heavy-duty trucks, locomotives, and other mobile sources.

The District Governing Board has previously submitted petitions to the federal government requesting that they reduce their fair share of emissions in an equitable manner through more stringent national standards for heavy-duty trucks and locomotives.[37] In response to the District and similar petitions submitted by CARB and South Coast AQMD, on March 3, 2022, EPA proposed a rule to reduce emissions from new heavy-duty trucks nationwide. The District is participating in this regulatory process to communicate the Valley's need for emissions reductions from this sector. In addition, in November 2022, and in response to the District's petition, EPA committed to conducting regulatory analyses to consider the potential of setting a national standard for locomotives.[38] Subsequently, on April 12, 2023, EPA issued a Notice of Proposed Rulemaking (NPRM) to propose more stringent standards to reduce greenhouse gas

[37] SJVAPCD. *Petition Requesting that EPA Adopt New National Standards for On-Road Heavy-Duty Trucks and Locomotives under Federal Jurisdiction.* Retrieved from: https://www.epa.gov/sites/default/files/2016-11/documents/san_joaquin_valley_petition_for_hd_and_locomotive.pdf

[38] EPA. *Letter to San Joaquin Valley Air Pollution Control District from the U.S. Environmental Protection Agency.* Retrieved from: https://www.epa.gov/system/files/documents/2022-11/locomotive-regs-san-joaquin-regs-petition-response.pdf

emissions from heavy-duty vehicles beginning in model year 2027.[39] As part of this action, EPA is also proposing to revise its regulations addressing preemption of state regulation of locomotives. On April 12, 2023, in a separate action, EPA proposed standards to further reduce criteria pollutants and greenhouses gases from light-duty and medium-duty vehicles starting with model year 2027, building on EPA's final standards for model years 2023 through 2026. The proposed standards would be phased in starting in 2027 through 2032.[40]

Conclusion

While the above strategies, if finalized by EPA, would reduce emissions in the long-term, they do not assist the District and CARB in addressing needed contingency measures for the following reasons:

- The proposed measures are currently under development and will take several years for promulgation (if promulgated). In addition to the lengthy period to promulgate the measures, emissions reductions from these measures will be realized in the long-term over an extended period, and not in the rapid, trigger-based, and short-term fashion required for contingency measures.
- EPA's recently promulgated or proposed mobile source emissions standards are not designed to serve as contingency measures. Without meeting all of the requirements for contingency measures (held in reserve, triggered upon various Clean Air Act findings, etc.), federal mobile source regulatory measures currently under development will not assist in addressing contingency measure requirements.

As summarized in Table 18 and Table 19, the District and CARB are able to satisfy contingency requirements as outlined in EPA's draft contingency guidance. However, it is clear that in order for the San Joaquin Valley to identify the total emissions reductions called for under EPA's OYW$_P$, further emissions reductions will be needed from mobile sources, particularly from federally-regulated mobile sources.

8. PUBLIC PROCESS

This Contingency Measure SIP Revision was prepared through an involved public process that provided multiple opportunities for the public and interested stakeholders to offer comments and suggestions. The District held two public workshops in March 2023 and April 2023 to present, discuss, and receive feedback on the development of the

[39] EPA. *Pre-Publication Copy, Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles - Phase 3; Proposed Rule (signed April 12, 2023)*. Retrieved from: https://www.epa.gov/system/files/documents/2023-04/hd-ghg-veh-phase-3-nprm-2023-04.pdf
[40] EPA. *Pre-Publication Copy, Multi-Pollutant Emissions Standards for Model Years 2027 and Later Light-Duty and Medium-Duty Vehicles; Proposed Rule (signed April 12, 2023)*. Retrieved from: https://www.epa.gov/system/files/documents/2023-04/lmdv-multi-pollutant-emissions-my-2027-nprm-2023-04.pdf

District's strategy, and solicited specific feedback on the measures evaluated. This process also included numerous updates at District Governing Board meetings, Citizen Advisory Committee (CAC) meetings, and Environmental Justice Advisory Group (EJAG) meetings. During these updates, meetings, and workshops, the public had the opportunity to provide comment, ask questions, or request additional information. Workshop materials were available in English and Spanish, and the District provided Spanish translation during the workshops. The District also accepted written comments throughout development of this plan.

9. CONCLUSION

Both the District and CARB have decades of experience developing stringent regulations and, as a result, have robust control programs which limit the ability to identify potential contingency measures that achieve surplus reduction. At this time, CARB and the District are including zero-emission and near-zero emission components in most of their regulations, both those already adopted and those that are in development. Beyond the wide array of sources the District and CARB have been regulating over the last few decades, and especially considering those they are driving to zero-emission, there are few sources of emissions left for the District and CARB to implement additional controls upon under its authorities. The few source categories that do not have control measures are primarily-federally and internationally regulated.

To fulfill contingency measure requirements, the District is amending Rule 4901. The SIP revision and rule revision included in this document will be submitted to CARB and EPA for approval and inclusion into the California SIP.

This page intentionally blank.

APPENDIX A

Proposed Amendments to Rule 4901

This page intentionally blank.

RULE 4901 WOOD BURNING FIREPLACES AND WOOD BURNING HEATERS (Adopted July 15, 1993; Amended July 17, 2003; Amended October 16, 2008; Amended September 18, 2014; Amended June 20, 2019; Amended [*rule adoption date*])

1.0 Purpose

The purpose of this rule is to limit emissions of carbon monoxide and particulate matter from wood burning fireplaces, wood burning heaters, and outdoor wood burning devices.

2.0 Applicability

This rule applies to:

2.1 Any person who manufactures, sells, offers for sale, or operates a wood burning fireplace, wood burning heater, or outdoor wood burning device.

2.2 Any person who sells, offers for sale, or supplies wood intended for burning in a wood burning fireplace or wood burning heater.

2.3 Any person who sells or transfers a real property.

2.4 Any person who installs a wood burning fireplace or wood burning heater.

2.5 Section 5.7.3 shall not become applicable until the effective date of the federal Environmental Protection Agency's (EPA) final and full approval of the California State Implementation Plan (SIP) as meeting the contingency measure requirements of the Clean Air Act section 172(c)(9) for San Joaquin Valley for the applicable PM2.5 National Ambient Air Quality Standards (NAAQS).

3.0 Definitions

3.1 APCO: the Air Pollution Control Officer of the San Joaquin Valley Unified Air Pollution Control District.

3.2 ASTM: the American Society for Testing and Materials.

3.3 Consumer: any person other than a distributor or a retailer who buys a wood burning fireplace, wood burning heater, or outdoor wood burning device.

3.4 Distributor: any person other than a manufacturer or a retailer who sells, offers for sale, or supplies wood burning fireplaces, wood burning heaters, or outdoor wood burning devices to retailers or others for resale.

3.5 EPA: the United States Environmental Protection Agency.

3.6 EPA Certified: any wood burning heater that meets the standards set forth in Title 40 Code of Federal Regulations (CFR), Part 60, Subpart AAA and labeled pursuant to those regulations.

3.7 Garbage: any solid, semisolid, and liquid wastes generated from residential, commercial, and industrial sources, including trash, refuse, rubbish, industrial wastes, asphaltic products, manure, vegetable or animal solid or semisolid wastes, and other discarded solid or semisolid wastes.

3.8 Low Mass Fireplace: any fireplace and attached chimney, as identified in ASTM E 2558-7, "Determining Particulate Matter Emissions from Fires in Low Mass Wood-burning Fireplaces," that can be weighed (including the weight of the test fuel) on a platform scale.

3.9 Manufacturer: any person who constructs or imports a wood burning fireplace or wood burning heater.

3.10 Masonry Heater: any site-built or site-assembled, wood burning heating device constructed mainly of masonry materials in which the heat from intermittent fires burned rapidly in its firebox is stored in its structural mass for slow release to the site. Such wood burning heating devices must meet all federal requirements and be designed and constructed per specifications set forth in ASTM E 1602-3, "Guide for Construction of Solid Fuel Burning Masonry Heaters."

3.11 New Wood Burning Heater: any wood burning heater that has not been sold, supplied, or exchanged for the first time by the manufacturer, the manufacturer's distributor or agency, or a retailer.

3.12 Normal Operating Conditions: the operation of a wood burning fireplace or wood burning heater as defined in this rule, except when a fire is started. Startup of a new fire shall not exceed 15 consecutive minutes in any consecutive four-hour period.

3.13 NSPS: New Source Performance Standard. For purposes of this rule the NSPS is the Code of Federal Regulations, Part 60, Title 40, Subpart AAA.

3.14 Outdoor Wood Burning Device: any wood burning fireplace, or other device designed to burn wood, and that is located outside of a building or structure. This includes, but is not limited to, burn bowls, fire rings/pits, and chimineas. This does not include fire pits at state parks, national parks, or national forests.

3.15 Paints: any exterior and interior house and trim paints, enamels, varnishes, lacquers, stains, primers, sealers, undercoaters, roof coatings, wood preservatives, shellacs, and other paints or paint-like products.

3.16 Paint Solvents: any organic solvents sold or used to thin paints or clean up painting equipment.

3.17 Pellet-Fueled Wood Burning Heater: any wood burning heater manufactured for the purpose of heating a space and is intended to operate on pellet fuel.

3.18 Pellet Fuel: includes, but is not limited to, compressed sawdust, compressed paper products, and compressed forest residue, wood chips and other waste biomass, ground nut-hulls and fruit pits, corn, and cotton seed.

3.19 Permanently Inoperable: modified in such a way that a wood burning heater can no longer operate as a wood burning heater.

3.20 PM: particulate matter. PM2.5 has an aerodynamic diameter equal to or less than 2.5 microns. PM10 has an aerodynamic diameter equal to or less than 10 microns.

3.21 Real Property: the land itself and anything that is permanently affixed to the land, such as buildings and structures.

3.22 Remodel: a physical modification to a fireplace or chimney that impacts the physical structure of the fireplace or chimney. Aesthetic modifications that do not affect the physical structure of the fireplace are not considered a remodel, i.e. installing decorative stone/tile in front of fireplace.

3.23 Retailer: any person engaged in the sale of wood burning fireplaces, wood burning heaters, or outdoor wood burning devices directly to the consumer.

3.24 Seasoned Wood: wood of any species that has been sufficiently dried so as to contain 20 percent or less moisture by weight.

3.25 Treated Wood: wood of any species that has been chemically impregnated, painted, or similarly modified to improve resistance to insects or weathering.

3.26 Used Wood Burning Heater: any wood burning heater that has been used at least once, except wood burning heaters that have been used by retailers for the purpose of demonstration.

3.27 Waste Petroleum Product: any petroleum product other than gaseous fuels that has been refined from crude oil, and has been used, and, as a result of use, has been contaminated with physical or chemical impurities.

3.28 Wood Burning Fireplace: any permanently installed masonry or factory built wood burning device designed to be used with an air-to-fuel ratio greater than or equal to 35-to-1.

3.29 Wood Burning Heater: an enclosed, wood burning appliance capable of and intended for space heating (i.e. wood stove, pellet-fueled wood burning heater, or wood burning fireplace insert).

3.30 Wood Burning Season: for purposes of this rule, the months of November, December, January, and February.

4.0 Exemptions

The following devices are exempt from the provisions of this rule:

4.1 Devices that are exclusively gaseous-fueled.

4.2 Cookstoves, as described in Code of Federal Regulations 60.531.

4.3 Any burning occurring on the ground is open burning and is subject to requirements of District Rule 4103.

5.0 Requirements

5.1 Sale or Transfer of Wood Burning Heaters

5.1.1 New wood burning heaters

No person shall advertise, sell, offer for sale, supply, install, or transfer a new wood burning heater unless it is either:

5.1.1.1 EPA certified under the NSPS at time of purchase or installation and at least as stringent as EPA Phase II requirements,

5.1.1.2 A pellet-fueled wood burning heater that is exempt from EPA certification pursuant to requirements in the NSPS, until such time that amendments to the NSPS are finalized to remove exemptions for pellet-fueled wood burning heaters, then all new wood burning heaters must comply with Section 5.1.1.1.

5.1.2 Used wood burning heaters

No person shall advertise, sell, offer for sale, supply, install, or transfer a used wood burning heater unless it has been rendered permanently inoperable, satisfies requirements pursuant to Section 5.1.1, or is a low mass fireplace, masonry heater, or other wood-burning device of a make and model that meets all federal requirements and has been approved in writing by the APCO.

5.1.3 Public Awareness Information

Retailers selling or offering for sale new wood burning heaters shall supply public awareness information with each sale of a wood burning heater in the form of pamphlets, brochures, or fact sheets on the following topics listed in Sections 5.1.3.1 through 5.1.3.6. Public awareness information shall be subject to the review and approval of the APCO.

5.1.3.1 Proper installation, operation, and maintenance of the wood burning heater,

5.1.3.2 Proper fuel selection and use,

5.1.3.3 Health effects from wood smoke,

5.1.3.4 Weatherization methods for the home,

5.1.3.5 Proper sizing of wood burning heaters, and

5.1.3.6 Episodic Wood Burning Curtailment levels as defined in Section 5.7.

5.1.4 Sections 5.1.1 and 5.1.2 do not apply to wood burning heaters subject to Section 5.2.

5.2 Sale or Transfer of Real Property

5.2.1 Effective until December 31, 2019

5.2.1.1 No person shall sell or transfer any real property which contains a wood burning heater without first assuring that each wood burning heater included in the real property is:

5.2.1.1.1 EPA Phase II Certified or has a more stringent certification under the NSPS at time of purchase or installation, or

5.2.1.1.2 A pellet-fueled wood burning heater that was exempt from EPA Certification pursuant to requirements in the NSPS at the time of purchase or installation, or

5.2.1.1.3 Rendered permanently inoperable.

5.2.1.2 Upon the sale or transfer of real property, the seller shall provide to the recipient of the real property, and to the APCO, documentation of compliance with Section 5.2.1.1. Documentation shall be in the form of a statement signed by the seller describing the type(s) of

wood burning heater(s) included in the real property transaction, and any action taken to comply with Section 5.2.1.1. The APCO shall make blank forms available to the public for the purpose of fulfilling this requirement.

5.2.2 Effective on or after January 1, 2020

5.2.2.1 No person shall sell or transfer any real property which contains a wood burning heater without first assuring that each wood burning heater included in the real property:

5.2.2.2.1 Meets certification under the NSPS at time of purchase or installation and is at least as stringent as EPA Phase II requirements,

5.2.2.2.2 Is a pellet-fueled wood burning heater that was exempt from EPA certification pursuant to requirements in the NSPS at the time of purchase or installation, or

5.2.2.2.3 Is rendered permanently inoperable and removed from property.

5.2.2.2 Upon the sale or transfer of any residential real property in the San Joaquin Valley, the seller shall provide to the buyer of the real property and to the APCO, documentation certifying the following:

5.2.2.2.1 The type(s) and number(s) of wood burning heaters and wood burning fireplaces included in the real property transaction. If no wood burning heaters or wood burning fireplaces are included in the real property transaction, this should be documented.

5.2.2.2.2 Any action(s) taken to comply with Section 5.2.2.1.

5.2.2.2.3 Documents required by Section 5.2.2.2 shall be retained by the seller and shall again be made available to the APCO upon request.

5.3 Remodel of Wood Burning Fireplace or Chimney Where Total Cost Exceeds $15,000, Local Building Permit is Required, and Application for Building Permit is Submitted On or After January 1, 2020

5.3.1 A person may only install a gas-fueled, electric, exempt, or EPA certified wood burning heater that meets requirements of NSPS at the time of installation.

5.4 Limitations on Wood Burning Fireplaces or Wood Burning Heaters

5.4.1 Effective until December 31, 2019

For any single or multi-family housing unit, for which construction began on or after January 1, 2004. Construction began when the foundation for the structure was constructed.

5.4.1.1 No person shall install a wood burning fireplace in a residential development with a density greater than two (2) dwelling units per acre.

5.4.1.2 No person shall install more than two (2) EPA Phase II Certified or more stringent certification as currently enforced under NSPS, wood burning heaters per acre in any residential development with a density greater than two (2) dwelling units per acre.

5.4.1.3 No person shall install more than one (1) wood burning fireplace or EPA Phase II Certified or more stringent certification, as currently enforced under the NSPS, per dwelling unit in any residential development with a density equal to or less than two (2) dwelling units per acre.

5.4.2 Effective on or after January 1, 2020

Requirements of Sections 5.4. 2.1 and 5.4. 2.2 do not apply to the retrofit or replacement of an existing wood burning fireplace, low mass fireplace, masonry heater, or wood burning heater to a cleaner device.

5.4.2.1 At elevations below 3,000 feet in areas with natural gas service, no person shall install a wood burning fireplace, low mass fireplace, masonry heater, or wood burning heater.

5.4.2.2 At elevations at or above 3,000 feet or in areas without natural gas service, no more than two (2) EPA certified wood burning heaters, that meet NSPS at time of installation, shall be installed per acre.

5.4.2.2.1 No person shall install more than one (1) EPA certified wood burning heater, that meets NSPS at time of installation, per dwelling unit.

5.4.2.2.2 No person shall install a wood burning fireplace, low mass fireplace, masonry heater, or non-certified wood burning heater.

5.5 Advertising Requirements for Sale of Wood

5.5.1 No person shall sell, offer for sale, or supply any wood which is orally or in writing, advertised, described, or in any way represented to be "seasoned wood" unless the wood has a moisture content of 20 percent or less by weight.

5.5.2 The APCO may delegate to another person or agency the authority to test wood for moisture content and determine compliance with Section 5.5.1.

5.6 Prohibited Fuel Types

No person shall cause or allow any of the following materials to be burned in a wood burning fireplace, wood burning heater, or outdoor wood burning device:

5.6.1 Garbage,

5.6.2 Treated wood,

5.6.3 Non-seasoned wood,

5.6.4 Plastic products,

5.6.5 Rubber products,

5.6.6 Waste petroleum products,

5.6.7 Paints and paint solvents,

5.6.8 Coal, or

5.6.9 Any other material not intended by a manufacturer for use as fuel in a wood burning fireplace, wood burning heater, or outdoor wood burning device.

5.7 Episodic Wood Burning Curtailment

This section shall be in effect annually during the months of November through February.

5.7.1 Level One Episodic Wood Burning Curtailment

A wood burning fireplace, low mass fireplace, masonry heater, outdoor wood burning device, or nonregistered wood burning heater shall not be operated within the geographic region for which a Level One Episodic Wood Burning Curtailment is in effect.

5.7.1.1 For the counties of San Joaquin, Stanislaus, Merced, Kings, and Tulare, the APCO shall declare a Level One Episodic Wood Burning Curtailment for a geographic region whenever the potential for a PM2.5 concentration is forecast to equal or exceed 20 µg/m³ but not exceed 65 µg/m³ for the geographic region.

5.7.1.2 For the counties of Madera, Fresno, and Kern, the APCO shall declare a Level One Episodic Wood Burning Curtailment for a geographic region whenever the potential for a PM2.5 concentration is forecast to equal or exceed 12 µg/m³ but not exceed 35 µg/m³ for the geographic region.

5.7.1.3 A wood burning heater that has an approved and current registration with the District may be operated within the geographic region for which a Level One Episodic Wood Burning Curtailment is in effect provided the wood burning heater:

5.7.1.3.1 Is not fired on a prohibited fuel type pursuant to Section 5.6,

5.7.1.3.2 Is maintained according to manufacturer instructions, and

5.7.1.3.3 Is operated according to manufacturer instructions.

5.7.2 Level Two Episodic Wood Burning Curtailment

A wood burning fireplace, low mass fireplace, masonry heater, outdoor wood burning device, or wood burning heater shall not be operated within the geographic region for which a Level Two Episodic Wood Burning Curtailment is in effect.

5.7.2.1 For the counties of San Joaquin, Stanislaus, Merced, Kings, and Tulare, the APCO shall declare a Level Two Episodic Wood Burning Curtailment for a geographic region whenever the potential for a PM2.5 concentration is forecast to exceed 65 µg/m³ or a PM10 concentration is forecast to equal or exceed 135 µg/m³ for the geographic region.

5.7.2.2 For the counties of Madera, Fresno, and Kern, the APCO shall declare a Level Two Episodic Wood Burning Curtailment for a geographic region whenever the potential for a PM2.5 concentration is forecast to exceed 35 µg/m³ or a PM10 concentration is forecast to equal or exceed 135 µg/m³ for the geographic region.

5.7.3 Contingency Provision

~~Notwithstanding Sections 5.7.1 and 5.7.2, on and after sixty days following the effective date of EPA final rulemaking that the San Joaquin Valley Air Basin has failed to attain the 1997, 2006, or 2012 National Ambient Air Quality Standard by the applicable attainment date specified in the EPA-approved *2018 Plan for the 1997, 2006, and 2012 PM2.5 Standards* adopted by the District Governing Board on November 15, 2018,the District shall notify the public of an Episodic Curtailment for the PM2.5 curtailment levels described in Sections 5.7.1.2 and 5.7.2.2 for any county that has failed to attain the applicable standard.~~

The effective date of this provision shall be 60 days after the issuance of a final determination by EPA, pursuant to 40 CFR *§* 51.1014(a), that the San Joaquin Valley has failed to meet one or more of the following Trigger Elements of the applicable PM2.5 NAAQS:

(1) Any Reasonable Further Progress requirement;
(2) Any quantitative milestone;
(3) Submission of a quantitative milestone report; or
(4) Attainment of the applicable PM2.5 NAAQS by the applicable attainment date.

The Contingency Provisions for the Level One and Level Two Episodic Wood Burning Curtailment shall be implemented in the following order: Paragraph (A) shall be implemented, upon the effective date of the first of any determination by EPA of failure to meet a Triggering Element; and paragraph (B) shall be implemented upon the effective date of any subsequent determination by EPA of failure to meet a Triggering Element as follows:

(A) Level One curtailment threshold of 12 µg/m³ and Level Two curtailment threshold of 35 µg/m³, upon failure to comply with any one of the Trigger Elements, will be in place for all Valley counties;

(B) Level One curtailment threshold of 11 µg/m³ and Level Two curtailment threshold of 35 µg/m³ will be in place for all Valley counties, upon failure to comply with any two of the Trigger Elements.

5.7.4 The following wood burning fireplaces and wood burning heaters are not subject to the provisions of Section 5.7.1 and 5.7.2:

5.7.4.1 Those in locations where natural gas service is not available. For the purposes of this rule, propane and butane are not considered natural gas, or

5.7.4.2 Those for whom a wood burning fireplace or wood burning heater is the sole available source of heat in a residence. This includes times of temporary service outages, as determined by the gas or electrical utility service.

5.7.5 Episodic Wood Burning Curtailment Notice

The APCO shall notify the public of each Episodic Wood Burning Curtailment by any of the following methods:

5.7.5.1 Provide notice to newspapers of general circulation within the San Joaquin Valley.

5.7.5.2 Broadcast of messages presented by radio or television stations operating in the San Joaquin Valley.

5.7.5.3 A recorded telephone message for which the telephone number is published.

5.7.5.4 Messages posted on the District's website, www.valleyair.org.

5.7.5.5 Any other method as the APCO determines is appropriate.

5.8 Visible Emissions Limitations

5.8.1 Under normal operating conditions, no person shall cause or allow any visible smoke from a registered wood burning heater.

5.8.2 Under normal operating conditions, no person shall cause or allow from a wood burning fireplace or nonregistered wood burning heater a visible emission of any air contaminant, other than uncombined water vapor, that exceeds No. 1 on the Ringelmann Chart or 20 percent opacity for a period or periods aggregating more than 3 minutes in any one (1) hour.

5.9 Registration of Wood Burning Heaters

5.9.1 Eligibility for Registration

A wood burning heater is eligible to be registered with the District provided it is either:

5.9.1.1 Meeting certification under the NSPS at time of purchase or installation and is at least as stringent as EPA Phase II requirements, or

5.9.1.2 A pellet-fueled wood burning heater exempt from EPA certification requirements pursuant to requirements in the NSPS at the time of purchase or installation.

5.9.1.3 Wood burning heaters which do not meet the requirements of Section 5.9.1.1 or 5.9.1.2 are ineligible for registration.

5.9.1.4 Any registration of a wood burning heater which does not meet eligibility requirements is invalid.

5.9.2 Registration Process

Persons applying to register a wood burning heater shall:

5.9.2.1 Submit a completed application and supplemental documentation demonstrating compliance with the eligibility requirements specified in Section 5.9.1 to the District. Supplemental documentation shall include the following:

5.9.2.1.1 Receipt or invoice from the installation or purchase that includes the manufacturer and model name of the wood burning heater, or

5.9.2.1.2 A certification from a District Registered Wood Burning Heater Professional verifying that the wood burning heater meets eligibility requirements pursuant to Section 5.9.1.

5.9.2.1.3 If the wood burning heater was purchased and/or installed more than one year prior to registration with the District, the person must show proof of inspection of the wood burning heater from a District Registered Wood Burning Heater Professional.

5.9.2.2 Pay a registration fee as required by Section 3.0 of District Rule 3901 (Fees for Registration of Wood Burning Heaters).

5.9.2.3 Operate the wood burning heater in compliance with the requirements in Section 5.6 and Section 5.7.

5.10 Renewal of Registration

5.10.1 Registration shall be valid for a period of up to three wood burning seasons from the date of registration issuance, unless the holder of the certificate is disqualified pursuant to Section 5.11.

5.10.2 Registration may be renewed by complying with the following requirements:

5.10.2.1 Complete and submit to the District a Registration Renewal application with verification that the wood burning heater has been inspected by District Registered Wood Burning Heater Professional to verify that it is maintained pursuant to manufacturer specifications.

5.10.2.2 Payment of a registration renewal fee as required by Section 4.0 of District Rule 3901.

5.10.3 Failure to comply with Sections 5.10.1 or 5.10.2 may result in disqualification of registration.

5.11 Disqualification of Registration

5.11.1 If the District finds a registered wood burning heater is operated in violation of the requirements of this rule, the registration may be disqualified, provided that notice and an opportunity for an office conference was afforded pursuant to Section 5.11.4.

5.11.2 A registration disqualified pursuant to Section 5.11.1 may be reinstated if subsequent to the disqualification the operator of the wood burning heater demonstrates compliance with the requirements of Section 5.6 and Section 5.7.

5.11.3 Persons with a disqualified registration pursuant to Section 5.11.1 may appeal the determination by petitioning to the APCO.

5.11.4 Notice of Preliminary Disqualification Determination

If the District makes a preliminary determination that a registered unit is in violation of Section 5.0, the following actions shall be taken:

5.11.4.1 Notify the person who registered the wood burning heater, in writing, that the District has made a preliminary disqualification determination and pursuant to Section 5.11.1 the District may cancel the registration 30 calendar days after the date on the notice. The notice shall include all of the relevant facts relating to the preliminary determination that are known to the District at the time of the notice.

5.11.4.2 Request as part of the notification required by Section 5.11.4.1 that the person who registered the wood burning heater confer with the District, in an office conference within 30 calendar days of the date on the notice to discuss the facts relating to the preliminary disqualification determination.

5.11.4.3 Conduct the office conference required by Section 5.11.4.2 provided that the person who registered the wood burning heater accepts the request for the office conference.

5.11.5 Setting Aside a Disqualification

A disqualification determination pursuant to Section 5.11.1 shall be set aside by the APCO if the petitioner demonstrates to the satisfaction of the APCO that the violations forming the basis for the disqualification were the result of circumstances beyond the reasonable control of the petitioner and could not have been prevented by the exercise of reasonable care.

5.12 Registration of Wood Burning Heater Professionals

5.12.1 To qualify to register as a Wood Burning Heater Professional with the District the applicant must meet one of the following criteria; this must be active, valid, and current:

5.12.1.1 Fireplace Investigation Research and Education (F.I.R.E.) Certified Inspector, or

5.12.1.2 Chimney Safety Institute of America (CSIA) certification, or

5.12.1.3 National Fireplace Institute (NFI) certification, or

5.12.1.4 A person determined to be qualified to perform inspections, maintenance, and cleaning activities on wood burning heaters by the APCO.

5.12.2 Persons applying to register as a Wood Burning Heater Professional with the District shall:

5.12.2.1 Submit a completed application for registration to the District.

5.12.2.2 Submit any necessary supplemental documents as determined by the APCO as necessary to verify statements and qualifications as presented in the application for registration.

5.12.2.3 If the applicant does not have a certification pursuant to Sections 5.12.1.1 through 5.12.1.3 the applicant may submit an application to the APCO with supplemental documentation verifying that the applicant meets the certification standards as required by certifications pursuant to Sections 5.12.1.1 through 5.12.1.3.

5.12.3 Registration as a Wood Burning Heater Professional with the District is valid for up to three years from the date of issuance.

5.12.4 The District shall maintain a list of registered Wood Burning Heater Professionals on the District web page.

5.13 Inspection of Registered Wood Burning Heaters

The District has the right of entry for the purpose of inspecting any wood burning heater registered with the District in order to enforce or administer this rule.

6.0 Administrative Requirements

6.1 Upon request of the APCO, the manufacturer shall demonstrate that each wood burning heater subject to the requirements of Sections 5.1 or 5.2 is compliant with said requirements.

6.2 The person who registers the wood burning heater shall retain a copy of the District issued registration and make it available upon request.

7.0 Test Methods

7.1 Moisture content of wood shall be determined by the current version of ASTM Test Method D 4442.

7.2 Compliance with visible-smoke free operation of the wood burning heater pursuant to Section 5.8.1 shall be determined using EPA Method 22 (Visible Determination of Fugitive Emissions from Material Sources and Smoke Emissions from Flares).

7.3 Compliance with the visible emission limit pursuant to Section 5.8.2 shall be determined using US EPA Method 9 for visual determination of the opacity of emissions.

This page intentionally blank.

APPENDIX B

Rule Consistency Analysis for Rule 4901

This page intentionally blank.

RULE CONSISTENCY ANALYSIS FOR PROPOSED AMENDMENTS TO RULE 4901 (WOOD BURNING FIREPLACES AND WOOD BURNING HEATERS)

SUMMARY

Pursuant to Sections 40727 and 40727.2 of the California Health and Safety Code, prior to adopting, amending, or repealing a rule or regulation, the District performs a written analysis that identifies and compares the air pollution control elements of the rule or regulation with corresponding elements of existing or proposed District rules, existing statues, and state and federal rules, regulations, and guidelines that apply to the same source category. The rule elements analyzed are emission limits, monitoring and testing requirements, recordkeeping and reporting requirements, and operating parameters and work practice requirements. Amendments to Rule 4901 do not conflict with any District or federal rules, regulations, or policies applicable to similar stationary sources, as demonstrated below.

District Rules

There are no other District prohibitory rules or regulations or fee rules tailored specifically for wood burning fireplaces or wood burning heaters; therefore, there are no rules in conflict with or inconsistent with the requirements of Rule 4901.

State Rules, Regulations, and Policies

There are no identified California state rules, regulations, or policies specific to reducing emissions from residential wood combustion.

Federal Rules, Regulations, and Policies

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). 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.

EPA New Source Performance Standard (NSPS)

On April 2, 2020, EPA published amendments to the 2015 NSPS for New Residential Wood Heaters, New Hydronic Heaters and Forced-Air Furnaces (collectively referred to as “wood heating devices”).[1] These amendments maintain compliance dates

[1] EPA. *Standards of Performance for New Residential Wood Heaters, New Residential Hydronic Heaters and Forced-Air Furnaces; Final Rule*. 85 Fed. Reg. 64, pp. 18448-18455. (April 2, 2020). Retrieved from: https://www.govinfo.gov/content/pkg/FR-2020-04-02/pdf/2020-05961.pdf

established in the original NSPS, removed the pellet fuel minimum requirements from the 2015 NSPS, and clarified requirements regarding the use of unseasoned wood in the pellet fuel production. Rule 4901 continues to be as stringent as the NSPS.

APPENDIX C

Emission Reduction Analysis for Rule 4901

This page intentionally blank.

EMISSION REDUCTION ANALYSIS FOR PROPOSED AMENDMENTS TO RULE 4901 (WOOD BURNING FIREPLACES AND WOOD BURNING HEATERS)

SUMMARY

The proposed amendments to District Rule 4901 (Wood Burning Fireplaces and Wood Burning Heaters) would reduce thresholds for wood burning curtailments pursuant to EPA contingency measure requirements, per Section 5.7, only after certain Clean Air Act required contingency triggers occur. The triggerable contingency measures are estimated to achieve 0.69 tpd of PM2.5 and 0.10 tpd NOx on an annual average basis.

EMISSION REDUCTIONS FROM PROPOSED EPISODIC TIERED CURTAILMENT CONTINGENCY MEASURES

This analysis will estimate the emissions reductions from triggerable contingency measures in the proposed amendment to District Rule 4901. Proposed contingency measures, if triggered, would lower the episodic wood burning thresholds upon certain triggers as specified in Section 5.7 of the proposed rule.

The contingency measures would be triggered upon the issuance of a final determination by EPA that the District has failed to comply with the following requirements pursuant to Clean Air Act Section 172(c)(9) or 40 CFR § 51.1014(a) for any of the PM2.5 NAAQS:

1. Meet any Reasonable Further Progress (RFP) requirement;
2. Meet any quantitative milestone;
3. Submit a quantitative milestone report; or
4. Attain by the applicable attainment date.

The calculation methodology in this analysis is based on the District's *2015 Area Source Emissions Inventory Methodology 610 – Residential Wood Combustion* document.[1] This analysis consists of two steps:

- Step One: Determine the daily emissions from wood burning devices. Registered devices are allowed to burn during level one episodic wood burning curtailment, per section 5.7 of the proposed rule, while unregistered devices are prohibited from operating under both level one and level two episodic wood burning curtailments.
- Step Two: Determine the emission reductions from additional episodic wood burning curtailment due to the proposed lower curtailment thresholds, using the calculated daily emissions from step one and estimated additional days of curtailment.

The following details each of these steps.

[1] SJVAPCD. *2015 Area Source Emissions Inventory Methodology 610 – Residential Wood Combustion.* Retrieved from: https://www.valleyair.org/Air_Quality_Plans/EmissionsMethods/MethodForms/Current/ResidentialWoodCombustion2016.pdf

Step One: Determine daily average emissions from registered and unregistered wood burning devices

The emissions inventory is divided into two categories, one for fireplaces and one for wood stoves. The inventory is reported as a winter average, distributing the emissions over a 180 day period. For this analysis the inventory will be distributed into emissions from registered and unregistered devices on days they are allowed to be operated. This distribution of the inventory emissions was based on a mathematical model of residential wood burning emissions, represented by the following system of 6 equations:

Equation 1 $$I_W = L_0 E_{NC} + (L_0 + f_R L_1) E_C$$

Equation 2 $$I_F = L_0 E_F$$

Equation 3 $$E_R = f_R E_C$$

Equation 4 $$E_U = E_F + E_{NC} + (1 - f_R) E_C$$

Equation 5 $$E_C = f_C E_W$$

Equation 6 $$E_{NC} = (1 - f_C) E_W$$

Where:

E_R = the emissions per day from registered wood burning devices;
E_U = the emissions per day from unregistered wood burning devices;
E_F = the emissions per day from all fireplaces;
E_W = the emissions per day from all wood stoves;
E_C = the emissions per day from certified wood stoves eligible for registration;
E_{NC} = the emissions per day from uncertified wood stoves;
I_F = the winter emissions inventory from fireplaces, in tons per winter season;
I_W = the winter emissions inventory from wood stoves, in tons per winter season;
L_1 = the average number of days in a wood burning season a level 1 wood burning curtailment is called;
L_0 = the average number of days in a wood burning season no wood burning curtailment is called; and
f_C = the fraction of emissions from wood stoves that are from wood stoves that meet certification requirements making them eligible for registration per §5.9 of the proposed rule; and
f_R = the fraction of woodstoves that are eligible for registration per §5.9 of the proposed rule that are actually registered.

Equation 1 calculates the emissions for a year from wood stoves (I_W). It is represented by the sum of two contributors, essentially the emissions from uncertified wood stoves plus the emissions from certified wood stoves. Where the emissions from uncertified wood stoves is the number of days no curtailments are called (L_0) times the emissions per day from uncertified wood stoves (E_{NC}) that are not eligible for registration. The emissions from certified wood stoves is the sum of the number of days no curtailments are called (L_0) and the number of days level one curtailments are called (L_1) scaled by the fraction of certified devices that are actually registered (f_R) multiplied by the emissions per day from certified wood stoves (E_C).

Equation 2 calculates the emissions for a year from fireplaces (I_F). It is simply the number of days no curtailments are called (L_0) times the emissions per day from fireplaces (E_F)

Equation 3 calculates the emissions per day from registered wood stoves (E_R). It is the fraction of certified wood stoves that are actually registered (f_R) times the emissions per day from certified wood stoves (E_C)

Equation 4 calculates the emissions per day from unregistered wood burning devices (E_U). It is the sum of three terms: the emissions per day from fireplaces (E_F), the emissions per day from uncertified wood stoves (E_{NC}), and the emissions per day from certified wood stoves that are not registered. The last term is calculated by multiplying the fraction of certified wood stoves that are unregistered by the emissions per day from certified wood stoves (E_C). Where the fraction of fraction of certified wood stoves that are unregistered is just one minus the fraction of certified wood stoves that are actually registered ($1 – f_R$)

Equation 5 calculates the emissions per day from certified wood stoves (E_C) as the fraction of wood stove emissions that are from certified wood stoves (f_C) times the daily emissions from wood stoves (E_W).

Equation 6 calculates the emissions per day from uncertified wood stoves (E_{NC}) as the fraction of wood stove emissions that are from uncertified wood stoves ($1 – f_C$) times the daily emissions from wood stoves (E_W).

In these equations L_0, L_1, I_F, I_W, f_R, and f_C can all be found from observed ambient particulate levels (L_0 and L_1), the emissions inventory (I_F and I_W), and the emissions inventory methodology (f_R and f_C), with further details below. The remaining six emissions per day variables (E_R, E_U, E_F, E_W, E_{NC}, E_C) can be determined from this system of six equations. Using a variety of methods, this system of equations can be used to solve for the daily emissions from registered wood burning devices (E_R), see Equation 7 below, and unregistered wood burning devices (E_U), see Equation 8 below, on days in which they are allowed to operate.

Equation 7
$$E_R = \frac{f_R f_C I_W}{L_0 + f_R f_C L_1}$$

Equation 8
$$E_U = \frac{I_F}{L_0} + \frac{(1 - f_R f_C) I_W}{L_0 + f_R f_C L_1}$$

The derivation of these are left as an exercise for the reader.

Determine the Annual Emissions Affected by Wood Burning Curtailments

This analysis uses the same emissions inventory for residential wood burning as the District's *2018 PM2.5 Plan* (CEPAM version 1.05)[2]. This inventory provides emissions

[2] CEPAM: 2016 SIP Baseline Emission Projections v. 1.05 – Winter Average

for residential wood burning from fireplaces and wood stoves and also provides annual and winter season daily averages. For the purposes of this evaluation, the winter season daily average emissions, representative of the 180 days between November and April, will be used as a starting point, as shown by the table below. The emissions inventory used in this analysis for the two EICs affected are static in future years, so this analysis holds any future year for any plan commitments based on the CEPAM version 1.05 inventory. For the purpose of this analysis the 2020 inventory is used, but any year after or including 2017 would yield the same results. Table C-1 below is this emissions inventory.

Table C-1 2020 Winter Season Wood Burning Emissions Inventory (tpd)

County	PM2.5		NOx	
	Wood Stoves	Fireplaces	Wood Stoves	Fireplaces
Fresno	0.7215	0.5937	0.1210	0.0680
Kern (SJV)	0.3905	0.4209	0.0762	0.0509
Kings	0.0566	0.0832	0.0141	0.0092
Madera	0.1280	0.0844	0.0183	0.0089
Merced	0.3373	0.1968	0.0458	0.0224
San Joaquin	0.4019	0.5827	0.0878	0.0683
Stanislaus	0.4167	0.4549	0.0778	0.0535
Tulare	0.3611	0.2616	0.0610	0.0321

The winter season includes the months of November through April (180 days). However, the wood burning season consists of the months of November through February (120 days). Because there is little to no residential wood burning activities during the months of March and April, all emissions are assumed to be limited to the wood burning season months of November through February.

To determine the annual emissions from fireplaces (I_F) and the annual emissions from wood stoves (I_W) used in this analysis the daily winter average emissions from Table C-1 must be multiplied by the 180 days in the winter season. Furthermore, wood burning stoves and fireplaces used in homes without natural gas service are exempted from wood burning curtailments in Rule 4901. As a result the emissions that can be affected by curtailments is reduced to only those homes with natural gas service. Table C-2 lists the percentage of homes with both wood burning devices and natural gas service.

Table C-2 Natural Gas Service Rate

County	With Natural Gas Service
Fresno	92.96%
Kern (SJV)	95.31%
Kings	94.58%
Madera	48.79%
Merced	96.90%
San Joaquin	96.67%
Stanislaus	94.96%
Tulare	94.47%

One further reduction to accurately assess the emissions reductions is by considering the compliance rate of Valley residents who obey the curtailment requirements. The actual compliance rate is likely much higher, but for the purposes of being conservative in our analysis the District has used an 80% compliance rate. Table C-3 contains the total annual emissions, in tons per year (tpy), from homes with piped natural gas service. It is calculated by multiplying the inventory (in Table C-1) by the percentage of homes with natural gas service (Table C-2), the assumed compliance rate (80%), and 180 days in the winter season.

Table C-3 Annual Emissions from Homes with Natural Gas Service (tpy)

County	PM2.5		NOx	
	Wood Stoves (I_W)	Fireplaces (I_F)	Wood Stoves (I_W)	Fireplaces (I_F)
Fresno	96.58	79.47	16.20	9.10
Kern (SJV)	53.59	57.77	10.46	6.99
Kings	7.71	11.33	1.92	1.25
Madera	8.99	5.93	1.29	0.63
Merced	47.07	27.46	6.39	3.13
San Joaquin	55.95	81.11	12.22	9.51
Stanislaus	56.98	62.20	10.64	7.32
Tulare	49.12	35.59	8.30	4.37

Determine the usage of each category of wood stove

Equation 5 and Equation 6 rely on the fraction of wood stove emissions that come from certified wood stoves (f_C). Dividing the daily emissions for wood stoves into emissions from certified and uncertified devices will require looking closer at the wood stove category. The methodology used to determine the emissions inventory in Table C-1 above uses five categories of wood stoves: pellet-fueled, compressed wood logs, conventional, EPA Phase II (non-catalytic), and EPA Phase II (catalytic).

In order to distribute the emissions from the wood stove category, this analysis will rely on the latest fuel usage data for wood stoves in the *2015 Area Source Emissions Inventory Methodology 610 – Residential Wood Combustion.*[3] Table A-12 of that methodology includes baseline data for fuel use as well as emission factors from each type of wood stove. Data in Table C-4 and Table C-5 below are from this source.

[3] SJVAPCD. *2015 Area Source Emissions Inventory Methodology 610- Residential Wood Combustion*. October 18, 2016. Retrieved from: https://www.valleyair.org/Air_Quality_Plans/EmissionsMethods/MethodForms/Current/ResidentialWoodCombustion2016.pdf

Table C-4 All Wood Stoves – Fuel Use (tons/year)

County	Conventional	Phase II, Non-Catalytic	Phase II, Catalytic	Pellets	Compressed Wood Logs
Fresno	6,404	4,522	1,010	5,700	0
Kern (SJV)	3,758	2,101	268	3,932	0
Kings	504	306	39	773	0
Madera	822	1,032	394	877	0
Merced	3,122	1,823	301	1,923	0
San Joaquin	3,514	2,285	397	5,542	0
Stanislaus	4,158	2,421	397	4,429	0
Tulare	3,420	2,166	398	2,480	0

Table C-5 PM2.5 Emission Factors (lb/ton-fuel-burned)

Pollutant	Conventional	Phase II, Non-Catalytic	Phase II, Catalytic	Pellets	Compressed Wood Logs
PM2.5	29.5	14.1	19.6	2.9	25
NOx	2.6	2.28	2	3.8	2.8

Distributing the emissions into each of these categories will allow the emissions to be regrouped into emissions from certified wood stoves and uncertified wood burning devices later in this analysis.

Determine the portion of emissions from each category of wood stove

To calculate the percentage of wood burning stove emissions of a given pollutant in each county by device type, the emissions from each device type is divided by the total emissions of that pollutant from all device types, as shown by the following formula:

Equation 9

$$f_D = \frac{F_D \times EF_D}{\sum_{i=Device\ Types}(F_i \times EF_i)} \times 100\%$$

Where:

f_D = Percentage of emissions for a given device type D;
F_D = Fuel Use for a given device type D; and
EF_D = Emissions factor for a given device type D.

Example: Calculating the percentage of PM2.5 wood stove emissions for conventional wood stoves in Fresno County

$$f_D = \frac{6{,}404\ {}^{tons}/_{year} \times 29.5\ {}^{lbs}/_{ton}}{\left(6{,}404\ {}^{tons}/_{year} \times 29.5\ {}^{lbs}/_{ton}\right) + \left(4{,}522\ {}^{tons}/_{year} \times 14.1\ {}^{lbs}/_{ton}\right) + \cdots} \times 100\%$$

$$= \frac{188{,}913\ {}^{lbs}/_{year}}{288{,}992.61\ {}^{lbs}/_{year}} \times 100\% = 65.4\%$$

This calculation is completed for PM2.5 for each device type and for each county to create Table C-6 below, and for NOx to create Table C-7 below.

Table C-6 Ratio of Contribution to County Wood Stove PM2.5 Inventory

County	Conventional	Phase II, Non-Catalytic	Phase II, Catalytic	Pellets	Compressed Wood Logs
Fresno	65.4%	22.1%	6.8%	5.7%	0.0%
Kern (SJV)	70.5%	18.9%	3.3%	7.3%	0.0%
Kings	67.0%	19.4%	3.5%	10.1%	0.0%
Madera	49.4%	29.7%	15.7%	5.2%	0.0%
Merced	71.2%	19.9%	4.6%	4.3%	0.0%
San Joaquin	64.9%	20.2%	4.9%	10.1%	0.0%
Stanislaus	69.1%	19.2%	4.4%	7.2%	0.0%
Tulare	68.9%	20.9%	5.3%	4.9%	0.0%

Table C-7 Ratio of Contribution to County Wood Stove NOx Inventory

County	Conventional	Phase II, Non-Catalytic	Phase II, Catalytic	Pellets	Compressed Wood Logs
Fresno	32.88%	20.36%	3.99%	42.77%	0.00%
Kern (SJV)	32.53%	15.95%	1.78%	49.74%	0.00%
Kings	26.09%	13.89%	1.55%	58.47%	0.00%
Madera	24.82%	27.33%	9.15%	38.70%	0.00%
Merced	40.22%	20.59%	2.98%	36.21%	0.00%
San Joaquin	25.24%	14.39%	2.19%	58.18%	0.00%
Stanislaus	31.84%	16.26%	2.34%	49.57%	0.00%
Tulare	36.97%	20.53%	3.31%	39.18%	0.00%

Determine the portion of emissions from certified and uncertified wood stoves

The 5 categories in Table C-6 and Table C-7 need to be combined into certified and uncertified categories, to account for the two-tiered curtailment requirement in the rule.

The device types that are certified include EPA Phase II (Non-Catalytic), EPA Phase II (Catalytic), and pellet stoves. Conventional wood stoves and the compressed wood log category are uncertified.

Calculating the percentage of the wood burning stove inventory for each county that is uncertified is accomplished by summing the percentage contributions by county for each device type that is uncertified. Similarly, the percentage of the wood stove emissions from certified devices is calculated by summing the percentage from each certified device type.

Equation 10 $$f_{NC} = f_{Conventional} + f_{Compressed\ Wood\ Logs}$$

Equation 11 $$f_C = f_{Phase\ II,Non\text{-}catalytic} + f_{Phase\ II,Catalytic} + f_{Pellet}$$

Where:

f_U = Percentage of emissions from uncertified wood stoves;
f_C = Percentage of emissions from certified wood stoves; and
$f_{Device\ Type}$= Percentage of emissions from that device type.

Example: Calculating the percentage of wood burning emissions due to certified devices Fresno County.

$$f_C = 22.1\% + 6.8\% + 5.7\% = 34.6\ \%$$

This calculation is completed for both uncertified and certified in each county to generate Table C-8 below.

Table C-8 Baseline Wood Stove Contributions

County	PM2.5		NOx	
	Uncertified	Certified (f_C)	Uncertified	Certified (f_C)
Fresno	65.37%	34.63%	32.88%	67.12%
Kern (SJV)	70.55%	29.45%	32.53%	67.47%
Kings	67.01%	32.99%	26.09%	73.91%
Madera	49.42%	50.58%	24.82%	75.18%
Merced	71.24%	28.75%	40.22%	59.78%
San Joaquin	64.90%	35.10%	25.24%	74.76%
Stanislaus	69.14%	30.87%	31.84%	68.17%
Tulare	68.90%	31.10%	36.97%	63.02%

Note that only f_C is used in Equation 5 and Equation 6, as f_U will always be (1 – f_C).

To determine the fraction of devices that are actually registered (f_R), the number of wood stoves registered is divided by the number of certified wood stoves in the Valley. As of March 20, 2023 there were 1,011 wood burning devices registered with the District. Once again referencing the *2015 Area Source Emissions Inventory Methodology 610 – Residential Wood Combustion.*[4] Table A-5 shows a total of 16,922 homes in the valley with wood stoves in use, and Table A-6 shows the 35.2% of wood stoves are certified. 1,011 registered wood stoves divided by 35.2% of 16,922 wood stoves yields 16.97% of certified stoves are registered. So, f_R is 16.97%.

The final information necessary to determine the daily emissions will be the average number of days curtailments were called in the baseline inventory. Specifically, the

[4] SJVAPCD. *2015 Area Source Emissions Inventory Methodology 610- Residential Wood Combustion*. October 18, 2016. Retrieved from: https://www.valleyair.org/Air_Quality_Plans/EmissionsMethods/MethodForms/Current/ResidentialWoodCombustion2016.pdf

average number of days a level one curtailment is called (L_1) and the average number of days no curtailment is called (L_0).

The CEPAM version 1.05 used in this analysis was prepared prior to the 2019 amendment to District Rule 4901, so the lowered thresholds in that rule were not in effect at the time that inventory was developed. So for this step of the calculations the analysis should be based on the curtailment thresholds in effect prior to that amendment.

To calculate the average number of curtailment days the observed PM2.5 levels from the 2019-2020, 2020-2021, and 2021-2022 wood burning curtailment seasons (November to February) were used. The average number of level 1 days (L_1) represent the number of days the observed PM2.5 levels were between the level 1 and level 2 thresholds inclusive, divided by the number of days PM2.5 observations occurred, times 120 the number of full days in a season. In a few cases some monitoring stations had maintenance preventing the observations, this calculation was done to estimate the average over a 120 day season. Table C-9 shows the thresholds and number of curtailment days observed.

Table C-9 Inventory Baseline Average Curtailment Days

County	Level 1 Threshold µg/m^3	Level 2 Threshold µg/m^3	Level 1 Days (L1)	Level 2 Days	Days with No Curtailment (L0)
Fresno	20	65	64.49	0	55.51
Kern (SJV)	20	65	59.50	0	60.50
Kings	20	65	64.49	0	55.51
Madera	20	65	33.95	0	86.05
Merced	20	65	32.09	0	87.91
San Joaquin	20	65	47.87	0	72.13
Stanislaus	20	65	53.52	0	66.48
Tulare	20	65	52.77	0	67.23

Using the data collected above for I_W, I_F, f_C, f_D, L_0, and L_1 with Equation 7 and Equation 8, the daily emissions for certified and uncertified wood burning devices is calculated. The results are in Table C-10.

Table C-10 Average Daily Residential Wood Burning Emissions by County

County	PM2.5		NOx	
	E_R	E_U	E_R	E_U
Fresno	0.095728	2.964559	0.029361	0.392302
Kern (SJV)	0.042202	1.756955	0.017795	0.253134
Kings	0.007302	0.327216	0.003787	0.048920
Madera	0.008675	0.161290	0.001821	0.019773
Merced	0.025670	0.812758	0.007112	0.098585
San Joaquin	0.044454	1.826224	0.019827	0.268275
Stanislaus	0.043091	1.714939	0.016940	0.239578
Tulare	0.037032	1.193903	0.012183	0.166713

Step Two: Determine Emission Reductions from Additional Curtailment Days

To calculate the potential emission reductions from lower curtailment thresholds, this analysis will determine the increase in number of Level One and Level Two curtailment days. The additional days for each curtailment level are multiplied by the appropriate daily emissions in Table C-10. Since the proposed contingency strategy includes four triggers, this calculation will compare the first trigger to the baseline, then each further trigger to the trigger before it.

Table C-11 Current Baseline Average Curtailment Days

County	Current Level 1 Threshold µg/m^3	Current Level 2 Threshold µg/m^3	Level 1 Days	Level 2 Days	Days with No Curtailment
Fresno	12	35	73.13	19.28	27.59
Kern (SJV)	12	35	74.87	20.72	24.41
Kings	20	65	64.49	0	55.51
Madera	12	35	67.90	3.70	48.4
Merced	20	65	32.09	0	87.91
San Joaquin	20	65	47.87	0	72.13
Stanislaus	20	65	53.52	0	66.48
Tulare	20	65	52.77	0	67.23

The average number of level one and level two curtailments expected to be called for each contingency threshold are shown in Table C-12 Average Level One and Level Two Curtailments by Proposed Contingency Trigger (Days)

County	First Trigger		Second Trigger	
	Level One (12 µg/m^3)	Level Two (35 µg/m^3)	Level One (11 µg/m^3)	Level Two (35 µg/m^3)
Fresno	73.13	19.28	76.79	19.28
Kern (SJV)	74.87	20.72	78.22	20.72
Kings	70.14	22.60	73.46	22.60
Madera	67.90	3.70	72.61	3.70
Merced	69.86	2.34	74.54	2.34
San Joaquin	77.78	5.65	80.44	5.65
Stanislaus	79.45	8.31	82.77	8.31
Tulare	75.29	14.79	80.67	14.79

. The threshold values are shown as [level one threshold]/[level two threshold] in table headers. Since Fresno, Kern, and Madera counties are already subject to the lower thresholds, there is no information to show for those counties in the higher threshold columns.

Table C-12 Average Level One and Level Two Curtailments by Proposed Contingency Trigger (Days)

County	First Trigger		Second Trigger	
	Level One (12 µg/m^3)	Level Two (35 µg/m^3)	Level One (11 µg/m^3)	Level Two (35 µg/m^3)
Fresno	73.13	19.28	76.79	19.28
Kern (SJV)	74.87	20.72	78.22	20.72
Kings	70.14	22.60	73.46	22.60
Madera	67.90	3.70	72.61	3.70
Merced	69.86	2.34	74.54	2.34
San Joaquin	77.78	5.65	80.44	5.65
Stanislaus	79.45	8.31	82.77	8.31
Tulare	75.29	14.79	80.67	14.79

To determine the emissions reductions for each triggered contingency threshold, the number of curtailments is compared to the previous threshold. Table C-13 shows the additional curtailment days that would occur compared to the previous trigger.

Table C-13 Additional Level One and Level Two Curtailments by Proposed Contingency Trigger (Days)

County	First Trigger		Second Trigger	
	Level One (12 µg/m^3)	Level Two (35 µg/m^3)	Level One (11 µg/m^3)	Level Two (35 µg/m^3)
Fresno	0.00	0.00	3.66	-
Kern (SJV)	0.00	0.00	3.35	-
Kings	5.65	22.60	3.32	-
Madera	0.00	0.00	4.71	-
Merced	37.77	2.34	4.68	-
San Joaquin	29.91	5.65	2.66	-
Stanislaus	25.93	8.31	3.32	-
Tulare	22.52	14.79	5.38	-

Finally, to calculate the emissions reduction from each of the contingency triggers simply multiply the additional number of days for a given curtailment level, by the daily emissions of the equipment that would be curtailed at that level. Specifically, the emissions from uncertified wood burning devices (E_U) on Level One days, and the emissions from both the uncertified and certified wood burning devices ($E_U + E_R$) on Level Two days. This is shown in Equation 12.

Equation 12 $$R = E_U A_1 + (E_U + E_R) A_2$$

Where:

R = the emissions reduction from additional curtailment days;
E_U = the emissions per day from uncertified units, per Equation 8;
E_R = the emissions per day from certified units, per Equation 7;
A_1 = the additional Level One curtailment days; and
A_2 = the additional Level Two curtailment days.

Completing this calculation for each triggered contingency threshold for both PM2.5 and NOx results in the emissions reduction shown **Error! Reference source not found.** in Table C-14.

Table C-14 Annual PM2.5 and NOx Emission Reductions by Proposed Contingency Trigger (tons/year)

County	Contingency Thresholds			
	12/35 µg/m^3		11/35 µg/m^3	
	PM2.5	NOx	PM2.5	NOx
Fresno	0.0000	0.0000	10.8503	1.4358
Kern (SJV)	0.0000	0.0000	5.8858	0.848
Kings	9.4089	1.4676	1.0864	0.1624
Madera	0.0000	0.0000	0.7597	0.0931
Merced	32.6598	3.9709	3.8037	0.4614
San Joaquin	65.1917	9.6519	4.8578	0.7136
Stanislaus	59.0776	8.3439	5.6936	0.7954
Tulare	45.0922	6.4002	6.4232	0.8969

The emissions reductions presented above are the total annual reductions. To convert to a tons per day annual average, divide by 365.

Table C-15 Annual Average Emission Reductions by Proposed Contingency Trigger (tons/day)

County	Contingency Thresholds			
	12/35 µg/m^3		11/35 µg/m^3	
	PM2.5	NOx	PM2.5	NOx
Fresno	0.0000	0.0000	0.0297	0.0039
Kern (SJV)	0.0000	0.0000	0.0161	0.0023
Kings	0.0258	0.0040	0.0030	0.0004
Madera	0.0000	0.0000	0.0021	0.0003
Merced	0.0895	0.0109	0.0104	0.0013
San Joaquin	0.1786	0.0264	0.0133	0.0020
Stanislaus	0.1619	0.0229	0.0156	0.0022
Tulare	0.1235	0.0175	0.0176	0.0025
Total	**0.5793**	**0.0817**	**0.1078**	**0.0148**

In total the triggerable contingency measures are estimated to achieve 0.69 tpd of PM2.5 and 0.10 tpd NOx on an annual average basis.

APPENDIX D

Economic Analysis for Rule 4901

This page intentionally blank.

ECONOMIC ANALYSIS FOR AMENDMENTS TO RULE 4901 (WOOD BURNING FIREPLACES AND WOOD BURNING HEATERS)

Pursuant to California Health and Safety Code (CH&SC) requirements, the District has performed a cost effectiveness analysis and socioeconomic analysis to assess the economic impacts of amendments to Rule 4901 in the Valley.

The proposed amendments to Rule 4901 establish a contingency measure provision for the PM2.5 NAAQS that includes enhanced wood burning curtailment thresholds for the counties of San Joaquin, Stanislaus, Merced, Madera, Fresno, Kings, Tulare, and the Valley air basin portion of Kern.

I. COST EFFECTIVENESS ANALYSIS

Per CH&SC Section (§) 40920.6(a), the District conducts absolute and incremental cost effectiveness analyses of available emission control options to evaluate the economic reasonableness of a rule or rule amendment prior to adoption. Absolute cost effectiveness of a control option is the additional annual compliance cost (in dollars per year) of the control technology or technique divided by the emission reduction achieved in tons of pollutant reduced per year (tons/year). Incremental cost effectiveness is the difference in cost between two successively more effective controls, divided by the additional emission reduction achieved.

The costs of the proposed amendments are not anticipated to be significant. For the proposed contingency provision, which will result in additional days of no burning, the costs incurred by Valley residents would be the cost of turning on the home's heating system instead of burning an approved fuel such as seasoned wood or pellets in the home's wood burning heater. Because the cost of the electricity is offset by the cost of the approved fuel, amendments to this rule are considered no cost amendments. The District is aware that some residents burn free wood; however, this is considered an anomaly due to its rarity and will therefore not be accounted for in this analysis.

II. SOCIOECONOMIC ANALYSIS

Pursuant to CH&SC §40728.5, the District conducted a socioeconomic analysis of the proposed rule amendments. This socioeconomic analysis, guided by the CH&SC, examines how rule amendments may impact the San Joaquin Valley's (Valley's) industries and businesses, employment rates, and economy.

A. Socioeconomic Analysis

The CH&SC consists of six specific requirements. The discussion of the necessity of amending Rule 4901 is discussed further in the staff report. The emission reductions potential of amendments to the rule are discussed in

Appendix C (Emission Reduction Analysis). The other CH&SC requirements for a socioeconomic analysis are satisfied through this appendix.

Type of industries or businesses, including small businesses, affected by amendments to the rule

A socioeconomic impact is any effect to the Valley's employment or economy due to a regulatory action. The following groups that could potentially be affected by these rule amendments are manufacturers of the devices, retailers who sell the devices and associated fuels, retailers who sell the seasoned wood for fireplaces, and Valley residents who live in homes with fireplaces or wood burning heaters that do not qualify to be registered with the District.

There are no manufacturers of wood burning heaters in the Valley. Retailers who sell residential wood burning devices and associated fuels are in a position to increase profits due to the estimated increase in Valley residents who will upgrade their existing fireplaces and older more polluting devices for EPA certified devices. Retailers who sell the seasoned wood for fireplaces may potentially experience some decrease in profits due to the additional No Burn days. No significant socioeconomic impacts are expected to result from rule amendments.

Availability and cost effectiveness of alternatives to the rule amendments

There are no alternatives to lowering the episodic wood burning curtailment thresholds and the costs are not significant; therefore, there would be no increased cost.

Impact of amendments on employment and the economy of the region

Because this is essentially a no cost rule and the socioeconomic impacts on Valley businesses and industries is not significant, no impact is anticipated on employment or the economy of the region.

B. Additional Socioeconomic Analyses

Per the *2011 Economic Analysis Process Recommendations* document, District staff is advised to include additional analyses as a part of each socioeconomic analysis for new or amended rules. As such, the District also evaluated the costs and socioeconomic impacts from previous versions of a rule and impacts to small businesses, municipalities, and at-risk communities.

Costs and Socioeconomic Impacts from Previous Versions of the Rule

Rule 4901 was adopted on July 15, 1993 and subsequently amended in 2003, 2008, September 2014, and June 2019. For purposes of this analysis, the

District did a historical review which included the September 2019 amendments. The analyses for the 2019 amendments resulted in the conclusion that impacts stemming from the proposed amendments are less than significant across the board, particularly from the vantage point of the retailers that sell logs and small businesses are not disproportionately impacted by the rule.

Impacts to Small Businesses, Municipalities, and At-Risk Communities

As discussed in the analyses above, the impact to small businesses and at-risk communities is less than significant and municipalities would not be affected by rule amendments.

This page intentionally blank.

APPENDIX E

Environmental Impact Analysis

This page intentionally blank.

ENVIRONMENTAL IMPACT ANALYSIS

According to Section 15061 (b)(3) of the CEQA Guidelines, a project is exempt from CEQA if, "(t)he activity is covered by the general rule that CEQA applies only to projects which have the potential for causing a significant effect on the environment. Where it can be seen with certainty that there is no possibility that the activity in question may have a significant effect on the environment, the activity is not subject to CEQA." As such, substantial evidence supports the District's assessment that the SIP Revision will not have any significant adverse effects on the environment.

Furthermore, the SIP Revision is an action taken by a regulatory agency, the San Joaquin Valley Air Pollution Control District, as authorized by state law to assure the maintenance, restoration, enhancement, or protection of air quality in the San Joaquin Valley where the regulatory process involves procedures for protection of air quality. CEQA Guidelines §15308 (Actions by Regulatory Agencies for Protection of the Environment), provides a categorical exemption for "actions taken by regulatory agencies, as authorized by state or local ordinance, to assure the maintenance, restoration, enhancement, or protection of the environment where the regulatory process involves procedures for protection of the environment. Construction activities and relaxation of standards allowing environmental degradation are not included in this exemption." No construction activities or relaxation of standards are included in this SIP Revision.

Therefore, for all the above reasons, the SIP Revision is exempt from CEQA. Pursuant to Section 15062 of the CEQA Guidelines, District staff will file a Notice of Exemption upon Governing Board approval.

This page intentionally blank.

APPENDIX F

Appendix C from the *2022 Ozone Plan*

This page intentionally blank.

Appendix C

Stationary and Area Source Evaluations

This page intentionally blank.

TABLE OF CONTENTS

TABLE OF FIGURES

TABLE OF TABLES

Appendix C: Stationary and Area Source Control Strategy Evaluations

The San Joaquin Valley (Valley) faces significant challenges in meeting federal air quality standards (also called National Ambient Air Quality Standards, or 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 wood burning, glass manufacturing, and agricultural burning, have set benchmarks for California and the nation.

Over the years, the District's numerous air quality plans (State Implementation Plans, or SIPs) have been a primary vehicle for improving air quality in the Valley. Each plan builds upon the work of prior plans while establishing the path for continued air quality improvements. Consistent with this planning continuity, the District's control measure evaluation in this *2022 Ozone Plan* is built upon analysis under the District's prior attainment plans and Reasonably Available Control Technology (RACT) SIPs, including but not limited to the *2007 Ozone Plan*[1], *2014 RACT Demonstration for the 8-Hour Ozone SIP (2014 RACT SIP)*[2], *2016 Plan for the 2008 8-Hour Ozone Standard* (*2016 Ozone Plan*)[3], the *2018 Plan for the 1997, 2006, and 2012 PM2.5 Standards* (*2018 PM2.5 Plan*)[4], and the *2020 RACT Demonstration for the 2015 8-Hour Ozone Standard* (*2020 RACT SIP*).[5]

Pursuant to Clean Air Act (CAA) Section (§) 172(c)(1) and in accordance with U.S. Environmental Protection Agency (EPA) guidance for implementation of the 70 parts per billion (ppb) 8-hour ozone standard, the District must provide for the implementation of reasonably available control measures (RACM), including, at a minimum, RACT, and demonstrate the adoption of all RACM necessary to demonstrate attainment as expeditiously as practicable.[6] The analyses summarized in this appendix are the result of a robust and exhaustive effort on the part of the District to identify potential emission reduction opportunities. District staff from multiple departments with expertise in the applicable sectors contributed to this effort. The evaluations capture relevant background information, compare to analogous rules from other areas, examine

[1] SJVAPCD. *2007 Ozone Plan*. (April 30, 2007). Retrieved from: http://www.valleyair.org/air_quality_plans/docs/AQ_Ozone_2007_Adopted/2007_8HourOzone_CompletePlan.pdf
[2] SJVAPCD. *2014 Reasonably Available Control Technology (RACT) Demonstration for the 8-Hour Ozone State Implementation Plan (SIP)*. (June 19, 2014). Retrieved from: http://valleyair.org/Air_Quality_Plans/docs/2014-RACT-SIP.PDF
[3] SJVAPCD. *2016 Ozone Plan for 2008 8-Hour Ozone Standard*. (June 16, 2016). Retrieved from: http://valleyair.org/Air_Quality_Plans/Ozone-Plan-2016/Adopted-Plan.pdf
[4] SJVAPCD. *2018 Plan for the 1997, 2006, and 2012 PM2.5 Standards*. (November 15, 2018). Retrieved from: https://www.valleyair.org/pmplans/documents/2018/pm-plan-adopted/2018-Plan-for-the-1997-2006-and-2012-PM2.5-Standards.pdf
[5] SJVAPCD. *2020 Reasonably Available Control Technology (RACT) Demonstration for the 2015 8-Hour Ozone Standard*. (June 18, 2020). Retrieved from: http://valleyair.org/Air_Quality_Plans/docs/2020-RACT-Demonstration.pdf
[6] Implementation of the 2015 National Ambient Air Quality Standards for Ozone: Nonattainment Area State Implementation Plan Requirements; Final Rule. 83 Fed. Reg. 234. Pp. 63007-63008. (2018, December 6), (to be codified at 40 CFR Part 51.) https://www.govinfo.gov/content/pkg/FR-2018-12-06/pdf/2018-25424.pdf

potential emission reduction opportunities for technological and economic feasibility, and make recommendations for appropriate District actions moving forward.

This appendix also includes a brief conclusion of whether District rules under evaluation satisfy, do not satisfy, or are not subject to federal RACT requirements. RACT is "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). RACT changes over time as new technologies become feasible and cost-effective, thus making them reasonable to require. Per Sections 182(b)(2) and 182(f) of the federal CAA, ozone nonattainment areas are required to implement RACT for sources that are subject to Control Techniques Guidelines (CTG) issued by EPA and for "major sources" of volatile organic compounds (VOC) and nitrogen oxides (NOx), which are ozone precursors.

In response to the District's *2014 RACT SIP* and related rule amending projects, EPA has issued federal actions[7] documenting their approval of District rules and their concurrence that District rules are at least as stringent as RACT levels. In fact, these efforts show that many District rules are significantly more stringent than established RACT standards. The District adopted its *2020 RACT SIP* on June 18, 2020, to satisfy requirements for the 2015 8-hour ozone standard. The *2020 RACT SIP* analysis shows that the District continues to meet or exceed RACT for all applicable source categories.

CONTROL MEASURE EVALUATION METHODOLOGY

Control Measure Evaluations

Each stationary and area source control measure evaluation summarized in this appendix follows a thorough and consistent analysis methodology. This methodology includes sections for the following discussions and analyses:

- Emissions inventory
- Rule description
- Regulatory evaluation of federal, state, and local regulations, including an assessment of RACT
- Summary of potential emission reduction opportunities identified and the associated analysis of such opportunities
- Contingency measure evaluation
- Summary of the evaluation findings.

Although the District follows this methodology for each individual stationary and area source control measure evaluation, additional sections may be added as appropriate to

[7] Air Plan Approval; SJVAPCD; Reasonably Available Control Technology Demonstration. 83 Fed. Reg. 160, pp. 41006-41009 (2018, August 17). Retrieved from https://www.govinfo.gov/content/pkg/FR-2018-08-17/pdf/2018-17714.pdf

provide a more complete summary of the analysis performed. The following is a description of the sections in the control measure analyses.

Emissions Inventory

Each control measure evaluation contains an emission inventory table that identifies the summer average NOx emissions and VOC for the respective control measure for multiple years between 2017, the baseline year for this plan, and 2037, the attainment year. As discussed in detail in Chapter 2, ozone is a product of atmospheric reactions involving VOCs, NOx, the hydroxyl radical (OH), other radicals, and sunlight. As such, although some District rules control multiple emissions including oxides of sulfur (SOx) and particulate matter (PM), this appendix focuses on NOx and VOC emission inventories and emission reduction opportunities.

The emissions data provided in the emission inventory table is presented as a summer average in tons of emissions per day (tpd) since ozone exceedances occur in the summer months in the Valley. Consistent with the Districts Health Risk Reduction Strategy, to ensure the emissions reductions efforts of this plan contribute to improved air quality and progress toward attainment of the 2015 8-hour ozone standard, the focus is on emissions and activities in the summer months. The data is a compilation of the data sources identified in the emission inventory appendix (see Appendix B).

Rule Description

This section of each control measure will provide a general overview of the rule, including rule applicability, types of sources subject to rule requirements, rule adoption/ amendment history, and any other additional pertinent details, as relevant to the control measure evaluation.

How does the District rule compare with federal standards and regulations?

This section of the control measure evaluation includes a comparison of District rules to federal air quality regulations and standards. Research of federal regulations includes literature review of the following regulations and guidance documents:

- **CTG**: Control Techniques Guidelines[8]
- **ACT**: Alternative Control Techniques[9]
- **NSPS**: New Source Performance Standards[10]

[8] EPA. Control Techniques Guidelines. Retrieved from https://www.epa.gov/ground-level-ozone-pollution/control-techniques-guidelines-and-alternative-control-techniques
[9] EPA. Alternative Control Techniques. Retrieved from https://www.epa.gov/ground-level-ozone-pollution/control-techniques-guidelines-and-alternative-control-techniques
[10] EPA. Standards of Performance for New Stationary Sources. Retrieved from https://www.epa.gov/stationary-sources-air-pollution/new-source-performance-standards

How does the District rule compare with California State regulations?

Generally, state regulations are specific to mobile sources and area sources such as consumer products. However, sometimes the California Air Resources Board (CARB) will adopt a *Suggested Control Measure* (SCM) for area sources, such as the SCM for architectural coatings promulgated in May of 2020. Additionally, there are California Health and Safety Code (CH&SC) requirements and CARB Airborne Toxic Control Measures (ATCM)[11] that apply to stationary and area sources. Most of the rules evaluated in this plan do not have a CARB regulation or SCM associated with their source category. The District has included and evaluated all relevant state guidelines identified within the applicable control measure evaluations.

How does the District rule compare to rules in other air districts?

The District compared every control measure 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:

- **BAAQMD**: Bay Area Air Quality Management District[12]
- **SCAQMD**: South Coast Air Quality Management District[13]
- **SMAQMD**: Sacramento Metropolitan Air Quality Management District[14]
- **VCAPCD**: Ventura County Air Pollution Control District[15]

Under the CAA's system of "cooperative federalism," federal, state, regional, and local governments must work together to improve regional air quality by regulating sources under their respective jurisdictions. Local and regional agencies tailor their regulations, analysis, and innovation based on their unique situations. Therefore, regional regulations will differ in language and structure due to differences in local needs and priorities. Thus, comparing individual lines of regulatory text from a range of jurisdictions out of context does not establish RACT or RACM on its own. Instead, the District carefully reviews differences between rules with focus on what the regulation as a whole accomplishes while acknowledging differences in regional situations.[16]

[11] California Air Resources Board (CARB). Airborne Toxic Control Measures (ATCMs). Retrieved from http://www.arb.ca.gov/toxics/atcm/atcm.htm
[12] Bay Area Air Quality Management District (BAAQMD). Rules and Regulations. Retrieved from http://www.baaqmd.gov/Divisions/Planning-and-Research/Rules-and-Regulations.aspx
[13] South Coast Air Quality Management District (SCAQMD). Rules and Regulations. Retrieved from http://www.aqmd.gov/home/regulations/rules/scaqmd-rule-book/table-of-contents
[14] Sacramento Metropolitan Air Quality Management District (SMAQMD). Rules and Regulations. Retrieved from http://www.airquality.org/rules/
[15] Ventura County Air Pollution Control District (VCAPCD). Rules and Regulation. Retrieved from http://www.vcapcd.org/Rulebook/RuleIndex.htm
[16] Similarly, when EPA acts on control measure analysis, EPA considers a rule "as a whole." See, e.g., EPA's Technical Support Document, EPA Evaluation of BACM/MSM for the San Joaquin Valley PM2.5 Plan for the 2006 PM2.5 NAAQS at page 5, supporting final BACM/MSM approval at available at 85 FR 44,192.

Potential Emission Reduction Opportunities

The District reviewed each control measure to identify potential opportunities for emissions reductions. This section summarizes the results of this review. The District evaluated all potential emission reduction opportunities for technological and economic feasibility:

- **Technological feasibility** – The technological feasibility analysis determines if a potential opportunity to reduce emissions is viable for existing facilities and operators in the Valley, given their current operating needs and restrictions. District analysis of technological feasibility includes a literature review of Best Available Control Technology (BACT) guidelines; District permits; environmental and technological studies; EPA and CARB guideline documents; and other air districts' rules, regulations, and guidelines, to identify potential opportunities and determine the technological feasibility of any identified potential opportunities.

- **Economic feasibility** – To determine economic feasibility, the District conducts a cost effectiveness analysis to evaluate the economic reasonableness of an air 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 (tpy).

The District reviewed staff reports and studies from other air districts, EPA technical guidance documents, and applicable study data from the scientific community to assist in evaluating the technological and economic feasibility of potential emission reduction opportunities.

Contingency Measure Evaluation

The District considered whether a contingency measure component would be feasible for each control measure. This requirement is discussed in more detail in Chapter 6. For the purposes of this Appendix C analysis, a contingency measure must be (1) economically and technologically feasible, (2) feasible for a contingency trigger, and (3) beyond what is needed to achieve attainment.

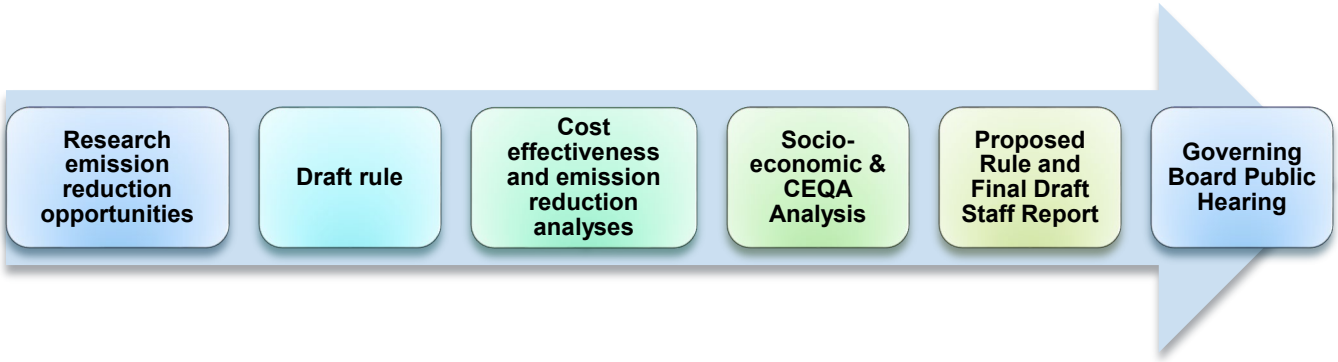
Evaluation Findings

This section includes a summary of the District's findings from the full control measure evaluation and includes any recommendations, such as a new or amended rule or further study actions. The *Evaluation Findings* section also includes a brief conclusion of whether the District rule under evaluation satisfies, does not satisfy, or is not subject to federal RACT requirements.

RULE DEVELOPMENT PROCESS

The District places great value on innovation and full public participation in the development and adoption of regulations. The District's rule development process involves extensive interaction with affected sources to find the most effective means of achieving emissions reductions and a rigorous public engagement and commenting process. For each rule, the District undergoes a robust process, which includes an evaluation of potential emission reduction opportunities, and a number of intricate analyses required by the California Health and Safety Code[17] related to cost effectiveness, emission reductions, environmental impacts, and socioeconomic impacts. Following Governing Board adoption, the District submits the rule through CARB to EPA for inclusion into the SIP, as appropriate. Through this process, the District hosts numerous public workshops to solicit feedback from the public and affected stakeholders, and continues to invite public participation and comment for the entirety of the project. The figure below further details the District's rule development process.

Figure C-1 Rule Development Process



Beyond the rule development and adoption process, District staff will continue to engage the public and affected source operators throughout implementation and compliance. Additionally, District staff continues public outreach and education through notifications to stakeholders of the rule adoption, issuance of compliance bulletins, and assistance through the District's Small Business Assistance program. Overall, the District's comprehensive rule development process, coupled with continued public outreach and communication with affected stakeholders, results in effective strategies that result in emission reductions and associated health benefits for the Valley.

[17] CH&SC §40920.6

C.1 RULE 4103 OPEN BURNING

Emissions Inventory (Summer Average – Tons per day)

	2017	2023	2026	2029	2032	2035	2037
NOx	6.55	6.42	1.53	1.51	1.50	1.49	1.49
VOC	7.85	7.69	1.41	1.40	1.39	1.38	1.38

District Rule 4103 Description

Historically, agricultural materials such as prunings and orchard removals have been disposed through burning to prevent the spread of plant diseases and to control weeds and pests in an economical and timely manner. The District first adopted Rule 4103 (Open Burning) on June 18, 1992, to regulate and coordinate the use of open burning while minimizing smoke impacts on the public. The District has since amended and increased the stringency of Rule 4103 seven times. In 2003, California Senate Bill (SB) 705 (Florez, 2003), codified as CH&SC §41855.5 and §41855.6, established a schedule to phase out the open burning of agricultural material, including consideration of technical and economic factors in implementing the phase-out. The District incorporated the phase-out requirements of SB 705 into Rule 4103.

Near-Complete Phase-Out of Agricultural Burning

The Valley Air District is the only region in California and nation with stringent requirements that phase-out agricultural open burning. Through the implementation of state law under SB 705, the District has adopted prohibitions that have significantly reduced open burning, supported by continued efforts to identify and demonstrate new alternatives to reduce open burning. As the most recent activity in this ongoing effort, the District, in collaboration with CARB, adopted a final phase-out strategy in 2021 for remaining agricultural burning by the end of 2024.[18] This strategy is supported by significant new incentive funding to help offset the high cost associated with new alternatives to burning, with enhanced focus on smaller growing operations.

Since adoption of the District's final phase-out strategy, the San Joaquin Valley has seen a tremendous reduction in open burning through the adoption of new practices, and is on track to achieving a 90% reduction in burning from historical levels by the end of 2022. Additional requirements for smaller growers at the end of 2022 and 2023 will continue to provide for additional reductions in open burning prior to the phase-out by the end of 2024.

[18] SJVAPCD. *Final Supplemental Report and Recommendations on Agricultural Burning.* June 17, 2021. Retrieved from: https://ww2.valleyair.org/media/aldmsd0b/final-supplemental-report-and-recommendations-on-agricultural-burning.pdf

Alternatives to Open Agricultural Burning Incentive Program

To support the Valley's ongoing phase-out of agricultural open burning, in 2018, the District's Governing Board authorized the creation of the Alternatives to Agricultural Open Burning Incentive Program. [19] This program provides financial incentives to commercial agricultural operations located within the District boundaries to chip agricultural material. The chipped material is then used for soil incorporation or land application on agricultural land as an alternative to the open burning of the agricultural materials. Since 2018, the District Governing Board has allocated $25,309,504 in local District funding to this program.

On August 19, 2021, the District accepted $178,200,000 in additional state funding to be used in the District's Alternatives to Agricultural Open Burning Incentive Program.[20] This funding is the result of significant advocacy from the District and Valley agricultural stakeholders and is designated to assist the District in developing new alternative practices, increase fleet capacity for chipping in the Valley and offset the significant incremental cost of implementing new alternatives to open burning.

Overall, the program has resulted in the deployment of alternative practices at over 139,000 acres, for over 3,800,000 tons of agricultural materials, resulting in the reduction of 7,558 tons of NOx, 13,905 tons of PM and 11,712 tons of ROG emissions.

Smoke Management System

To implement SB 705 and enhance the effectiveness of the District's burn reduction efforts, in 2004, the District established the Smoke Management System (SMS), which the District uses to authorize or prohibit individual burns based on modeled smoke impacts.

Someone requesting authorization to burn is required to complete the proper application to report the acreage, type material, location, and date of the burn. The District uses SMS to calculate emissions by multiplying the tons of fuel burned by a crop-specific emission factor. SMS uses real-time meteorological information to analyze the impact of burning on air quality and appropriately limit burn allocations by area. The District only authorizes burns of allowable materials when the SMS emissions analysis indicates that the burn will not cause or contribute to exceedances of federal air quality standards, cause a public nuisance, or impact nearby smoke-sensitive areas. The District enforces these requirements through permits, project inspections, proactive surveillance, and complaint response.

Each year, open burning windows narrow due to unprecedented wildfires and stagnant winters with little precipitation. Open burning is strictly prohibited from November

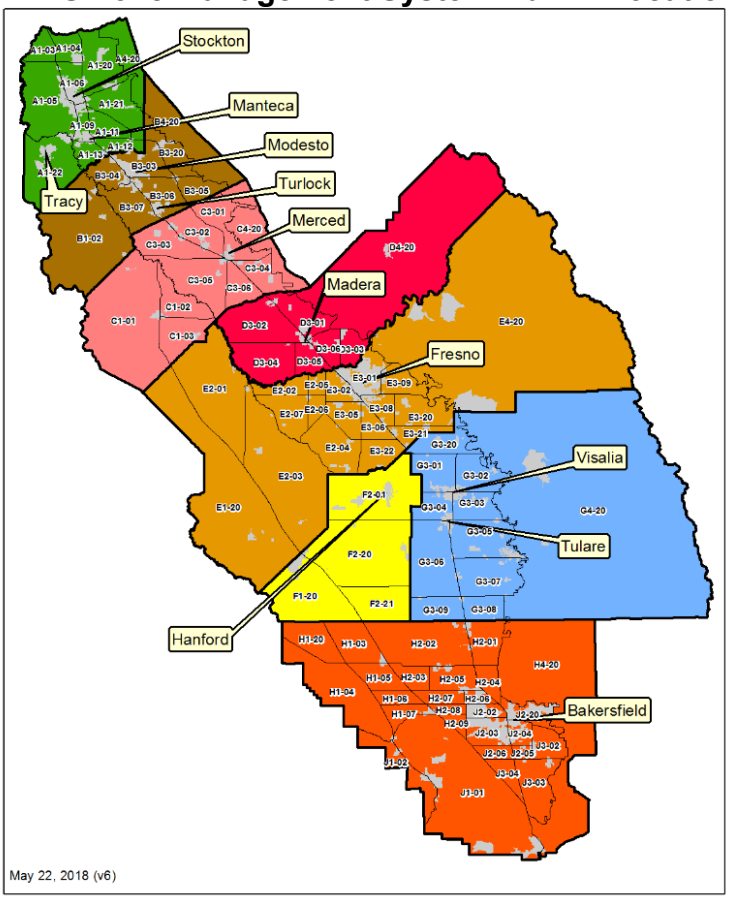
[19] District Alternatives to Agricultural Open Burning Incentive Program. Retrieved from: http://valleyair.org/grants/alt-ag-burning.htm

[20] SJVAPCD. *Accept and Appropriate $178,200,000 in State Funding and Approve Enhancements to Alternatives to Agricultural Open Burning Incentive Program*. (August 19, 2021). Retrieved from: https://www.valleyair.org/Board_meetings/GB/agenda_minutes/Agenda/2021/August/final/10.pdf

through February each year if there is an episodic residential wood burning curtailment under District Rule 4901 (Wood Burning Fireplaces and Wood Burning Heaters). These Rule 4901 curtailments are becoming increasingly frequent, with the majority of winter days now declared as No Burn days for residential wood burning, resulting in fewer agricultural open burn days each winter.

District's SMS program divides the Valley into 97 allocation zones (see figure below) based on a number of criteria, such as crop distribution throughout the Valley, historical burning activities, nearby sensitive receptors, and known geographic boundaries. The amount of burning allowed in a given zone on a specific day is based on factors such as the local meteorology, the air quality conditions, the atmospheric holding capacity, the amount of burning already approved or happening in a given area, and the potential impacts on downwind populations.

Figure C-2 Smoke Management System Burn Allocation Zones



How does District Rule 4103 compare with federal and state rules and regulations?

Federal Regulations

There are no Control Techniques Guidelines, Alternative Control Techniques, or New Source Performance Standards applicable to this source category.

State Regulations

- *CH&SC §41850-41866 (Agricultural Burning)*
  17 CCR §80100-80330 (Smoke Management Guidelines for Agricultural and Prescribed Burning)

The District implements the above state regulation requirements through Rule 4103. In 2003, SB 705, incorporated into CH&SC §41855.5 and 41855.6, required the District to regulate the burning of diseased crops, establish best management practices (BMP) for the maintenance and control of weeds, and phase out the open burning for numerous crop categories. SB 705 established a schedule for specific types of agricultural material to no longer be burned in the field, but provided for a postponement of the phase-out where justified by technical and economic impediments. In addition to the requirements of CH&SC §41855.5, state law requires the District to postpone the burn prohibition dates for specific types of agricultural material if the District makes three specific determinations and CARB concurs.[21] The determinations are: (1) there are no economically feasible alternatives to open burning for that type of material; (2) open burning for that type of material will not cause or substantially contribute to a violation of an air quality standard; and (3) there is no long-term federal or state funding commitment for the continued operation of biomass facilities in the Valley or the development of alternatives to burning.

The District has complied with state requirements in preparing five reports on agricultural burning activities in the Valley since 2010. These reports have evaluated every crop category for feasible alternatives to open burning and provided recommendations for allowing or prohibiting the open burning of each crop category as outlined by SB 705. The most recent *Supplemental Report* established an updated schedule for the near-complete phase-out of remaining agricultural open burning in the Valley by January 1, 2025.

[21] CH&SC §41855.6

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

District staff compared emission limits, optional control requirements, and work practice standards in District Rule 4103 to comparable requirements in rules from the following California nonattainment areas:

- Bay Area AQMD Regulation 5 (Amended November 20, 2019)[22]
- Sacramento Metropolitan AQMD Rule 501 (Amended April 3, 1997)[23]
- South Coast AQMD Rule 444 (Amended July 12, 2013)[24]
- Ventura County APCD Rule 56 (Amended November 11, 2003)[25]

The District finds that Rule 4103 is the only rule of its kind and requires the most stringent requirements on open burning in the nation. Therefore, District Rule 4103 is far more stringent than the abovementioned rules.

Potential Emission Reduction Opportunities

As demonstrated above, in adherence with applicable state laws instituted under SB705, the Valley has the toughest restrictions on agricultural burning in the state.

The District did not identify additional emission reduction opportunities at this time.

Contingency Measure Evaluation

As discussed in Chapter 6, contingency measures are immediately implemented ONLY if triggered by an unanticipated milestone or attainment failure. The District reviewed this control measure for a potential contingency component. The District concludes that this control measure is not an appropriate contingency measure because the most stringent feasible controls are already in place.

Evaluation Findings

The District's robust agricultural burning rule and efforts to phase out agricultural burning to date, further made more stringent with the recent action to phase out of agricultural burning by January 1, 2025, support that the District's rule is the most stringent in the nation. Therefore, Rule 4103 meets or exceeds federal RACT requirements for this source category based upon evaluation of applicable federal regulations, state standards, and other air districts' rules.

---

[22] BAAQMD. *Regulation 5 (Open Burning).* (Amended November 25, 2019). Retrieved from: https://www.baaqmd.gov/~/media/dotgov/files/rules/regulation-5/documents/20191120_r0500_final-pdf.pdf?la=en&rev=51124978dd4b4e598ba56bfe2a1c23df.

[23] SMAQMD. *Rule 501 (Agricultural Burning).* (Amended April 3, 1997). Retrieved from: http://www.airquality.org/ProgramCoordination/Documents/rule501.pdf.

[24] SCAQMD. *Rule 444 (Open Burning).* (Amended July 12, 2013). Retrieved from: http://www.aqmd.gov/docs/default-source/rule-book/rule-iv/rule-444.pdf?sfvrsn=4.

[25] VCAPCD. *Rule 56 (Open Burning).* (Amended November 11, 2003). Retrieved from: http://www.vcapcd.org/Rulebook/Reg4/RULE%2056.pdf.

C.2 RULE 4104 REDUCTION OF ANIMAL MATTER

Emissions Inventory (Summer Average – Tons per day)

	2017	2023	2026	2029	2032	2035	2037
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VOC	0.00	0.00	0.00	0.00	0.00	0.00	0.00

The inventory for this source category appears as zero, which reflects the activity of facilities controlled at very stringent levels. However, it may not reflect all the applicable equipment used in rendering facilities accounted for in other source categories, such as fuel combustion. Additional analysis is required to account for emissions from this source category.

District Rule 4104 Description

Adopted in 1992, District Rule 4104 limits the air contaminants from operations used for the reduction of animal matter by requiring gases, vapors, and gas-entrained effluent from the process to be incinerated at temperatures not less than 1200 degrees Fahrenheit or processed in an equally effective manner. The District regulates combustion units, which are the remaining portion of the operation that produces emissions, through other District rules.

The reduction of animal matter source category includes rendering, cooking, drying, dehydration, digesting, evaporating, and protein concentration processes. The criteria pollutant emissions from this category are relatively small. The primary source of concern from this source category is odor, which rule requirements minimize by utilizing a venturi scrubber, cyclone, or packed bed scrubber for PM control followed by a thermal oxidizer for VOC control. These facilities generally use steam from a boiler (indirect-fired) or a rotary dryer (direct-fired) for their operations, which generates NOx emissions from these combustion units.

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

Federal Regulations

There are no Control Techniques Guidelines, Alternative Control Techniques, or New Source Performance Standards applicable to this source category.

State Regulations

There are no state regulations applicable to this source category.

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

District staff compared emission limits, optional control requirements, and work practice standards in District Rule 4104 to comparable requirements in rules from the following California nonattainment areas:

- Bay Area AQMD Regulation 12, Rule 2 (Amended April 24, 2018)[26]
- Monterey Bay ARD Rule 414 (Amended August 21, 2002)[27]
- Sacramento Metropolitan AQMD Rule 410 (Amended August 3, 1977)[28]
- San Diego County APCD Rule 64 (Amended August 21, 1981)[29]
- South Coast AQMD Rules 472 (Adopted May 7, 1976)[30]
- Ventura County APCD Rule 58 (Amended May 23, 1972)[31]

The District reviewed the rule requirements implemented prior to EPA's approval of the *2014 RACT SIP*, and found that Rule 4104 continues to implement RACT levels of control. The below comparison tables demonstrate that, for more recently amended rules, District Rule 4104 continues to meet RACT.

Bay Area AQMD

- BAAQMD Regulation 12, Rule 2 (Rendering Plants)

	SJVAPCD Rule 4104	BAAQMD Reg 12, Rule 2
Applicability	Source operations using any heated process, including rendering, cooking, drying, dehydration, digesting, evaporating, and protein concentration for the processing of animal matter, except for the exclusive processing of food for human consumption.	Any heated process including rendering, cooking, drying, dehydrating, digesting, evaporating, and protein concentrations at plants whose purpose is the reduction of animal matter.
Requirements	Emissions from any article, machine, equipment, or other contrivance for the reduction of animal matter shall be incinerated at temperatures of not less than 1,200 °F for a period of not less than 0.3 seconds or processed in such a manner, which is equally or more effective for emissions control.	Emissions from the reduction of animal matter shall be incinerated at a temperature of not less than 650° C (1,202 °F) for a period of not less than 0.3 seconds or processed in a such a manner, which is equally or more effective for air pollution odor control.

[26] BAAQMD. *Regulation 12, Rule 2 (Rendering Plants).* (Amended April 24, 2018). Retrieved from: https://www.baaqmd.gov/~/media/dotgov/files/rules/reg-12-rule-2-rendering-plants/documents/rg1202.pdf?la=en&rev=bdc8a980e3174c4b8b2f483142394f1e.
[27] MBARD. *Rule 414 (Reduction of Animal Matter).* (Amended August 21, 2002). Retrieved from: https://ww2.arb.ca.gov/sites/default/files/classic/technology-clearinghouse/rules/RuleID1646.pdf.
[28] SMAQMD. *Rule 410 (Reduction of Animal Matter).* (Amended August 3, 1977). Retrieved from: http://www.airquality.org/ProgramCoordination/Documents/rule410.pdf.
[29] SDAPCD. *Rule 64 (Reduction of Animal Matter).* (Amended August 21, 1981). Retrieved from: https://www.sdapcd.org/content/dam/sdapcd/documents/rules/current-rules/Rule-64.pdf.
[30] SCAQMD. *Rule 472 (Reduction of Animal Matter).* (Adopted May 7, 1976). Retrieved from: http://www.aqmd.gov/docs/default-source/rule-book/rule-iv/rule-472.pdf?sfvrsn=4.
[31] VCAPCD. *Rule 58 (Reduction of Animal Matter).* (Amended May 23, 1972). Retrieved from: http://www.vcapcd.org/Rulebook/Reg4/RULE%2058.pdf.

	SJVAPCD Rule 4104	BAAQMD Reg 12, Rule 2
	Provide, properly install, and maintain in calibration, in good working order, and in operation, devices for indicating temperature, pressure, or other operating conditions.	Provide, install, calibrate and maintain in good working order, devices for indicating temperature, pressure, or other operating conditions.

District Rule 4104 requires an incineration temperature of 1,200 °F. BAAQMD Regulation 12, Rule 2 requires an incineration temperature of 1,202 °F. Both rules require the same retention time of not less than 0.3 seconds. The 2 degrees Fahrenheit difference in the minimum incineration temperature does not result in a significant increase in the control efficiency of the pollutants emitted from the rendering of animal matter. Therefore, District Rule 4104 is at least as stringent as BAAQMD Regulation 12, Rule 2.

Potential Emission Reduction Opportunities

Packed Bed Scrubbers

The District evaluated the potential opportunity to reduce emissions if facilities were to replace their thermal oxidizers with packed bed scrubbers. In certain installations, packed bed scrubbers may be more efficient at removing PM/VOC emissions from the exhaust and additionally do not generate NOx or SOx emissions. However, retrofitting an existing facility by replacing an existing thermal oxidizer with a packed bed scrubber system may take some design and experimenting on the part of the facility to ensure it does not cause an increase in nuisance/odors or effect the operation. The retrofit costs associated with the capture and control using a packed bed scrubber would be significant. Additionally, operators would need to replace the filter media used in the scrubber periodically, adding to the cost of upkeep. Existing thermal oxidizer installations do not present similar issues. In addition, the total NOx emissions from this category are relatively small given that there are only a few units subject to this rule.

Regenerative Thermal Oxidizers

The District evaluated the potential opportunity to reduce emissions from facilities by replacing traditional thermal oxidizers with regenerative thermal oxidizers (RTOs) with heat recovery, which is a current practice at some facilities in the Valley. RTO devices use less supplementary fuel, which may achieve emissions reductions through fuel savings. However, while the control efficiency is nearly the same for both thermal oxidizers and RTOs, site-specific operational parameters (such as flow rates, effluent concentrations, etc.) must be considered and a larger RTO may need to be installed to replace the existing thermal oxidizer. Additionally, as mentioned above, the total NOx emissions from this category are relatively small given that there are only a few units subject to this rule.

As part of the District's recent Best Available Retrofit Control Technology (BARCT) analysis as required by Assembly Bill (AB) 617, the District found that potential enhanced control options would only provide limited opportunity for emission reductions (0.5 tons/year of VOC), would result in increased NOX emissions being formed as

thermal NOx, and were not cost-effective given the significant implementation costs. The District found that the existing requirements of Rule 4104 satisfy BARCT requirements.[32]

Overall, the District did not identify any additional emission reduction opportunities at this time.

Contingency Measure Evaluation

As discussed in Chapter 6, contingency measures are immediately implemented ONLY if triggered by an unanticipated milestone or attainment failure. The District reviewed this control measure for a potential contingency component. The District concludes that this control measure is not an appropriate contingency measure because the most stringent feasible controls are already in place, and a contingency trigger is incompatible with the technologies involved in reducing emissions from this category.

Evaluation Findings

Rule 4104 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds federal RACT requirements for this source category. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

[32] SJVAPCD. *AB 617 Best Available Retrofit Control Technology (BARCT) Analysis*. Pp. 51-53. December 26, 2019. Retrieved from: https://community.valleyair.org/media/1790/final-barct-rule-analysis-july-30-2020.pdf

C.3 RULE 4106 PRESCRIBED BURNING AND HAZARD REDUCTION BURNING

Emissions Inventory (Summer Average – Tons per day)

	2017	2023	2026	2029	2032	2035	2037
NOx	0.21	0.22	0.22	0.22	0.23	0.23	0.23
VOC	3.50	4.23	4.23	4.24	4.24	4.24	4.24

District Rule 4106 Description

District Rule 4106, adopted in June 2001, is applicable to range improvement burning, forest management burning, wildland vegetation management burning, and hazard reduction burning within the Valley. Prescribed burning generally includes forest waste, fire hazard reduction, rangeland management, wildlife habitat improvement, and ecosystem (forest health) burning. The adoption of Rule 4106 incorporated provisions made necessary by the March 23, 2000 amendment of Title 17 of the California Code of Regulations. EPA approved Rule 4106 into the SIP in February 2002.[33]

Recognizing the importance of both prescribed burning and hazard reduction burning, the purpose of Rule 4106 is to permit, regulate, and coordinate the use of prescribed burning and hazard reduction burning while minimizing smoke impacts on the public. Through this rule, the District has expended considerable resources to ensure that the ignition of burn projects are only permitted when air quality and dispersion conditions are favorable, thus lessening health impacts on Valley citizens and on air quality in the Valley.

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

Federal Regulations

There are no Control Technique Guidelines, Alternative Control Techniques, or New Source Performance Standards applicable to this source category.

State Regulations

There are no state regulations applicable to this source category.

[33] EPA. *Revisions to the California State Implementation Plan, San Joaquin Valley Unified Air Pollution Control District*. 67 FR 39, pp. 8894-8897 (to be codified at 40 CFR Part 52). (2002, February 27). Retrieved from https://www.federalregister.gov/articles/2002/02/27/02-4526/revisions-to-the-california-state-implementation-plan-san-joaquin-valley-unified-air-pollution

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

District staff compared emission limits, optional control requirements, and work practice standards in District Rule 4106 to comparable requirements in rules from the following California nonattainment areas:

- Bay Area AQMD Regulation 5 (Amended November 20, 2019)[34]
- Placer County APCD Rule 301 (August 9, 2018)[35]
- Placer County APCD Rule 303 (February 9, 2012)[36]
- Sacramento Metropolitan AQMD Rule 501 (Amended April 3, 1997)[37]
- South Coast AQMD Rule 444 (Amended July 12, 2013)[38]
- Ventura County APCD Rule 56 (Amended November 11, 2003)[39]

The District reviewed the rule requirements implemented prior to EPA's approval of the *2014 RACT SIP*, and found that Rule 4106 continues to implement RACT levels of control. The below comparison tables demonstrate that, for more recently amended rules, District Rule 4106 continues to meet RACT.

Bay Area AQMD

- BAAQMD Regulation 5 (Open Burning)

	SJVAPCD Rule 4106	BAAQMD Regulation 5
Applicability	All prescribed burning, and to hazard reduction burning in wildland/urban interface.	Open burning in the BAAQMD.
Exemptions	None.	Fires set only for cooking of food for human beings; fires burning as safety flares or for the combustion of waste gases; the use of flame cultivation when the burning is performed with LPG or natural gas-fired burners designed and used to kill seedling grass and weeds and the growth is such that the combustion will not continue without the burner; fires set for fire training using one gallon or less of flammable liquid per fire; further requirements for conditional exemptions (similar to SJV).

[34] BAAQMD. *Regulation 5 (Open Burning).* (Amended November 20, 2019). Retrieved from: https://www.baaqmd.gov/~/media/dotgov/files/rules/regulation-5/documents/20191120_r0500_final-pdf.pdf?la=en&rev=51124978dd4b4e598ba56bfe2a1c23df.
[35] PCAPCD. *Rule 301 (Nonagricultural Burning Smoke Management).* (Amended August 9, 2018). Retrieved from: https://placerair.org/DocumentCenter/View/2221/Rule-301-PDF.
[36] PCAPCD. *Rule 303 (Prescribed Burning Smoke Management).* (Amended February 9, 2012). Retrieved from: https://placerair.org/DocumentCenter/View/2223/Rule-303-PDF.
[37] SMAQMD. *Rule 501 (Agricultural Burning).* (Amended April 3, 1997). Retrieved from: http://www.airquality.org/ProgramCoordination/Documents/rule501.pdf.
[38] SCAQMD. *Rule 444 (Open Burning).* (Amended July 12, 2013). Retrieved from: http://www.aqmd.gov/docs/default-source/rule-book/rule-iv/rule-444.pdf?sfvrsn=4.
[39] VCAPCD. *Rule 56 (Open Burning).* (Amended November 11, 2003). Retrieved from: http://www.vcapcd.org/Rulebook/Reg4/RULE%2056.pdf.

	SJVAPCD Rule 4106	BAAQMD Regulation 5
Requirements	No burning of garbage or green waste is allowed. The District shall allocate burning based on the predicted meteorological conditions and whether the total tonnage to be emitted would allow the volume of smoke and other contaminants to impact smoke sensitive areas, or create or contribute to an exceedance of an ambient air quality standard. Specific requirements for minimizing smoke, using approved ignition devices, and having vegetation be free of dirt, soil, and moisture. **Prescribed Burning** Specific requirements for prescribed burn conductors to have taken a prescribed burning smoke management training class approved by the APCO. Additional prescribed burn requirements detailed by project size. **Permits for Hazard Reduction Burning** No Hazard Reduction Burning shall take place without a permit. A Permit shall be valid only on those days during which burning is not prohibited by CARB, by the District or other designated agencies. Further administrative requirements and Smoke Management Plan requirements are outlined by project size.	Recreational fires allowed on non-curtailment days; on permissive burn days the following fires are allowed with permission from the APCO (specific requirements for each category): disease and pest, crop replacement, orchard pruning and attrition, double cropping stubble, stubble, hazardous materials (hazard reduction burning), fire training, flood debris, irrigation ditches, flood control, range management, forest management, marsh management, contraband, filmmaking, and public exhibition.

The District evaluated the requirements contained within BAAQMD's Regulation 5 and found no requirements that were more stringent than those already in Rule 4106.

Placer County APCD

- PCAPCD Rule 301 (Nonagricultural Burning Smoke Management)

	SJVAPCD Rule 4106	PCAPCD Rule 301
Applicability	All prescribed burning, and to hazard reduction burning in wildland/urban interface.	All burning located within Placer County except where otherwise prohibited by a local jurisdiction.
Exemptions	None.	• Burning conducted pursuant to Rules 302, 303, 304, 305, and 306. • Fire hazard or health hazard burning conducted under a Public Officer waiver.

	SJVAPCD Rule 4106	PCAPCD Rule 301
		• Recreational or cooking fire, provided the fire is not used for waste disposal purposes. • Burning, in a respectful and dignified manner, of an unserviceable American flag that is no longer fit for display. • Open burning conducted by Public Officers, if conducted under other rule requirements. • Burning of standing green vegetation which is part of right-of-way clearing, levee, ditch, and reservoir maintenance. • APCO may grant exemption to drying times requirements if the denial of such burning would threaten imminent and substantial economic loss.
Requirements	No burning of garbage or green waste is allowed. The District shall allocate burning based on the predicted meteorological conditions and whether the total tonnage to be emitted would allow the volume of smoke and other contaminants to impact smoke sensitive areas, or create or contribute to an exceedance of an ambient air quality standard. Specific requirements for minimizing smoke, using approved ignition devices, and having vegetation be free of dirt, soil, and moisture. **Prescribed Burning** Specific requirements for prescribed burn conductors to have taken a prescribed burning smoke management training class approved by the APCO. Additional prescribed burn requirements detailed by project size. **Permits for Hazard Reduction Burning** No Hazard Reduction Burning shall take place without a permit. A Permit shall be valid only on those days during which burning is not prohibited by CARB, by the District or other designated agencies.	• No person shall use an open outdoor fire (including the use of a burn barrel) for the purpose of disposal or burning of any disallowed combustibles. The only allowable combustibles is vegetation originating on the premises which is reasonably free of dirt, soil, and visible surface moisture. • A person shall not ignite or allow open outdoor burning without first obtaining a valid burn permit for Fire Hazard Reduction, Mechanized Burner, Open Burning Conducted by Public Officers, Right of Way Clearing, Levee, Ditch and Reservoir Maintenance, subject to burn day validity requirements. • Sources must comply with preparation and drying time requirements. • Burns subject to ignition devices, wind, and other requirements. • Other administrative and recordkeeping requirements.

	SJVAPCD Rule 4106	PCAPCD Rule 301
	Further administrative requirements and Smoke Management Plan requirements are outlined by project size.	

The District evaluated the requirements contained within PCAPCD Rule 301 and found no requirements that were more stringent than those already in Rule 4106.

Potential Emission Reduction Opportunities

Beyond the review of current regulations and rule requirements, the District performed an extensive review of the feasibility of technologies and measures implemented in other regions and potential new technologies and measures that may be feasible for implementation in the near future.

While there are many factors that need to be evaluated and addressed in the pursuit of minimizing fuel buildup, more effective use of prescribed burning is an area where the District has direct regulatory authority and can take action. The District has long been supportive of fuel reduction efforts including prescribed burns, advocating that reducing fuels in a responsible way will improve the health of the forests and improve future air quality by lessening the severity of wildfires. Despite these efforts, the forest fuel buildup has continued to increase at an alarming rate over the years due to decades of forest mismanagement, with fire danger being at an all-time high due to the recent catastrophic tree mortality from the drought and pest infestation. This long-term buildup of forest fuel poses a significant risk of large-scale wildfires with potential devastating impacts on air quality and public health. This has increased the need and urgency for greater forest fuel reductions. Based on direction received from the District's Governing Board in November 2015, and input from land management agencies, the District has become even more flexible when identifying permissive burn days for prescribed burning, which has assisted in a more rapid reduction of fuels. Additionally, in June 2019, the District's Governing Board authorized the District to enter into a Memorandum of Understanding (MOU) with the California Air Pollution Control Officers Association (CAPCOA) to participate in the new statewide Prescribed Burn Reporting and Monitoring Support Program in an effort to facilitate increased levels of prescribed burning across the state. These efforts will assist in further using prescribed burning as a measure to prevent catastrophic wildfires while simultaneously minimizing health impacts for local residents.

Mechanic Removal of Forest Biomass

Given the catastrophic nature of wildfires, contradictory environmental concerns that preclude the use of mechanized equipment to dispose of fuel supplies need further examination. On one hand, there is concern that the transportation and operation of logging equipment can damage wildland ecosystems and impact endangered and threatened species, and that mechanical harvesting of vegetative fuel supplies could lead to overharvesting of the forests. On the other hand, if left unchecked, fuel buildup can lead to large wildfires that cause the destruction of the very species intended to be

protected by policies such as those under the federal Wilderness Act, and in turn result in devastating public health impacts due to air pollution. The District will work with federal land managers and environmental stakeholders to ascertain the wildland areas where ecosystem and species impacts are of less concern, and support mechanical fuel reduction methods as appropriate.

The District analyzed the possibility of mechanical removal as an alternative to prescribed burning, but found that mechanical removal of forest biomass was infeasible as a required alternative to prescribed burning, due to the inaccessibility of mountain terrain and the extreme amount of forest acreage needing biomass management.

However, the District will support the use of mechanical removal where feasible. Fire agencies are procuring and deploying chippers, portable saw mills, masticators and air curtain burners throughout the state, but primarily in the forested land surrounding the Valley. This process has been facilitated by emergency exemptions that have been invoked by CARB to waive the requirements for portable equipment and certain off-road equipment.

Air Curtain Burners

While air curtain burners are capable of deployment in some areas of the forest and are a viable alternative to reduce emissions from prescribed burning in some cases, these units are limited in their ability to be a large-scale solution to the management of forest biomass. Forest managers face challenges in being able to locate the units in remote areas, and the equipment and staff time necessary to operate the units makes the wide-spread operation of air curtain burners economically infeasible for land management agencies. Additionally, to prevent an accidental fire, air curtain burners must be operated in a cleared area, representing further challenges to the broad deployment of this technology. The vast amount of remote acreage and huge number of diseased or dead trees that must be removed from California forests make it infeasible for air curtain burners to be a regulatory requirement or a large-scale alternative to prescribed burning.

Due to the emissions reductions achieved through the use of air curtain burners, the District will support the deployment of air curtain burners for use where feasible. The use of air curtain burners has been hindered by regulatory hurdles at the federal level. EPA has opined that air curtain burners are subject to the federal New Source Performance Standard for Other Solid Waste Incinerators, 40 CFR 60 Subpart EEEE, which only allows exemptions for emergency or disaster relief for up to 8 weeks. To comply with the requirements beyond the 8-week period, the operator must comply with certain emission limitations and obtain a Title V operating permit, which adds cost and complexity to the use of these devices. To provide some administrative relief, EPA granted an extended exemption to CalFire in 2017 to operate several air curtain burners for an additional 30 months. That exemption was extended for an additional 12 months in 2019 and again in 2020. That exemption has since expired. In August 2020, the EPA published a proposed rule that would remove the Title V operating permit requirement under Subpart EEEE for air curtain burners that burn exclusively wood

waste, clean lumber, and yard waste, however action by EPA on the proposed rule has been postponed. The District will continue to support the use of air curtain burners as an alternative to prescribed burning where feasible.

District Support of Forest-Specific Biomass Projects

The District will also explore other avenues to encourage and support forest-specific biomass projects, such as the North Fork Community Power project in Madera County. This 2 MW power plant will gasify hazard-reduction forest material, where the gas is then burned in an exhaust-controlled environment that produces very low levels of NOx. This project has been permitted and construction has commenced. The successful operation of this plant will be an important demonstration of gasification technology as a viable alternative to the open burning of forest debris. The operation of this project complements the Governor's October 30, 2015, State of Emergency Proclamation that directs state agencies to implement a number of measures to accelerate the removal of fuel in the state's forests, and which includes extending and expediting power purchase agreements with biomass facilities, seeking additional funding for biomass facilities to help offset higher feedstock costs, and exempting projects under the proclamation from California Environmental Quality Act requirements.

Due to the scale of acreage that requires management and due to access issues to remote forest areas, this is not a technologically feasible regulatory alternative to prescribed burning. However, the District will work to support forest-specific biomass projects in an effort to reduce transport emissions created from hauling forest biomass to the Valley floor for further processing.

No additional emission reduction opportunities have been identified at this time.

Contingency Measure Evaluation

As discussed in Chapter 6, contingency measures are immediately implemented ONLY if triggered by an unanticipated milestone or attainment failure. The District reviewed this control measure for a potential contingency component. The District concludes that this control measure is not an appropriate contingency measure because the most stringent feasible controls are already in place, and a contingency trigger is incompatible with the technologies involved in reducing emissions from this category.

Evaluation Findings

Rule 4106 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds federal RACT requirements for this source category. Due to extensive forest mortality and the critical need to reduce the risks of catastrophic wildfires through prescribed burning in the region, the District does not recommend any additional regulatory measures at this time.

With the fuel load in the Valley's mountain areas at an all-time high due to the drought and the bark beetle infestation, the District is working collaboratively with land

management agencies to conduct strategic controlled burns to lessen the wildfire risk. In this effort, and as directed by the Governing Board, the District has been more flexible in allowing more days for prescribed burning activities under marginal conditions, and allowing larger amounts of acres to be treated per day where localized impacts to nearby communities are not expected to occur. In addition, the District continues to advocate for additional funding for state and federal agencies to conduct additional prescribed burning and fuel reduction activities, in an effort to reduce the severity of future wildfires across the region.

As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

C.4 RULE 4301 FUEL BURNING EQUIPMENT

Emissions Inventory (Summer Average – Tons per day)

	2017	2023	2026	2029	2032	2035	2037
NOx	n/a	n/a	n/a	n/a	n/a	n/a	n/a
VOC	n/a	n/a	n/a	n/a	n/a	n/a	n/a

The emission inventory is not specific to Rule 4301. See Rules 4306, 4307, 4308, 4309, and 4352 for the individual emissions inventories.

District Rule 4301 Description

District Rule 4301 applies to all types of fuel burning equipment, except air pollution control equipment. The purpose of this rule is to limit emissions of air contaminants from fuel burning equipment by specifying maximum emission rates for SOx, NOx, and PM (identified in the rule as combustion contaminant emissions). EPA finalized approval of the 1992 amendments to Rule 4301 on May 18, 1999 and deemed this rule as being at least as stringent as established RACT requirements.

Rule 4301 limits the concentration of combustion contaminants to 0.1 grain per standard cubic feet of gas and limits maximum emissions rates of SOx to 200 pounds per hour, NOx to 140 pounds per hour, and combustion contaminants to 10 pounds per hour from fuel burning equipment.

Rule 4301 has a very broad applicability, as it applies to all types of fuel burning equipment. Several District rules with more stringent NOx requirements for specific types of fuel burning equipment supersede this rule. See the control measure evaluations for Rules 4306, 4307, 4308, 4309, 4320, and 4352 for more specific information about the individual fuel burning equipment source categories.

How does District Rule 4301 compare with federal and state rules and regulations?

Facilities subject to Rule 4301 are subject to various state rules and federal requirements. However, several District rules have superseded Rule 4301 with more stringent requirements. The control measure evaluations for those rules include comparisons of those District rules to the applicable federal and state regulations.

How does District Rule 4301 compare to rules in other air districts?

Several District rules with more stringent NOx requirements for specific types of fuel burning equipment supersede this rule. See Rules 4306, 4307, 4308, 4309, 4320, and 4352 for more specific evaluations about the individual fuel burning equipment sources categories.

Potential Emission Reduction Opportunities

Several District rules with more stringent requirements have superseded Rule 4301. The control measure evaluations for those rules discuss any potential emission reduction opportunities for this source category.

Contingency Measure Evaluation

As discussed in Chapter 6, contingency measures are immediately implemented ONLY if triggered by an unanticipated milestone or attainment failure. The District reviewed this control measure for a potential contingency component. Several District rules with more stringent NOx requirements for specific types of fuel burning equipment supersede this rule. See the control measure evaluations for Rules 4306, 4307, 4308, 4309, 4320, and 4352 for more specific information about the contingency measure analyses for those rules.

Evaluation Findings

Several District rules with more stringent NOx requirements for specific types of fuel burning equipment supersede this rule. These rules satisfy and go beyond RACT for fuel burning equipment. See the control measure evaluations for Rules 4306, 4307, 4308, 4309, 4320, and 4352.

C.5 RULE 4302 INCINERATOR BURNING

Emissions Inventory (Summer Average – Tons per day)

	2017	2023	2026	2029	2032	2035	2037
NOx	0.03	0.03	0.03	0.03	0.03	0.03	0.03
VOC	0.00	0.00	0.00	0.00	0.01	0.01	0.01

District Rule 4302 Description

This rule applies to any incinerator activity or equipment. The purpose of this rule is to limit air pollution by prohibiting the use of any incinerator except for multiple-chamber incinerators or one equally effective in controlling air pollution. EPA finalized approval of the 1993 amendments to Rule 4302 on August 19, 1999 and deemed this rule as being at least as stringent as established RACT requirements.[40]

How does District Rule 4302 compare with federal and state rules and regulations?

Federal Regulations

There are no Control Techniques Guidelines or Alternative Control Techniques applicable to this source category.

A. New Source Performance Standards (NSPS)

- *40 CFR 60 Subpart E - Standards of Performance for Incinerators (2006/05)*

Rule 4302 is more stringent than the requirements in the NSPS because the NSPS exempts all facilities with less than 50 tpd charging rate. All facilities in the Valley produce less than 50 tpd but are still subject to Rule 4302.

State Regulations

There are no state regulations applicable to this source category.

[40] EPA. *Approval and Promulgation of Implementation Plans; California State Implementation Plan Revisions for Six California Air Pollution Control Districts; Final Rule*. 64 Fed. Reg. 45170. (1999, August 19). (to be codified at 40 CFR Part 52). http://www.gpo.gov/fdsys/pkg/FR-1999-08-19/pdf/99-21164.pdf

How does District Rule 4302 compare to rules in other air districts?

District staff compared emission limits, optional control requirements, and work practice standards in District Rule 4302 to comparable requirements in rules from the following California nonattainment areas:

- Sacramento Metropolitan AQMD Rule 408 (Amended June 1, 1976) [41]
- South Coast AQMD Rule 473 (Adopted May 7, 1976)[42]
- Ventura County APCD Rule 57 (Amended January 11, 2005)[43]

Bay Area AQMD does not have an analogous rule for this source category.

Sacramento Metropolitan AQMD

- SMAQMD Rule 408 (Incinerator Burning)

	SJVAPCD Rule 4302	SMAQMD Rule 408
Applicability	Any incineration activity or equipment.	Burning of any combustible refuse in any incinerator or other enclosure.
Requirements	A person shall not burn in any incinerator within the District except in a multiple-chamber incinerator as defined in Rule 1020 (Definitions), or in equipment found by the APCO to be equally effective for the purpose of air pollution control as an approved multiple-chamber incinerator. The incineration of residential rubbish as permitted in Rule 4103 (Open Burning) shall be conducted in accordance with the Uniform Fire Code.	A person shall not burn any combustible refuse in any incinerator or other enclosure except: • Such refuse that is generated and burned on the premises of a single or two-family dwelling in the unincorporated area of the County of Sacramento, State of California, situated south of the center line of Township 7 North, or in any incorporated city whose boundaries are situated wholly south of such center line. The burning of putrescible waste, bedding, rubber products are excluded from this exception. • In equipment found by the Air Pollution Control Officer in advance of such use to be equally effective for the purpose of air pollution control as an approved multiple chamber incinerator.

The District evaluated the requirements contained within SMAQMD's Rule 408 and found no requirements that were more stringent than those already in Rule 4302.

[41] SMAQMD. *Rule 408 (Incineration Burning).* (Amended June 1, 1976). Retrieved from: http://www.airquality.org/ProgramCoordination/Documents/rule408.pdf
[42] SCAQMD. *Rule 473 (Disposal of Solid and Liquid Wastes).* (Adopted May 7, 1976). Retrieved from: http://www.aqmd.gov/docs/default-source/rule-book/rule-iv/rule-473.pdf?sfvrsn=4
[43] VCAPCD. *Rule 57 (Incinerators).* (Revised January 1, 2005). Retrieved from: http://www.vcapcd.org/Rulebook/Reg4/RULE%2057.pdf

South Coast AQMD

- SCAQMD Rule 473 (Disposal of Solid and Liquid Wastes)

	SJVAPCD Rule 4302	SCAQMD Rule 473
Applicability	Any incineration activity or equipment.	Any equipment used to process combustible refuse.
Requirements	A person shall not burn in any incinerator within the District except in a multiple-chamber incinerator as defined in Rule 1020 (Definitions), or in equipment found by the APCO to be equally effective for the purpose of air pollution control as an approved multiple-chamber incinerator. The incineration of residential rubbish as permitted in Rule 4103 (Open Burning) shall be conducted in accordance with the Uniform Fire Code.	A person shall not burn any combustible refuse in any incinerator except in a multiple-chamber incinerator or in equipment found by the Air Pollution Control Officer to be equally effective for the purpose of air pollution control. A person shall not discharge into the atmosphere from any equipment used to dispose of combustible refuse by burning, PM in excess of what is specified in rule.

The District evaluated the requirements contained within SCAQMD's Rule 473 and found no requirements that were more stringent than those already in Rule 4302.

Ventura County APCD

- VCAPCD Rule 57 (Incinerators)

	SJVAPCD Rule 4302	VCAPCD Rule 57
Applicability	Any incineration activity or equipment.	Equipment used for the disposal of solid or liquid combustible refuse by burning.
Requirements	A person shall not burn in any incinerator within the District except in a multiple-chamber incinerator as defined in Rule 1020 (Definitions), or in equipment found by the APCO to be equally effective for the purpose of air pollution control as an approved multiple-chamber incinerator. The incineration of residential rubbish as permitted in Rule 4103 (Open Burning) shall be conducted in accordance with the Uniform Fire Code.	No person shall burn solid or liquid combustible refuse in an incinerator except in a multiple chamber incinerator, or in equipment approved by the APCO and EPA to be equally effective for the purpose of air pollution control. No incinerator shall discharge particles individually large enough to be visible while suspended in the atmosphere.

The District evaluated the requirements contained within VCAPCD's Rule 57 and found no requirements that were more stringent than those already in Rule 4302.

Potential Emission Reduction Opportunities

As demonstrated above, Rule 4302 currently has in place the most stringent measures feasible to implement in the Valley. No additional emission reduction opportunities have been identified at this time.

Contingency Measure Evaluation

As discussed in Chapter 6, contingency measures are immediately implemented ONLY if triggered by an unanticipated milestone or attainment failure. The District reviewed this control measure for a potential contingency component. The District concludes that this control measure is not an appropriate contingency measure because the most stringent feasible controls are already in place, and a contingency trigger is incompatible with the technologies involved in reducing emissions from this category.

Evaluation Findings

Rule 4302 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds federal RACT requirements for this source category. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

C.6 RULE 4306 AND RULE 4320 ADVANCED EMISSION REDUCTION OPTIONS FOR BOILERS, STEAM GENERATORS, AND PROCESS HEATERS GREATER THAN 5.0 MMBTU/HR

Emissions Inventory (Summer Average – Tons per day)

	2017	2023	2026	2029	2032	2035	2037
NOx	3.53	2.85	2.36	2.11	1.94	1.91	1.89
VOC	1.46	1.30	1.24	1.19	1.15	1.11	1.09

The EICs are the same for Rules 4306/4320, 4307, and 4308. Therefore, above are the baseline emissions from boilers as a whole.

District Rules 4306 and 4320 Description

Rules 4306 and 4320 apply 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 these rules is to limit NOx, carbon monoxide (CO), and PM emissions from boilers, steam generators, and process heaters of this size range. Facilities with units subject to these rules represent a wide range of industries, including but not limited to electrical utilities, cogeneration, oil and gas production, petroleum refining, manufacturing and industrial processes, food and agricultural processing, and service and commercial facilities.

The purpose of Rule 4320 is to limit emissions of NOx, CO, SO2, and particulate matter with a diameter of 10 microns or less (PM10) from boilers, steam generators, and process heaters. The rule applies to any gaseous fuel or liquid fuel fired boiler, steam generator, and process heater with a rated heat input greater than 5.0 million Btu/hr. Rule 4320 establishes NOx limits separate from Rule 4306 and provides Advanced Emission Reduction Options for rule compliance, where an operator can either meet the specific NOx emission and PM control requirements, or pay an annual emissions fee to the District and meet the PM control requirements.

The District Governing Board adopted amendments to Rules 4306 and 4320 on December 17, 2020. Based on a comprehensive technical analysis, in-depth review of local, state, and federal regulations, and a robust public process, the District adopted several modifications to Rules 4306 and 4320 to reduce emissions from boilers, process heaters, and steam generators in the Valley. Modifications to Rule 4306 and 4320 include lowered NOx emissions limits for a variety of unit classes and categories and established dates for emission control plans, authorities to construct, and compliance deadlines. Additionally, the District updated the Rule 4306 categories from the previous categories in the rule to account for differences in technologically achievable and cost-effective limits, which vary between different types and sizes of units. Updated category groupings also establish consistency in the categories included in Rule 4306 as well as Rule 4320. The District also added definitions and updated test methods in Rules 4306 and 4320 to improve clarity and reflect changes to rule requirements, and reflect the

latest version of test methodology available.

In situations where a retrofit may not be the best option given the technology forcing nature of the limits, operators have the option of paying an annual emissions fee based on the actual emissions of the unit during the previous calendar year while the facility continually evaluates the feasibility of potential controls. These fees may then be used by the District to support cost-effective emission reductions and other pollution reduction activities. Fees would be paid annually and continue until the unit complies with the applicable limit. The affected sources will have the option, on an annual basis, to stop the fee option and install controls specified in the rule.

The amended rules include the most effective controls that are available and are technologically feasible. Rule 4306 and Rule 4320 are the most stringent regulations in the country for the subject type of units and go above and beyond federal standards of RACT.

Cost Effectiveness

As part of the December 2020 amendments to Rules 4306 and 4320, the District estimated a cost effectiveness ranging up to $209,600, depending on the unit category and compliance scenario.

How do District Rules 4306 and 4320 compare with federal and state rules and regulations?

Federal Regulations

There are no Control Techniques Guidelines applicable to this source category.

A. Alternative Control Techniques (ACT)

District staff conducted a comprehensive evaluation of EPA ACT requirements. EPA has not adopted updates to the following ACTs since EPA found that Rules 4306/4320 met RACT requirements through EPA's approval of the *2014 RACT SIP*. Therefore, further evaluation is not necessary at this time.

- *Alternative Control Techniques Document – NOx Emissions from Process Heaters (EPA-453/R-93-034 1993/09)*
- *Alternative Control Techniques Document – NOx Emissions from Industrial/Commercial/Institutional Boilers (EPA-453/R-94-022 1994/03)*
- *Alternative Control Techniques Document – NOx Emissions from Utility Boilers (EPA-453/R-94-023 1994/03)*

B. New Source Performance Standards (NSPS)

District staff conducted a comprehensive evaluation of EPA NSPS requirements. EPA has not adopted updates to the following NSPS since EPA found that Rules 4306/4320 met RACT requirements through EPA's approval of the *2014 RACT SIP*. Therefore, further evaluation is not necessary at this time.

- *40 CFR 60 Subpart D - Standards of Performance for Fossil-Fuel Fired Steam Generators (2007/06)*
- *40 CFR 60 Subpart Db - Standards of Performance for Industrial-Commercial-Institutional Steam Generating Units (2007/06)*
- *40 CFR 60 Subpart Dc - Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units (2012/04)*

State Regulations

There are no state regulations applicable to this source category.

How do District Rules 4306 and 4320 compare to rules in other air districts?

District staff compared emission limits, optional control requirements, and work practice standards in District Rules 4306 and 4320 to comparable requirements in rules from the following nonattainment areas:

- Bay Area AQMD Regulation 9, Rule 7 (Amended May 4, 2011)[44]
- Bay Area AQMD Regulation 9, Rule 10 (Amended November 3, 2021)[45]
- Bay Area AQMD Regulation 9, Rule 11 (Amended May 17, 2000)[46]
- Sacramento Metropolitan AQMD Rule 411 (Amended August 23, 2007)[47]
- South Coast AQMD Rule 1146 (Amended December 4, 2020)[48]

[44] BAAQMD. Regulation 9, Rule 7. Nitrogen Oxides and Carbon Monoxide from Industrial, Institutional, and Commercial Boilers, Steam Generators, And Process Heaters. (Amended May 4, 2011). Retrieved from: https://www.baaqmd.gov/~/media/dotgov/files/rules/reg-9-rule-7-nitrogen-oxides-and-carbon-monoxide-from-industrial-institutional-and-commercial-boiler/documents/rg0907.pdf?la=en&rev=ab95f36c2dd146528f1cf3c10596bce3

[45] BAAQMD. *Regulation 9, Rule 10. Nitrogen oxides And Carbon Monoxide From Boilers, Steam Generators And Process Heaters in Petroleum Refineries.* (Amended November 3, 2021). Retrieved from: https://www.baaqmd.gov/~/media/dotgov/files/rules/refinery-rules-definitions/rg0910_20211103-pdf.pdf?la=en&rev=6e3872940d924000b45ea05f05b5a309

[46] BAAQMD. *Regulation 9, Rule 11. Nitrogen Oxides And Carbon Monoxide from Utility Electric Power Generating Boilers*. (Amended May 17, 2000). Retrieved from: https://www.baaqmd.gov/~/media/dotgov/files/rules/reg-9-rule-11-nitrogen-oxides-and-carbon-monoxide-from-utility-electric-power-generating-boilers/documents/rg0911.pdf?la=en&rev=cf79907f652d454c9b52a55ae3e95903

[47] SMAQMD. *Rule 411. NOx From Boilers, Process Heaters and Steam Generators.* (Amended August 23, 2007). Retrieved from: http://www.airquality.org/ProgramCoordination/Documents/rule411.pdf

[48] SCAQMD. *Rule 1146. Emissions of Oxides of Nitrogen From Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters.* (Amended December 4, 2020). Retrieved from: http://www.aqmd.gov/docs/default-source/rule-book/reg-xi/rule-1146.pdf

- South Coast AQMD Rule 1109.1 (Adopted November 5, 2021)[49]
- Ventura County APCD Rule 74.15 (Amended November 10, 2020)[50]

The District reviewed the rule requirements implemented prior to EPA's approval of the *2014 RACT SIP*, and found that Rules 4306 and 4320 continue to implement RACT levels of control. The below comparison tables demonstrate that, for more recently amended rules, District Rules 4306 and 4620 continue to meet RACT.

Bay Area AQMD

- BAAQMD Regulation 9, Rule 10 (Boilers, Steam Generators and Process Heaters in Refineries)

BAAQMD amended Regulation 9, Rule 10 on November 3, 2021. The 2021 amendments were administrative and did not affect rule stringency. The District found no requirements in BAAQMD Regulation 9, Rule 10 that were more stringent than those in Rules 4306 and 4320.

South Coast AQMD

- SCAQMD Rule 1146 (Emissions of Oxides of Nitrogen from Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters)

	SJVAPCD Rule 4306	SCAQMD Rule 1146
Applicability	Any gaseous fuel or liquid fuel fired boiler, steam generator, or process heater with a total rated heat input greater than 5 million Btu per hour.	Boilers, steam generators, and process heaters of equal to or greater than 5 million Btu per hour rated heat input capacity used in industrial, institutional, and commercial operations.

Exemptions	• Units regulated by other District rules such as solid fuel fired units, dryers, glass melting furnaces, kilns, and smelters.
	• Any units while burning any fuel other than PUC quality natural gas that:
	  ○ Burns non-PUC gas no more than 168 cumulative hours in a calendar year plus 48 hours per calendar year for equipment testing;
	  ○ NOx emission do not exceed 150 parts per million (ppm).
		• Boilers used by electric utilities to generate electricity
		• Boilers and process heaters with a rated heat input capacity greater than 40 million Btu per hour that are used in petroleum refineries
		• Sulfur plant reaction boilers

[49] SCAQMD. *Rule 1109. Emissions of Oxides of Nitrogen From Petroleum Refineries and Related Operations.* (Amended December 4, 2020). Retrieved from: http://www.aqmd.gov/docs/default-source/rule-book/reg-xi/r1109-1.pdf?sfvrsn=8

[50] VCAPCD. *Rule 74.15. Boilers, Steam Generators, and Process Heaters.* (Amended November 10, 2020). Retrieved from: http://www.vcapcd.org/Rulebook/Reg4/RULE%2074.15.pdf

	SJVAPCD Rule 4306	SCAQMD Rule 1146
Requirements		
Category A Units 5-20 MMBtu/hr Except Categories C through G units	7 ppm for fire tube units 9 ppm for all other units	Non-RECLAIM 7 ppm for fire tube units 9 ppm for all other units RECLAIM 9 ppm for fire tube units 12 ppm for all other units
Category B Units > 20 MMBtu/hr Except Categories C through G units	20-75 MMBtu/hr 7 ppm 75 MMBtu/hr or greater 5 ppm	20-75 MMBtu/hr Non-RECLAIM 7 ppm for fire tube units 9 ppm for all other units RECLAIM 9 ppm for fire tube units 12 ppm for all other units 75 MMBtu/hr or greater Non-RECLAIM 5 ppm RECLAIM 9 ppm
Category C.1 Oilfield Steam Generators 5-20 MMBtu/hr	9 ppm	SCAQMD Rule 1146 applies to Industrial, Institutional, and Commercial Units. Oilfield steam generators do not fall into either one of these categories per definitions in the rule.
Category C.2 Oilfield Steam Generators 20-75 MMBtu/hr	9 ppm	
Category C.3 Oilfield Steam Generators >75 MMBtu/hr	7 ppm	
Category C.4 Oilfield Steam Generators fired on less than 50% PUC quality gas	15 ppm	
Category D.1 Refinery Boilers 5-40 MMBtu/hr	30 ppm 5 ppm for replacement units	SCAQMD Rule 1146 applies to Industrial, Institutional, and Commercial Units. Petroleum Refineries do not fall into either one of these categories per definitions in the rule.
Category D.2 Refinery Boilers 40-110 MMBtu/hr	9 ppm 5 ppm for replacement units	
Category D.3 Refinery Boilers >110 MMBtu/hr	5 ppm	
Category D.4 Refinery Process Heaters 5-40 MMBtu/hr	30 ppm 9 ppm for replacement units	

	SJVAPCD Rule 4306	SCAQMD Rule 1146
Category D.5 Refinery Process Heaters 40-110 MMBtu/hr	15 ppm 9 ppm for replacement units	
Category D.6 Refinery Process Heaters >110 MMBtu/hr	5 ppm	
Category E Units with annual heat input >1.8 billion Btu/yr but <30 billion Btu/yr	30 ppm	For units using 9.0 billion Btu/yr or less, tune up twice a year. For units over that limit, units must meet the following applicable limit: 25 ppm landfill gas units, 15 ppm digester gas units, otherwise, for other units: 20-75 MMBtu/hr Non-RECLAIM 7 ppm for fire tube units 9 ppm for all other units RECLAIM 9 ppm for fire tube units 12 ppm for all other units 75 MMBtu/hr or greater Non-RECLAIM 5 ppm RECLAIM 9 ppm
Additional Categories Included in SCAQMD Rule 1146		
Atmospheric Units District Rule 4306 does not establish limits specifically for atmospheric units. Therefore, these units would be subject to the limits in Category A or B.	Category A 7 ppm fire tube boilers 9 ppm other units Category B 7 ppm 20-75 MMBtu/hr 5 ppm enhanced >75 MMBtu/hr	12 ppm NOx (natural gas)
Digester gas District Rule 4306 does not establish limits specifically for atmospheric units. Therefore, these units would be subject to the limits in Category A or B.	Category A 7 ppm fire tube boilers 9 ppm other units Category B 7 ppm 20-75 MMBtu/hr 5 ppm enhanced >75 MMBtu/hr	15 ppm NOx
Landfill gas District Rule 4306 does not limits specifically for units fired with landfill gas. Therefore, these units would be subject to the limits in Category A or B.	Category A 7 ppm fire tube boilers 9 ppm other units Category B 7 ppm 20-75 MMBtu/hr 5 ppm enhanced >75 MMBtu/hr	25 ppm NOx

	SJVAPCD Rule 4306	SCAQMD Rule 1146
Other units fired on gaseous fuel This is a general category in SCAQMD's rule that is covered under multiple categories in Rule 4306	Category A 7 ppm fire tube boilers 9 ppm other units Category B 7 ppm 20-75 MMBtu/hr 5 ppm enhanced >75 MMBtu/hr	30 ppm NOx

The District concluded that overall Rule 4306 is as stringent as or more stringent than SCAQMD Rule 1146.

South Coast AQMD

- SCAQMD Rule 1109.1 (Emissions of Oxides of Nitrogen from Petroleum Refineries and Related Operations)

	SJVAPCD Rule 4306	SCAQMD Rule 1109.1
Applicability	Any gaseous fuel or liquid fuel fired boiler, steam generator, or process heater with a total rated heat input greater than 5 million Btu per hour.	Owners or operators of facilities with units at petroleum refineries and facilities with related operations to petroleum refineries.
Exemptions	• Units regulated by other District rules such as solid fuel fired units, dryers, glass melting furnaces, kilns, and smelters. • Any units while burning any fuel other than PUC quality natural gas that: ○ Burns non-PUC gas no more than 168 cumulative hours in a calendar year plus 48 hours per calendar year for equipment testing; ○ NOx emission do not exceed 150 ppm.	• Boilers or process heaters 2 MMBtu/hr or less • Boilers and process heaters with a rated heat input capacity less than 40 million Btu per hour that operate less than 200 hours per year • Boilers and process heaters with a rated heat input capacity less than 40 million Btu per hour that are fired at less than 15% maximum rated heat input capacity per year • Boilers or process heaters operating only the pilot prior to startup or after shutdown
Requirements		
Category A Units 5-20 MMBtu/hr Except Categories C through G units	7 ppm for fire tube units 9 ppm for all other units	SCAQMD Rule 1109.1 only applies to units at petroleum refineries
Category B Units > 20 MMBtu/hr Except Categories C through G units	20-75 MMBtu/hr 7 ppm 75 MMBtu/hr or greater 5 ppm	SCAQMD Rule 1109.1 only applies to units at petroleum refineries
Category C.1 Oilfield Steam Generators 5-20 MMBtu/hr	9 ppm	SCAQMD Rule 1109.1 only applies to units at petroleum refineries

	SJVAPCD Rule 4306	SCAQMD Rule 1109.1
Category C.2 Oilfield Steam Generators 20-75 MMBtu/hr	9 ppm	
Category C.3 Oilfield Steam Generators >75 MMBtu/hr	7 ppm	
Category C.4 Oilfield Steam Generators fired on less than 50% PUC quality gas	15 ppm	
Category D.1 Refinery Boilers 5-40 MMBtu/hr	30 ppm 5 ppm for replacement units	40 ppm 5 ppm after burner replacement
Category D.2 Refinery Boilers 40-110 MMBtu/hr	9 ppm 5 ppm for replacement units	5 ppm but with with higher conditional limits, higher interim limits, and multiple alternative compliance options
Category D.3 Refinery Boilers >110 MMBtu/hr	5 ppm	5 ppm but with higher conditional limits, higher interim limits, and multiple alternative compliance options
Category D.4 Refinery Process Heaters 5-40 MMBtu/hr	30 ppm 9 ppm for replacement units	40 ppm 9 ppm after replacement of burners
Category D.5 Refinery Process Heaters 40-110 MMBtu/hr	15 ppm 9 ppm for replacement units	5 ppm but with higher conditional limits, higher interim limits, and multiple alternative compliance options
Category D.6 Refinery Process Heaters >110 MMBtu/hr	5 ppm	5 ppm but with higher conditional limits, higher interim limits, and multiple alternative compliance options
Category E Units with annual heat input >1.8 billion Btu/yr but <30 billion Btu/yr	30 ppm	No NOx limit for boilers and process heaters with a rated heat input capacity less than 40 million Btu per hour that operate less than 200 hours per year, or are fired at less than 15% maximum rated heat input capacity per year

SCAQMD Rule 1109.1 has NOx emission limits for some categories of refinery units that could be seen as being more stringent than District Rule 4306. However, for these categories of units, SCAQMD Rule 1109.1 has higher conditional limits, higher interim limits, and multiple alternative compliance options are available, thus making the NOx limits less stringent than the firmly established NOx limits in Rule 4306. The District concluded that overall Rule 4306 is as stringent or more stringent than SCAQMD Rule 1109.1.

Ventura County APCD

- VCAPCD Rule 74.15 (Boilers, Steam Generators, and Process Heaters)

	SJVAPCD Rule 4306	VCAPCD Rule 74.15
Applicability	Any gaseous fuel or liquid fuel fired boiler, steam generator, or process heater with a total rated heat input greater than 5 million Btu per hour.	Boilers, steam generators and process heaters, greater than 5 million Btu per hour used in all industrial, institutional and commercial operations.

Exemptions	• Units regulated by other District rules such as solid fuel fired units, dryers, glass melting furnaces, kilns, and smelters.
	• Any units while burning any fuel other than PUC quality natural gas that:
	  ○ Burns non-PUC gas no more than 168 cumulative hours in a calendar year plus 48 hours per calendar year for equipment testing;
	  ○ NOx emission do not exceed 150 ppm.
		• Units fired on alternate fuel during natural gas curtailment
		• Emergency standby units
		• Cold Startup

Requirements		
Category A Units 5-20 MMBtu/hr Except Categories C through G units	7 ppm for fire tube units 9 ppm for all other units	40 ppm After January 1, 2027 9 ppm for boilers 12 ppm for process heaters
Category B Units > 20 MMBtu/hr Except Categories C through G units	20-75 MMBtu/hr 7 ppm 75 MMBtu/hr or greater 5 ppm	40 ppm After January 1, 2027 9 ppm for boilers 12 ppm for process heaters
Category C.1 Oilfield Steam Generators 5-20 MMBtu/hr	9 ppm	40 ppm After January 1, 2027 9 ppm
Category C.2 Oilfield Steam Generators 20-75 MMBtu/hr	9 ppm	
Category C.3 Oilfield Steam Generators >75 MMBtu/hr	7 ppm	
Category C.4 Oilfield Steam Generators fired on less than 50% PUC quality gas	15 ppm	

	SJVAPCD Rule 4306	VCAPCD Rule 74.15
Category D.1 Refinery Boilers 5-40 MMBtu/hr	30 ppm 5 ppm for replacement units	40 ppm After January 1, 2027 9 ppm
Category D.2 Refinery Boilers 40-110 MMBtu/hr	9 ppm 5 ppm for replacement units	40 ppm After January 1, 2027 9 ppm
Category D.3 Refinery Boilers >110 MMBtu/hr	5 ppm	40 ppm After January 1, 2027 9 ppm
Category D.4 Refinery Process Heaters 5-40 MMBtu/hr	30 ppm 9 ppm for replacement units	40 ppm After January 1, 2027 12 ppm
Category D.5 Refinery Process Heaters 40-110 MMBtu/hr	15 ppm 9 ppm for replacement units	40 ppm After January 1, 2027 12 ppm
Category D.6 Refinery Process Heaters >110 MMBtu/hr	5 ppm	40 ppm After January 1, 2027 12 ppm
Category E Units with annual heat input >1.8 billion Btu/yr but <30 billion Btu/yr	30 ppm	1.8 - 9 MMBtu - No NOx Limit 9 - 30 MMBtu – 40 parts per million volume (ppmv) After January 1, 2027 9 – 30 MMBtu 9 ppm for boilers 12 ppm for process heaters

The District concluded that overall Rule 4306 is as stringent as or more stringent than VCAPCD Rule 74.15.

Potential Emission Reduction Opportunities

Based on a comprehensive technical analysis, in-depth review of local, state, and federal regulations, and a robust public process, the recent rule amendments established more stringent emission limits for NOx. Rules 4306 and 4320 go above and beyond federal standards of RACT, BARCT, and Most Stringent Measures (MSM).

Although these District Rules go above and beyond RACT, BARCT, and MSM, the District evaluated the electric/solar opportunities for oilfield steam generators below.

Electrification of Oilfield Steam Generators

Currently, there are no electric steam generators capable of meeting the demands of conventional steam generators. One of the largest electric generators produces 4,882 lb/hr @ 135 pounds per square inch gauge (psig). This flow rate is only 1/10 of the rate needed from one conventional steam generator and the pressure rating of 135 psig is far below the needed pressure of 800 – 900 psig.

Furthermore, a typical conventional natural gas-fired steam generator is rated (designed) to burn up to 62.5 million Btu/hr of natural gas and consumes approximately 50 million Btu/hr (i.e. 80% firing rate). This will require, on average, 13.75 MW of electricity to replace one conventional steam generator. Therefore, the electricity needs to replace one conventional steam generator with electric steam generation would be the equivalent electricity demand of over 10,000 homes. To replace conventional steam generators operating in the San Joaquin Valley with electric steam generation would require approximately 5,160 MW, which would be the equivalent electricity demand of 3,800,000 homes. The immense amount of power needed to electrify all steam generators in the District would require significant infrastructure upgrades to California's power grid. Therefore, electric steam generators are not feasible at this time.

Solar Powered Oilfield Steam Generation

Emissions from oilfield steam generators that provide steam to reduce the viscosity of oil in thermally enhanced oil recovery operations have been significantly reduced through decades of increasingly stringent rule requirements. Instead of fuel oil, steam generators today are powered by natural gas or field gas which are significantly cleaner. To ensure that all potential emission reduction opportunities are evaluated, the District performed a comprehensive review of solar powered steam generators.

In the Valley, two small pilot projects were conducted to demonstrate the feasibility of solar powered steam generation technologies and found that such technologies were not feasible:

Berry Petroleum Company: This company installed a small pilot test facility designed to use solar energy to pre-heat feed water for the existing natural gas fired steam generators. The system consisted of mirrors in a glass greenhouse (supplied by Glasspoint Solar). The mirrors were designed to focus solar energy onto a pipe carrying water to heat the water. The heated water would then be sent to the input of the steam generators. The facility had a designed heat production of 300 kW. This project operated for a short time and was ultimately shut down based on the following shortcomings:

1) Significant heat loss: The heat losses to the water from the pipe runs from the solar installation to the actual steam generator locations were such that the water delivered to the steam generators was ambient or slightly warmer.
2) Excessively large footprint requirement: The footprint of the solar steam generators needed to provide the thermal output of one 85 MMBtu steam generator would be excessively large.

3) Inconsistent steam quality: The inability of the solar steam generators to consistently generate the quality of steam that is needed for injection that is currently supplied by the steam generators.
4) Unreliable power: The solar steam generators would still need to be supplemented by gas fired steam generators at night and during cloudy days.

Chevron: This company installed a pilot solar thermal steam plant near Coalinga, consisting of 7,600 mirrors that would direct solar energy towards a single solar collector tower (supplied by Brightsource Energy). The heat collected in the tower would turn water into steam. The installation had a footprint of 100 acres. This system discontinued operation in 2014. Although information from Chevron on their findings on the performance of this project is unavailable, based on news articles[51], the system was excessively costly. A news article referencing the manufacturer's SEC filings stated the company realized a 40 million dollar loss on the project.

Aera Energy: Despite the above-described challenges, in 2019, Aera Energy in collaboration with GlassPoint Solar considered the installation of a large 770-acre solar steam generation system adjacent to an Aera Energy oil production operation in western Kern County. However, in April of 2020, GlassPoint cancelled the project due to a lack of funding. This system would have generated the steam equivalent to approximately 10 gas-fired steam generators. The solar steam generators would still need to be supplemented by gas-fired steam generators at night and during cloudy days.

Based on discussions with Aera Energy, the project heavily relied on solar tax credits, the generation and sale of low carbon fuel standard credits, and the reduction in costs of greenhouse gas allowances for Aera. According to Aera Energy, there is no economic benefit to implementing such technologies. In fact, without the LCFS credits, the cost of steam using this solar technology would be as much as three times the current cost.

The project also faced technical challenges, similar to the above pilot projects. Furthermore, the gas-fired steam generators that are required to supplement the system could face difficulty meeting current rule limits due to the need to ramp up and down. There has not been a successful large scale implementation of such technologies.

In summary, solar powered oilfield steam generators are not yet feasible and still face significant technical and economic challenges as outlined below:

- **Costs:** The use of solar steam generation rely on a complex set of funding sources to make the operations economically feasible, including the Federal 30% tax credit, the value of California low-carbon fuel standards credits that may be

[51] http://www.naturalgasintel.com/articles/103562-potential-for-solar-assisted-eor-in-california-oilfield-still-unfulfilled and https://gigaom.com/2011/10/12/brightsources-solar-steam-project-went-way-over-budget/

generated as a result of using solar steam generation to produce oil, and a reduction in the costs for the oil producer of AB32 cap-and-trade credits required for their operations in California. The value of the GHG credits generated varies based on the price of credits on the open market. As the value of the credits is not fixed, the economic viability of a project may change depending on the value of the credits prior to construction and during operation. Even with available credits, the costs continue to be a challenge.

- **Land Availability:** Adequate open land next to the steam injection wells is needed to house the solar collectors. Both the amount of land and the distance of the land to the injection point are important factors. It is estimated that to create the steam needed to replace one steam generator would require 60 acres of solar generation. Finding the required amount of land available next to oilfield operations may be difficult. The solar systems have to be close to the steam injection wells. Otherwise, additional solar capacity will need to be developed to account for the heat loss because of travel distance.

- **Variability of Solar Steam Generation Output:** Solar steam generation plants need sunny days to be able to collect enough energy to make steam. During cloudy days and also during the night, the solar equipment would not make enough steam. Oilfield operators will need to supplement the solar operation with natural gas fired steam generators for when the solar equipment is not producing enough steam. On partly cloudy days, the natural gas steam generators would need to cycle on and off depending on the cloud cover. This may cause operational difficulties as the gas fired steam generators are tuned to operate at constant load. A variable load could cause emissions variability and potentially have emissions higher than that allowed in permit limits and/or District prohibitory rules.

The District will continue to work with operators of boilers, steam generators, and process heaters to develop, demonstrate, and deploy new emission control technologies. As part of this continued effort, the District will evaluate any advancements in addressing the above feasibility issues.

Contingency Measure Evaluation

As discussed in Chapter 6, contingency measures are immediately implemented ONLY if triggered by an unanticipated milestone or attainment failure. The District reviewed this control measure for a potential contingency component. The District concludes that this control measure is not an appropriate contingency measure because the most stringent feasible controls are already in place, and a contingency trigger is incompatible with the technologies involved in reducing emissions from this category.

Evaluation Findings

Rules 4306 and 4320 meet or exceed federal RACT requirements for this source category based upon evaluation of applicable federal regulations, state standards, and other air districts' rules. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

C.7 RULE 4307 BOILERS, STEAM GENERATORS AND PROCESS HEATERS–2.0 MMBTU/HR TO 5.0 MMBTU/HR

Emissions Inventory (Summer Average – Tons per day)

The emissions inventory for medium size boilers (2-5 MMBtu/hr) is included as part of the inventory for Rules 4306 and 4320 (Boilers, Steam Generators, and Process Heaters Greater than 5 MMBtu/hr); please refer to that control measure write-up for the baseline emissions from boilers as a whole.

District Rule 4307 Description

The District adopted Rule 4307 on December 15, 2005, and subsequently amended the rule April 21, 2016. The purpose of Rule 4307 is to limit NOx and CO emissions from boilers, steam generators, and process heaters. The rule applies to any gaseous fuel or liquid fuel fired boiler, steam generator, and process heater with a rated heat input of 2.0 MMBtu/hr up to and including 5.0 MMBtu/hr. This source category includes a wide range of industries including but not limited to medical facilities, educational institutions, office buildings, prisons, military facilities, hotels and industrial facilities achieving emission limits as low as 9 ppmv NOx.

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

Federal Regulations

There are no Control Techniques Guidelines or New Source Performance Standards applicable to this source category.

A. Alternative Control Techniques (ACT)

District staff conducted a comprehensive evaluation of EPA ACT requirements. EPA has not adopted updates to the following ACTs since EPA found that Rule 4307 met RACT requirements through EPA's approval of the *2014 RACT SIP*. Therefore, further evaluation is not necessary at this time.

- *Alternative Control Techniques Document - NOx Emissions from Process Heaters (EPA-453/R-93-034 1993/09)*
- *Alternative Control Techniques Document - NOx Emissions from Industrial/Commercial/ Institutional Boilers (EPA-453/R-94-022 1994/03)*
- *Alternative Control Techniques Document - NOx Emissions from Utility Boilers (EPA-453/R-94-023 1994/03)*

State Regulations

There are no state regulations that apply to this source category.

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

District staff compared emission limits, optional control requirements, and work practice standards in District Rule 4307 to comparable requirements in rules from the following California nonattainment areas:

- Bay Area AQMD Regulation 9, Rule 6 (Amended November 7, 2007)[52]
- Bay Area AQMD Regulation 9, Rule 7 (Amended May 4, 2011)[53]
- Bay Area AQMD Regulation 9, Rule 10 (Amended November 3, 2021)[54]
- Sacramento Metropolitan AQMD Rule 411 (Amended August 23, 2007)[55]
- San Diego County APCD Rule 69.2.2 (Adopted September 9, 2021)[56]
- South Coast AQMD Rule 1146.1 (Amended December 7, 2018)[57]
- South Coast AQMD Rule 1109 (Amended August 5, 1988)[58]
- Ventura County APCD Rule 74.15.1 (Amended June 23, 2015)[59]

The District reviewed the rule requirements implemented prior to EPA's approval of the *2014 RACT SIP*, and found that Rule 4307 continues to implement rule requirements that are equivalent or more stringent than those rules. The following sections compare District Rule 4307 requirements with the more recently amended rules.

Bay Area AQMD

- BAAQMD Regulation 9, Rule 10 (Boilers, Steam Generators and Process Heaters in Refineries)

BAAQMD amended Regulation 9, Rule 10 on November 3, 2021. The 2021 amendments were administrative and did not affect rule stringency. The District

[52] BAAQMD. *Regulation 9, Rule 6 (Natural Gas-Fired Boilers and Water Heaters)*. (Amended November 7, 2007). Retrieved from: https://www.baaqmd.gov/~/media/dotgov/files/rules/reg-9-rule-6-nitrogen-oxides-emissions-from-natural-gasfired-water-heaters/documents/rg0906.pdf?la=en&rev=70876e62c74040df8c646077d00d3c86

[53] BAAQMD. *Regulation 9, Rule 7 (Nitrogen Oxides and Carbon Monoxide from Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters)*. (Amended May 4, 2011). Retrieved from: https://www.baaqmd.gov/~/media/dotgov/files/rules/reg-9-rule-7-nitrogen-oxides-and-carbon-monoxide-from-industrial-institutional-and-commercial-boiler/documents/rg0907.pdf?la=en&rev=ab95f36c2dd146528f1cf3c10596bce3

[54] BAAQMD. *Regulation 9, Rule 10 (Nitrogen Oxides and Carbon Monoxide from Boilers, Steam Generators, and Process Heaters in Refineries)*. (Amended November 3, 2021). Retrieved from: https://www.baaqmd.gov/~/media/dotgov/files/rules/refinery-rules-definitions/rg0910_20211103-pdf.pdf?la=en&rev=6e3872940d924000b45ea05f05b5a309

[55] SMAQMD. *Rule 411 (NO_x from Boilers, Process Heaters, and Steam Generators)*. (Amended August 8, 2007). Retrieved from: https://www.airquality.org/ProgramCoordination/Documents/Rule411%20StaffReport%20080807.pdf

[56] SCAQMD. *Rule 69.2.2 (Medium Boilers, Process Heaters, and Steam Generators)*. (Adopted September 9, 2021). Retrieved from: https://www.sdapcd.org/content/dam/sdapcd/documents/rules/current-rules/Rule-69.2.2.pdf

[57] SCAQMD. *Rule 1146.1 (Emissions of Oxides of Nitrogen from Small Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters)*. (Amended December 7, 2018). Retrieved from: http://www.aqmd.gov/docs/default-source/rule-book/reg-xi/rule-1146-1.pdf

[58] SCAQMD. *Rule 1109 (Emissions of Oxides of Nitrogen from Boilers and Process Heaters in Petroleum Refineries)*. (Amended August 5, 1988). Retrieved from: http://www.aqmd.gov/docs/default-source/rule-book/reg-xi/rule-1109.pdf

[59] VCAPCD. *Rule 14.15.1 (Boilers, Steam Generators, and Process Heaters)*. (Amended June 23, 2015). Retrieved from: http://www.vcapcd.org/Rulebook/Reg4/RULE%2074.15.1.pdf

compared the emission limits in District Rule 4307 to the requirements contained within BAAQMD's Regulation 9, Rule 10 and found that NOx requirements in the District rule are on an emission-unit by emission-unit basis, whereas, the emission limits in BAAQMD rule is on a refinery-wide basis, and therefore, cannot be compared.

San Diego County APCD

- SDAPCD Rule 69.2.2 (Medium Boilers, Process Heaters, and Steam Generators)

	SJVAPCD Rule 4307	SDAPCD Rule 69.2.2
Applicability	Any gaseous fuel or liquid fuel fired boilers, steam generators and process heaters rated ≥2.0 MMBtu/hr to ≤5.0 MMBtu/hr	Boilers, steam generator and process heaters >2 MMBtu/hr to <5 MMBtu/hr
Exemptions	• Solid fuel fired units • Dryers and glass melting furnaces • Kilns, humidifiers, and smelters where the products of combustion come into direct contact with the material to be heated • Unfired or fired waste heat recovery boilers that are used to recover or augment heat from the exhaust of combustion turbines or internal combustion engines • Burning other fuel during PUC quality natural gas curtailment as long as other fuel not be burned for more than 168 hour/year plus 48 hour/year for equipment testing and NOx emissions shall not exceed 150 ppmv or 0.215 pounds per million British thermal units per hour (lb/MMBtu)	• Waste heat recovery boilers • Furnaces, kilns, and any combustion equipment where the material being • heated is in direct contact with the products of combustion • Thermal oxidizers and associated waste heat recovery equipment • Units which burns liquid fuel only during periods of natural gas curtailment, during emergencies, or during equipment testing for the purpose of maintaining the fuel oil back-up system
Requirements	<u>Existing units limited to 1.8 billion Btu/yr</u> • Install & maintain non-resettable fuel flow meter; AND • Tune-in the unit twice per calendar year, OR • Operate and maintain the stack O_2 concentrations at 3% by vol. or less, OR • Certify unit to comply with 30 ppmv NOx and 400 ppmv CO (gaseous fuel) when annual limit is exceeded; if unit is replaced then comply with limits of New and Replacement units (see below). <u>Existing atmospheric units in oilfield or refinery; each glycol reboiler; or each unit with heat input > 1.8 to < 5 billion Btu/yr:</u> • 30 ppmv NOx (gaseous fuel) • 40 ppmv NOx (liquid fuel-fired units) <u>New and Replacement units</u>:	<u>Existing or relocated units</u> • Tune the unit once per year (no more than 90 days apart) <u>New Units (effective July 1, 2021</u> • 30 ppmv NOx for units operated on gaseous fuel • 40 ppmv NOx for units operated on liquid fuel • 400 ppm CO

	SJVAPCD Rule 4307	SDAPCD Rule 69.2.2
	• 12 ppmv NOx (atmospheric units) • 9 ppmv NOx (non-atmospheric units)	

*Unless otherwise stated, all ppmv values are on a dry basis and corrected to 3% stack oxygen by volume.

District Rule 4307 contains NOx limits for existing units, while SDAPCD Rule 69.2.2 does not, and District Rule 4307 contains more stringent NOx limits for new units. Therefore, District Rule 4307 is as stringent as or more stringent than SDAPCD Rule 69.2.2.

South Coast AQMD

- SCAQMD Rule 1146.1 (Emissions of Oxides of Nitrogen from Small Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters)

	SJVAPCD Rule 4307	SCAQMD Rule 1146.1
Applicability	Any gaseous fuel or liquid fuel fired boilers, steam generators and process heaters rated ≥2.0 MMBtu/hr to ≤5.0 MMBtu/hr	Boilers, steam generator and process heaters >2 MMBtu/hr to <5 MMBtu/hr
Exemptions	• Solid fuel fired units • Dryers and glass melting furnaces • Kilns, humidifiers, and smelters where the products of combustion come into direct contact with the material to be heated • Unfired or fired waste heat recovery boilers that are used to recover or augment heat from the exhaust of combustion turbines or internal combustion engines • Burning other fuel during PUC quality natural gas curtailment as long as other fuel not be burned for more than 168 hour/year plus 48 hour/year for equipment testing and NOx emissions shall not exceed 150 ppmv or 0.215 lb/MMBtu	• Units at a RECLAIM or former RECLAIM facility subject to a NOx limit in a different rule • Units at municipal sanitation service facility subject to a NOx emission limit in Reg XI adopted or amended after 12/7/18
Requirements	<u>Existing units limited to 1.8 billion Btu/yr</u> • Install & maintain non-resettable fuel flow meter; AND • Tune-in the unit twice per calendar year, OR • Operate and maintain the stack O_2 concentrations at 3% by vol. or less, OR • Certify unit to comply with 30 ppmv NOx and 400 ppmv CO (gaseous fuel) when annual limit is exceeded; if unit is replaced then comply with limits of New and Replacement units (see below).	<u>Existing units (in operation prior to 9/5/08, at non-RECLAIM facilities, or in operation prior to December 7, 2019 at RECLAIM or former RECLAIM) limited to ≤1.8 billion Btu/yr</u> • Operate and maintain stack O_2 concentrations at 3% by vol. or less for any 15-consecutive-minute averaging period, OR • Tune-in the unit twice per year (4 to 8 months apart) <u>All other units (not mentioned below)</u> • 30 ppmv NOx or for natural gas-fired units 0.036 lb-NOx/MMBtu

	SJVAPCD Rule 4307	SCAQMD Rule 1146.1
	Existing atmospheric units in oilfield or refinery; each glycol reboiler; or each unit with heat input > 1.8 to < 5 billion Btu/yr: • 30 ppmv NOx (gaseous fuel) • 40 ppmv NOx (liquid fuel-fired units) New and Replacement units: • 12 ppmv NOx (atmospheric units) • 9 ppmv NOx (non-atmospheric units)	New and replacement units: • 7 ppmv NOx for any fire-tube boilers on natural gas** • 9 ppmv NOx for natural gas fired units excluding fire-tube boilers, atmospheric units, and thermal fluid heaters*** • 12 ppmv NOx for natural gas-fired atmospheric units • 12 ppmv NOx for natural gas-fired thermal fluid heaters**** • 15 ppmv NOx for digester gas fired units • 25 ppmv NOx for landfill gas fired units • Weight average limit for multi-fuel units (e.g., units using both natural gas and digester gas, etc.); ***Units with ≤12 ppmv NOx, >9 ppmv NOx, and ≤ 9 ppmv NOx installed, modified, or issued permits prior to 12/7/18, at a non-RECLAIM facility will become subject to the 7 ppm NOx limit when 50% or more of unit's burner are replaced, or by December 7, 2033, whichever is earlier.* ****Units with ≤12 ppmv NOx and >9 ppmv NOx installed, modified or issued permits prior to 9/5/08, at a non-RECLAIM facility will become subject to the 9 ppmv NOx limit when 50% or more of unit's burner are replaced, or by December 7, 2033, whichever is earlier.* ***Units with ≤30 ppmv NOx installed, modified, or issued permits prior to 12/7/18, at a non-RECLAIM facility will become subject to the 12 ppm NOx limit when 50% or more of unit's burner are replaced, or by December 7, 2033, whichever is earlier.*

*Unless otherwise stated, all ppmv values are on a dry basis and corrected to 3% stack oxygen by volume.

The District evaluated the requirements contained within SCAQMD Rule 1146.1, and found no requirements to be more stringent than those already in District Rule 4307.

Potential 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 able to install established control technologies. The following potential control techniques are evaluated to achieve further reductions:

Retrofitting with Selective Catalytic Reduction (SCR) as Potential Control

SCR technology is predominantly used to reduce NOx emissions from boilers, steam generators, and process heaters. Since SCR is post-combustion control, an existing boiler can be retrofitted with this technology. Pursuant to a local vendor, the cost of an SCR system including the SCR housing, catalyst, ammonia injection system, and ammonia flow control system would be about $200,000. This information is used as a basis to estimate the annualized cost for this control technique.

Description of Cost	Cost Factor	Cost	Source
Direct Costs			
Purchase equipment costs (PE)			
SCR System	A	200,000	Boiler Vendor
Instrumentation and controls	0.01 A	--	included above
Sales Taxes	0.08 A	16,000	
Freight	0.05 A	10,000	OAQPS
Purchased equipment cost, PEC	B = 1.14 A	226,000	
Direct installation costs (DI):			
Foundation & supports	0.08 B	18,080	OAQPS
Handling and erection	0.14 B	31,640	OAQPS
Electrical	0.04 B	9,040	OAQPS
Piping	0.02 B	4,520	OAQPS
Insulation and ductwork:	0.01 B	2,260	OAQPS
Painting	0.01 B	2,260	OAQPS
Direct installation costs	0.30 B	67,800	
Site preparation	As required, SP	--	See table footnote
Buildings	As required, Bldg.	--	
Total Direct Costs, DC	1.30B + SP+ Bldg.	293,800	
Indirect Costs (Installation)			
Engineering	0.10 B	22,600	OAQPS
Construction and field expenses	0.05 B	11,300	OAQPS
Contractor fees	0.10 B	22,600	OAQPS
Contingencies	0.03 B	6,780	OAQPS
Start-up	0.02 B	4,520	OAQPS
Performance test	0.01 B	2,260	OAQPS
Total Indirect Costs, IC	0.31 B	70,060	
Total Capital Investments (TCI= DC + IC):	**1.61 B + SP + Bldg.**	363,860	
Annualized TCI (10 years @ 10% interest)	0.1627 TCI	**59,200**	

Description of Cost	Cost Factor	Cost	Source
Direct Annual Costs (DAC)			
Operating and supervisory labor	--	--	See table footnote
Maintenance Costs (labor and material)	0.015 TCI	5,458	OAQPS
Reagent costs (anhydrous ammonia)		--	Not estimated
Electricity Cost:	$0.08848/kWH	--	Not estimated
Catalyst Replacement:	--	--	Catalyst is presumed to last at least over 10 years
	Total DAC:	5,458	

Description of Cost	Cost Factor	Cost	Source
Indirect Annual Costs (IAC)			
Overhead:	--	--	See table footnote
Insurance:	0.01 TCI	3,639	OAQPS
Property Tax:	--	--	See table footnote
Administrative:	--	--	See table footnote
	Total IAC:	3,639	
Total Annual Cost (DAC + IAC)		9,097	
Total annual cost (Annualized TCI + Total annual cost)		**68,297**	

*Per EPA's Air Pollution Control Cost Manual (6th Edition), EPA/452/B-02-001 (1/02), operating and supervisory, overhead, administrative costs would be insignificant for an SCR system. In general, SCR does not require site preparation or additional buildings, and property taxes do not apply to capital improvements such as air pollution control equipment.

The potential NOx emission reduction for each category is determined by taking the difference between the potential emissions and the emissions that could be reliably achievable by an SCR system. SCR is expected to reliably achieve 5 ppmv NOx @ 3% O2. The total cost for each category is determined by multiplying the number of units and $68,297 for a typical annual cost of an SCR system.

Type of unit	Number of units	Potential NOx Reductions with SCR Technology (tons/yr)	Total annualized cost of NOx Reductions with SCR Technology ($/yr)	Cost-effectiveness ($/ton of emission reduction)
New and replacement unit, 12 ppm NOx	36	5.0	2,458,692	**$491,738/ton**
New and replacement units, 9 ppmv NOx	178	14.9	12,156,866	**$815,897/ton**
Existing units (gaseous fuel), 30 ppmv NOx	251	135.6	17,142,547	**$126,420/ton**
Existing units (gaseous fuel), Low-use, ≤1.8 billion Btu/yr	114	9.8	7,785,858	**$794,475/ton**
Existing units – Gaseous fuel ≤5 billion Btu/yr	3*	--	--	--
Existing units - Liquid fuel ≤5 billion Btu/yr	1*	--	--	--

Retrofit with Ultra low-NOx burner

A boiler, steam generator, or process heater can be retrofitted with an ultra-low NOx burner to reliably achieve 9 ppmv NOx @ 3% O2. Pursuant to a local vendor, the cost of an ultra-low NOx burner would be about $40,000. However, retrofitting an existing boiler may not always be feasible and if feasible, it may involve upgrades to various systems such as fuel trains to comply with current codes, and upgrades to air intake fans, as these units require more air for the burner to operate at its optimum level. These additional items can add considerable costs to the retrofit, which are not included below.

Description of Cost	Cost Factor	Cost	Source
Direct Costs			
Purchase equipment costs (PE)			
Burner System ((Replacement burner, controls, and fuel train systems)	A	70,000	Local Vendor
Instrumentation and controls	0.01 A	--	Included above
Sales Taxes	0.08 A	5,600	
Freight	0.05 A	3,500	OAQPS
Purchased equipment cost, PEC		79,100	
Direct installation costs (DI):			
Foundation & supports	0.08 B	--	See footnote
Handling and erection	0.14 B	11,074	OAQPS
Electrical	0.04 B	3,164	OAQPS
Piping	0.02 B	1,582	OAQPS
Insulation and ductwork:	0.01 B	791	OAQPS
Painting	0.01 B	791	OAQPS
Direct installation costs		17,402	
Site preparation	As required, SP	--	See table footnote
Buildings	As required, Bldg.	--	
Total Direct Costs, DC		96,502	
Indirect Costs (Installation)			
Engineering	0.10 B	7,910	OAQPS
Construction and field expenses	0.05 B	3,955	OAQPS
Contractor fees	0.10 B	7,910	OAQPS
Contingencies	0.03 B	2,373	OAQPS
Start-up	0.02 B	1,582	OAQPS
Performance test	0.01 B	791	OAQPS
Total Indirect Costs, IC	0.31 B	24,521	
Total Capital Investments (TCI= DC + IC):		121,023	
Annualized TCI (10 years @ 10% interest)	0.1627 TCI	**19,690**	
Direct annual costs (DAC)			
Operating and supervisory labor	--	--	See table footnote
Maintenance Costs (labor and material)	--	--	
Electricity Cost:	$0.08848/kWH	--	Not estimated
Indirect Annual Costs (IAC)			
Overhead:	--	--	See table footnote
Insurance:	--	--	See table footnote
Property Tax:	--	--	See table footnote
Administrative:	--	--	See table footnote
Total IAC:			
Total Annual Cost (DAC + IAC)	--	--	
Total annual cost (annualized TCI + Total annual cost)		**19,690**	

*The existing foundation and supports will not be replaced; direct annual cost and indirect annual costs are presumed to be same as the existing burner

The potential NOx emission reduction for each category is determined by taking the difference between the potential emissions and the emissions that could be reliably achievable by an ultra-low NOx burner system. An ultra-low NOx burner is expected to reliably achieve 9 ppmv NOx @ 3% O2. Each unit is presumed to be operated for 8,760 hours per year at the maximum rated capacity. The total cost for each category is determined by multiplying the number of units and $19,690, a typical annual cost of an ultra-low NOx burner system.

Type of unit	Number of units	Potential NOx Reductions with ultra-low NOx burner Technology (tons/yr)	Total annualized cost of NOx Reductions with burner retrofit ($/yr)	Cost-effectiveness ($/ton of emission reduction)
New and replacement unit, 12 ppm NOx	32	2.2	708,840	**$322,200/ton**
New and replacement units, 9 ppmv NOx	178	Not needed, units are already equipped with 9 ppmv burner		
Existing units (gaseous fuel), 30 ppmv NOx	251	113.9	4,942,190	**$43,391/ton**
Existing units (gaseous fuel), Low-use, ≤1.8 billion Btu/yr	114	9.3	2,244,660	**$241,361/ton**
Existing units – Gaseous fuel ≤5 billion Btu/yr	3*	See Footnote below		
Existing units - Liquid fuel ≤5 billion Btu/yr	1*	See Footnote below		

Replacing an older unit

Replacement of an older boiler in many cases may be the only way to reduce NOx emissions. New units can reliably achieve 9 ppmv NOx @ 3% O2. The cost of these units depends on the heat input rate, use of unit (steam, hot water, etc.), control system, and heat recovery systems (economizer etc.). Per a local vendor, the cost of a steam boiler rated at 5.0 MMBtu/hr (300 psi) would be $150,000. Note that 94% of the units are greater than 2.0 MMBtu/hr; therefore, it is reasonable to use this cost data for cost-effectiveness analysis.

Description of Cost	Cost Factor	Cost	Source
Direct Costs			
Purchase equipment costs (PE)			
Replacing an older unit	A	150,000	Local Vendor
Instrumentation and controls	0.01 A	1,500	OAQPS
Sales Taxes	0.08 A	12,000	
Freight	0.05 A	7,500	OAQPS
Purchased equipment cost, PEC		171,000	
Direct installation costs (DI):			
Foundation & supports	0.08 B	13,680	See footnote
Handling and erection	0.14 B	23,940	OAQPS
Electrical	0.04 B	6,840	OAQPS
Piping	0.02 B	3,420	OAQPS
Insulation and ductwork:	0.01 B	1,710	OAQPS

Description of Cost	Cost Factor	Cost	Source
Painting	0.01 B	1,710	OAQPS
Direct installation costs		51,300	
Site preparation	As required, SP	--	See table footnote
Buildings	As required, Bldg.	--	
Total Direct Costs, DC		222,300	
Indirect Costs (Installation)			
Engineering	0.10 B	17,100	OAQPS
Construction and field expenses	0.05 B	8,550	OAQPS
Contractor fees	0.10 B	17,100	OAQPS
Contingencies	0.03 B	5,130	OAQPS
Start-up	0.02 B	3,420	OAQPS
Performance test	0.01 B	1,710	OAQPS
Total Indirect Costs, IC	0.31 B	53,010	
Total Capital Investments (TCI= DC + IC):		275,310	
Annualized TCI (10 years @ 10% interest)	0.1627 TCI	**44,793**	
Direct annual costs (DAC)			
Operating and supervisory labor	--	--	See table footnote
Maintenance Costs (labor and material)	--	--	
Electricity Cost:	$0.08848/kWH	--	Not estimated
Indirect Annual Costs (IAC)			
Overhead:	--	--	See table footnote
Insurance:	--	--	See table footnote
Property Tax:	--	--	See table footnote
Administrative:	--	--	See table footnote
Total IAC:			
Total Annual Cost (DAC + IAC)	--	--	
Total annual cost (annualized TCI + Total annual cost)		**44,793**	

*Direct annual cost and indirect annual costs are presumed to be same as the existing unit

The potential NOx emission reduction for each category is determined by taking the difference between the potential emissions and the emissions that could be reliably achievable by the use of a new unit equipped with ultra-low NOx burner system. An ultra-low NOx burner is expected to reliably achieve 9 ppmv NOx @ 3% O2. Each unit is presumed to be operated for 8,760 hours per year at the maximum rated capacity. The total cost for each category is determined by multiplying the number of units and $44,793, a typical annual cost of a unit with an ultra-low NOx burner system.

Type of unit	Number of units	Potential NOx Reductions with new unit equipped with ultra-low NOx burner Technology (tons/yr)	Total annualized cost of NOx Reductions with new unit equipped with ultra-low NOx burner Technology ($/yr)	Cost-effectiveness ($/ton of emission reduction)
New and replacement unit, 12 ppm NOx	36	2.2	1,612,548	**$732,976/ton**
New and replacement units, 9 ppmv NOx	178	Not needed, unit are equipped with 9 ppmv burner		
Existing units (gaseous fuel), 30 ppmv NOx	251	113.9	11,243,043	**$ 98,710/ton**
Existing units (gaseous fuel), Low-use, ≤1.8 billion Btu/yr	114	9.3	5,106,402	**$549,075/ton**
Existing units – Gaseous fuel ≤5 billion Btu/yr	3*	--	--	**--**
Existing units - Liquid fuel ≤5 billion Btu/yr	1*	--	--	**--**

EMx as Potential Control

The District researched post-combustion controls such as EMx, the second generation of the SCONOx technology that reduces NOx, SOx, CO, and VOC emissions. Per EmeraChem, manufacturer/vendor of the technology, this technology has not been achieved in practice (AIP) for natural gas fired boilers. SCONOx and EMx systems have only been used by power plants for the control of turbine emissions. The cost of an EMx system would be anywhere from $3 to $5 million, or even up to $8 million in some cases for large power plant installations. Moreover, an EMx system is ideal for a new installation, but becomes extremely challenging and sometimes nearly impossible to retrofit to an existing unit. In fact, cost-effectiveness analyses conducted by the District for the installation of SCONOx/EMx units on large power plant turbine installations within the Valley have shown that this technology is not cost-effective. Given the high cost-effectiveness demonstrated for turbines and lack of demonstrated practice with boilers, this technology is not feasible or cost-effective for reducing emissions from this category.

Overall, the potential emission reduction opportunities evaluated by the District were determined to not be cost-effective. Therefore, as demonstrated above, no additional emission reduction opportunities have been identified at this time.

Contingency Measure Evaluation

As discussed in Chapter 6, contingency measures are immediately implemented ONLY if triggered by an unanticipated milestone or attainment failure. The District reviewed this control measure for a potential contingency component. The District concludes that this control measure is not an appropriate contingency measure because the most

stringent feasible controls are already in place, and a contingency trigger is incompatible with the technologies involved in reducing emissions from this category.

Evaluation Findings

Rule 4307 meets or exceeds federal RACT requirements for this source category based upon evaluation of applicable federal regulations, state standards, and other air districts' rules. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

C.8 RULE 4308 BOILERS, STEAM GENERATORS AND PROCESS HEATERS–0.075 MMBTU/HR TO LESS THAN 2.0 MMBTU/HR

Emissions Inventory (Summer Average – Tons per day)

The emissions inventory for small boilers (0.075-2 MMBtu/hr) is included as part of the inventory for Rules 4306 and 4320 (Boilers, Steam Generators, and Process Heaters Greater than 5 MMBtu/hr); please refer to that control measure write-up for the baseline emissions from boilers as a whole.

District Rule 4308 Description

The purpose of this rule is to limit NOx and CO emissions from units within this source category. As a point-of-sale rule, Rule 4308 achieves emissions reductions as operators with units subject to the rule replace their equipment over time. This point-of-sale approach allows the District to achieve NOx emission reductions without forcing immediate replacement of existing units to comply with rule requirements and thus placing an undo financial burden on the consumer. This rule has resulted in more than 93% control of emissions from this source category.

The District adopted Rule 4308 on October 20, 2005, to establish NOx emissions limits for units that were previously exempt from District regulations because of their small size. The rule was amended in December 2009 to lower the NOx emissions limits to 20 ppmv for units fired on natural gas, with the exception of instantaneous water heaters and pool heaters greater than or equal to 0.075 MMBtu/hr but less than or equal to 0.4 MMBtu/hr. The District subsequently amended Rule 4308 in 2013 to lower the NOx emission limit for instantaneous water heaters 0.075 MMBtu/hr to 0.4 MMBtu/hr to 20 ppmv. EPA published a direct final approval of the 2013 amendments to Rule 4308 on February 12, 2015.

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

Federal Regulations

There are no Control Techniques Guidelines or New Source Performance Standards applicable to this source category.

A. Alternative Control Techniques (ACT)

ACTs address potential emission control techniques for units with the potential to emit more than 25 tons of NOx per year. No units subject to District Rule 4308 have the potential to emit 25 tpy; therefore, ACTs are not directly applicable to this source category. However, ACTs do discuss various control technologies, so the District has examined them. The following ACTs have not been updated since Rule 4308 was

approved as meeting RACT requirements through EPA's approval of the *2014 RACT SIP*. Therefore, further evaluation is not necessary at this time.

- *Alternative Control Techniques Document - NOx Emissions from Process Heaters) (EPA-453/R-93-034 1993/09)*
- *Alternative Control Techniques Document - NOx Emissions from Industrial/Commercial/Institutional Boilers (EPA-453/R-94-022 1994/03)*
- *Alternative Control Techniques Document - NOx Emissions from Utility Boilers (EPA-453/R-94-023 1994/06)*

State Regulations

There are no state regulations that apply to this source category.

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

District staff compared the emission limits, optional control requirements, and work practice standards in District Rule 4308 to comparable requirements in rules from the following California nonattainment areas:

- Bay Area AQMD Regulation 9, Rule 6 (Amended November 7, 2007)[60]
- Bay Area AQMD Regulation 9, Rule 7 (Amended May 4, 2011)[61]
- Bay Area AQMD Regulation 9, Rule 10 (Amended November 3, 2021)[62]
- Sacramento Metropolitan AQMD Rule 411 (Amended August 23, 2007)[63]
- Sacramento Metropolitan AQMD Rule 414 (Amended October 25, 2018)[64]
- South Coast AQMD Rule 1146.2 (Amended December 7, 2018)[65]
- Ventura County APCD Rule 74.11.1 (Amended September 11, 2012)[66]
- Ventura County APCD Rule 74.15.1 (Amended June 23, 2015)[67]

[60] BAAQMD. *Regulation 9, Rule 6 (Nitrogen Oxides Emissions from Natural Gas-Fired Water Heaters).* (Amended November 7, 2007). Retrieved from: https://www.baaqmd.gov/rules-and-compliance/rules/reg-9-rule-6-nitrogen-oxides-emissions-from-natural-gasfired-water-heaters

[61] BAAQMD. *Regulation 9, Rule 7 (Nitrogen Oxides and Carbon Monoxide from Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters)*. (Amended May 4, 2011). Retrieved from: https://www.baaqmd.gov/rules-and-compliance/rules/reg-9-rule-7-nitrogen-oxides-and-carbon-monoxide-from-industrial-institutional-and-commercial-boiler

[62] BAAQMD. *Regulation 9, Rule 10 (Nitrogen Oxides and Carbon Monoxide from Boilers, Steam Generators and Process Heaters in Petroleum Refineries).* (Amended November 3, 2021). Retrieved from: https://www.baaqmd.gov/rules-and-compliance/rules/reg-9-rule-10-nitrogen-oxides-and-carbon-monoxide-from-boilers-steam-generators-and-process-heaters

[63] SMAQMD. *Rule 411 (NOx from Boilers, Process Heaters and Steam Generators)*. (Amended August 23, 2007). Retrieved from: http://www.airquality.org/ProgramCoordination/Documents/rule411.pdf

[64] SMAQMD. *Rule 414 (Water Heaters, Boilers and Process Heaters Rated Less Than 1,000,000 BTU Per Hour)*. (Amended October 25, 2018). Retrieved from: http://www.airquality.org/ProgramCoordination/Documents/rule414.pdf

[65] SCAQMD. *Rule 1146.2 (Emissions of Oxides of Nitrogen from Large Water Heaters and Small Boilers and Process Heaters)*. (Amended December 7, 2018). Retrieved from: http://www.aqmd.gov/home/rules-compliance/rules/support-documents/rule-1146-2-details

[66] VCAPCD. *Rule 74.11.1 (Large Water Heaters and Small Boilers)*. (Amended September 11, 2012). Retrieved from: http://vcapcd.org/Rulebook/Reg4/RULE%2074.11.1.pdf

[67] VCAPCD. *Rule 74.15.1 (Boilers, Steam Generators, and Process Heaters).* (Amended June 23, 2015). Retrieved from: http://www.vcapcd.org/Rulebook/Reg4/RULE%2074.15.1.pdf

The District reviewed the other District rule requirements implemented prior to EPA's approval of the *2014 RACT SIP*, and found that Rule 4308 continues to implement rule requirements that are equivalent or more stringent than those rules. The below comparison tables demonstrate that, for more recently amended rules, District Rule 4308 continues to meet RACT.

Bay Area AQMD

- BAAQMD Regulation 9, Rule 10 (Boilers, Steam Generators and Process Heaters in Refineries)

BAAQMD amended Regulation 9, Rule 10 on October 16, 2013, and November 3, 2021. The District addressed the 2013 amendments in the *2014 RACT SIP*. The 2021 amendments were administrative and did not affect rule stringency. The District found no requirements in BAAQMD Regulation 9, Rule 10 that were more stringent than those in Rule 4308.

Sacramento Metropolitan AQMD

- SMAQMD Rule 414 (Water Heaters, Boilers and Process Heaters Rated Less than 1 MMBtu/hr)

	SJVAPCD Rule 4308	SMAQMD Rule 414
Applicability	Boilers, steam generators and process heaters with rated heat input capacity of ≥0.075 MMBtu/hr and <2 MMBtu/hr	Boilers, steam generators, and process heaters fired on gaseous or non-gaseous fuels with a rated capacity of <1 MMBtu/hr
Exemptions	• Units installed in manufactured homes. • Units installed in recreational vehicles. • Hot water pressure washers.	• Water heaters in recreational vehicles • Pool/spa heater with a heat input rate <0.075 MMBtu/hr. • Water heaters, boilers and process heater fired on LPG fuel.
Requirements	1) Units ≥0.075 to ≤0.4 MMBtu/hr (except, instantaneous water heater and pool heaters below): • PUC gas - 20 ppmv (0.024 lb/MMBtu); • Non-PUC or liquid – 77 ppmv (0.093 lb/MMBtu) 2) Units >0.4 to <2.0 MMBtu/hr (except, instantaneous water heater and pool heaters below): • PUC gas – 20 ppmv (0.024 lb/MMBtu) • Non-PUC or liquid – 30 ppmv (0.036 lb/MMBtu) 3) Instantaneous water heaters ≥0.075 to ≤0.4 MMBtu/hr: • PUC gas – 20 ppmv (0.024 lb/MMBtu)	Units <0.075 MMBtu/hr: • 40 ng/J of heat output or 55 ppm NOx for mobile home units • 10 ng/J of heat output or 15 ppm NOx for all other units Units ≥ 0.075 to <0.4 MMBtu/hr: • 40 ng/J of heat output or 55 ppm NOx for pool/spa units • 14 ng/J of heat output or 20 ppm NOx for all other units Units ≥ 0.4 to <1 MMBtu/hr: • 14 ng/J of heat output or 20 ppm NOx

	SJVAPCD Rule 4308	SMAQMD Rule 414
	• Non-PUC or liquid – 77 ppmv (0.093 lb/MMBtu) 4) Instantaneous water heaters >0.4 to <2.0 MMBtu/hr: • PUC gas – 20 ppmv (0.024 lb/MMBtu) • Non-PUC or liquid – 77 ppmv (0.093 lb/MMBtu) 5) Pool heaters ≥0.075 to ≤0.4 MMBtu/hr: • PUC gas – 55 ppmv (0.068 lb/MMBtu) • Non-PUC or liquid – 77 ppmv (0.093 lb/MMBtu) 6) Pool heaters >0.4 to <2.0 MMBtu/hr: • PUC gas – 20 ppmv (0.068 lb/MMBtu) • Non-PUC or liquid – 30 ppmv (0.036 lb/MMBtu)	

The District evaluated the requirements contained within SCAQMD Rule 414, and found no requirements to be more stringent than those already in District Rule 4308.

South Coast AQMD

- SCAQMD Rule 1146.2 (Emissions of Oxides of Nitrogen from Large Water Heaters and Small Boilers and Process Heaters)

	SJVAPCD Rule 4308	SCAQMD 1146.2
Applicability	Boilers, steam generators and process heaters with rated heat input capacity of ≥0.075 MMBtu/hr and <2 MMBtu/hr	Natural gas-fired water heaters, boilers and process heaters with rated heat input capacity of ≤2 MMBtu/hr
Exemptions	• Units installed in manufactured homes. • Units installed in recreational vehicles. • Hot water pressure washers.	• Units used in recreational vehicles. • Units subject to SCAQMD Rule 1121 (control of NOx from residential type, natural gas-fired water heaters) – Rule 1121 applies to units rated at <0.075 MMBtu/hr • Units at a RECLAIM or former RECLAIM facility subject to a NOx limit in a different rule • Units at municipal sanitation service facility subject to a NOx emission limit in Reg XI adopted or amended after 12/7/18 • The provision of paragraph (c)(3), (c)(4) and (c)(5) shall not apply to: - Any residential unit* - Units with >0.4 & ≤2 MMBtu/hr, demonstrated to use less than 9,000 therms during every calendar year

	SJVAPCD Rule 4308	SCAQMD 1146.2
Requirements	1) Units ≥0.075 to ≤0.4 MMBtu/hr (except, instantaneous water heater and pool heaters below): • PUC gas - 20 ppmv NOx (0.024 lb/MMBtu); • Non-PUC or liquid – 77 ppmv NOx (0.093 lb/MMBtu) 2) Units >0.4 to <2.0 MMBtu/hr (except, instantaneous water heater and pool heaters below): • PUC gas – 20 ppmv NOx (0.024 lb/MMBtu) • Non-PUC or liquid – 30 ppmv (0.036 lb/MMBtu) 3) Instantaneous water heaters ≥0.075 to ≤0.4 MMBtu/hr: • PUC gas – 20 ppmv (0.024 lb/MMBtu) • Non-PUC or liquid – 77 ppmv (0.093 lb/MMBtu) 4) Instantaneous water heaters >0.4 to <2.0 MMBtu/hr: • PUC gas – 20 ppmv (0.024 lb/MMBtu) • Non-PUC or liquid – 77 ppmv (0.093 lb/MMBtu) 5) Pool heaters ≥0.075 to ≤0.4 MMBtu/hr: • PUC gas – 55 ppmv (0.068 lb/MMBtu) • Non-PUC or liquid – 77 ppmv (0.093 lb/MMBtu) 6) Pool heaters >0.4 to <2.0 MMBtu/hr: • PUC gas – 20 ppmv (0.068 lb/MMBtu) • Non-PUC or liquid – 30 ppmv (0.036 lb/MMBtu)	Units >0.4 to ≤2 MMBtu/hr: • 14 ng-NOx/J of heat output or 20 ppmv NOx (or less) Units (excluding pool heaters) ≤0.4 MMBtu/hr: • 14 ng-NOx/J of heat output or 20 ppmv NOx (or less)

*Unless otherwise stated, all ppmv values in the table are ppmv @ 3% O_2

The District evaluated the requirements contained within SCAQMD Rule 1146.2, and found no requirements to be more stringent than those already in District Rule 4308.

Potential Emission Reduction Opportunities

Use of a Selective Catalytic Reduction system

SCR is a post-combustion technology. Presuming units between 0.075 to <2 MMBtu/hr can be equipped with SCR system, the total annualized cost of deploying such technology would be at least $33,613 per year.[68]

Assuming an SCR system reliably reduces NOx emissions from 20 ppmv @ 3% O_2 to 5 ppmv @ 3% O_2 for a 1.99 MMBtu/hr unit that operates 8,760 hours per year, the potential reductions would be 310 lb/year[69] (0.155 tons-NOx/yr).

The cost of achieving these potential NOx reductions would be at least $216,858/ton of emissions reduced. As such, this technology is not cost-effective for reducing emissions from this category.

Use of ultra-low NOx burner technology

Ultra-low NOx burners can reliably achieve at least 9 ppmv NOx @ 3% O_2 and are available for units rated between 2-5 MMBtu/hr. Presuming that this technology is also available for small size boilers for a given application, a unit may be equipped with an ultra-low NOx burner system. Per a local vendor, the cost of a 2 MMBtu/hr boiler would be $35,000 for a hot water boiler. The cost-effectiveness analysis is included below for this technology.

Description of Cost	Cost Factor	Cost	Source
Direct Costs			
Purchase equipment costs (PE)			
Burner System	A	$35,000	Local Vendor
Instrumentation and controls	0.01 A	$350	OAQPS
Sales Taxes	0.08 A	$2,828	
Freight	0.05 A	$1,750	OAQPS
Purchased equipment cost, PEC		$39,928	
Direct installation costs (DI):			
Foundation & supports	0.08 B	$3,194	See footnote
Handling and erection	0.14 B	$5,590	OAQPS
Electrical	0.04 B	$1,597	OAQPS
Piping	0.02 B	$799	OAQPS
Insulation and ductwork:	0.01 B	$399	OAQPS
Painting	0.01 B	$399	OAQPS
Direct installation costs		$51,906	
Site preparation	As required, SP	--	See table footnote
Buildings	As required, Bldg.	--	
Total Direct Costs, DC		$51,906	

[68] See Rule 4307 draft control measure analysis. Note that there is no significant price difference for an SCR system on 2-5 MMBtu/hr unit or smaller units.

[69] Potential NOx reduction = (0.024 – 0.0062) lb-NOx/MMBtu x 1.99 MMBtu/hr x 8,760 hr/yr = 310 lb-NOx/yr

Description of Cost	Cost Factor	Cost	Source
Indirect Costs (Installation)			
Engineering	0.10 B	$3,993	OAQPS
Construction and field expenses	0.05 B	$1,996	OAQPS
Contractor fees	0.10 B	$3,993	OAQPS
Contingencies	0.03 B	$1,198	OAQPS
Start-up	0.02 B	$799	OAQPS
Performance test	0.01 B	$399	OAQPS
Total Indirect Costs, IC	0.31 B	$12,378	
Total Capital Investments (TCI= DC + IC):		**$64,284**	
Annualized TCI (10 years @ 10% interest)	0.1627 TCI	**$10,459**	
Direct annual costs (DAC)			
Operating and supervisory labor	--	--	See table footnote
Maintenance Costs (labor and material)	--	--	
Electricity Cost:	$0.08848/kWH	--	Not estimated
Indirect Annual Costs (IAC)			
Overhead:	--	--	See table footnote
Insurance:	--	--	See table footnote
Property Tax:	--	--	See table footnote
Administrative:	--	--	See table footnote
Total IAC:			
Total Annual Cost (DAC + IAC)	--	--	
Total annual cost (annualized TCI + Total annual cost)		**$10,459**	

*Direct annual cost and indirect annual costs are presumed insignificant for new units and will likely be same when existing unit is being replaced

Assuming an ultra-low NOx burner system reliably reduces NOx emissions from 20 ppmv @ 3% O_2 to 9 ppmv @ 3% O_2 for a 1.99 MMBtu/hr unit that operates 8,760 hours per year, the potential reductions would be 227 lb/year[70] (0.114 tons-NOx/yr).

The cost of achieving these potential NOx reductions would be at least $91,746/ton of emissions reduced. As such, this technology is not cost-effective for reducing emissions from this category.

EMx as Potential Control

The District researched post-combustion controls such as EMx, the second generation of the SCONOx technology that reduces NOx, SOx, CO, and VOC emissions. Per EmeraChem, manufacturer/vendor of the technology, this technology has not been AIP for natural gas fired boilers. SCONOx and EMx systems have only been used by power plants for the control of turbine emissions. The cost of an EMx system would be anywhere from $3 to $5 million or even up to $8 million in some cases for large power plant installations. Moreover, the EMx system is ideal for new installation, but becomes extremely challenging and sometimes nearly impossible to retrofit to an existing unit. In fact, cost-effectiveness analyses conducted by the District for the installation of SCONOx/EMx units on large power plant turbine installations within the Valley have

[70] Potential NOx reduction = (0.024 – 0.011) lb-NOx/MMBtu x 1.99 MMBtu/hr x 8,760 hr/yr = 227 lb-NOx/yr

shown that this technology is not cost-effective. Given the high cost-effectiveness demonstrated for turbines and lack of demonstrated practice with boilers, especially very small boilers such as those covered by this rule, this technology is not feasible or cost-effective for reducing emissions from this category.

Mobile Home Exemption

The District evaluated the possibility of removing the exemption for water heaters used in mobile homes because multiple air districts do not exempt these sources in their analogous rules. 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 units 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 contained in SCAQMD and SMAQMD rules. BAAQMD Regulation 9, Rule 6 regulates all units less than 2 MMBtu/hr, essentially combining the requirements of District Rules 4308 and 4902.

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 such units are not available and do not exist in this size range.

Recreational Vehicle Exemption

The District evaluated the potential opportunity to remove the exemption for recreational vehicles (RVs). Stakeholder input indicates that there are very few units in RVs that fall under the size category subject to this rule. Most units in RVs are 12 gallons, which is significantly smaller than the 80 gallon size of a typical 0.075 MMBtu/hr unit.[71] Additionally, operations do not typically use RV units on a frequent basis and thus are small contributors to the NOx emissions of this source category. Other 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 units within this size range and the intermittent use of units in RVs.

[71] SJVAPCD. (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)*.

As demonstrated above, the District currently requires the most stringent measures feasible to implement in the Valley for this source category. However, in an effort to identify potential emission reduction opportunities, the District will conduct a further study to evaluate efforts from other agencies related to building decarbonization and advancing technology, as further discussed in Chapter 3.

Contingency Measure Evaluation

As discussed in Chapter 6, contingency measures are immediately implemented ONLY if triggered by an unanticipated milestone or attainment failure. The District reviewed this control measure for a potential contingency component. The District concludes that this control measure is not an appropriate contingency measure because the most stringent feasible controls are already in place, and a contingency trigger is incompatible with the technologies involved in reducing emissions from this category.

Evaluation Findings

Rule 4308 meets or exceeds federal RACT requirements for this source category based upon evaluation of applicable federal regulations, state standards, and other air districts' rules. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

C.9 RULE 4309 DRYERS, DEHYDRATORS, AND OVENS

Emissions Inventory (Summer Average – Tons per day)

	2017	2023	2026	2029	2032	2035	2037
NOx	0.23	0.22	0.22	0.22	0.22	0.23	0.23
VOC	0.26	0.26	0.26	0.26	0.27	0.28	0.29

District Rule 4309 Description

The District adopted Rule 4309 on December 15, 2005, to limit NOx and CO emissions from dryers, dehydrators, or ovens fired on gaseous, liquid, or gaseous and liquid fuel sequentially that have a total rated heat input for the unit of 5.0 MMBtu/hr. The rule limits NOx emissions to between 3.5-12 ppm for four categories of equipment. The adoption of Rule 4309 has considerably reduced NOx emissions from this source category.

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

Federal Regulations

There are no Control Techniques Guidelines or New Source Performance Standards applicable to this source category.

A. Alternative Control Techniques (ACT)

District staff conducted a comprehensive evaluation of EPA ACT requirements. EPA has not adopted updates to this ACT since EPA's approval of the *2014 RACT SIP*. Therefore, further evaluation is not necessary at this time.

- *Alternative Control Techniques Document - NOx Emissions from Cement Manufacturing (EPA-453/R-94-004 1994/03)*

State Regulations

There are no state regulations applicable to this source category.

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

District staff compared emission limits, optional control requirements, and work practice standards in District Rule 4309 to comparable requirements in rules from the following California nonattainment areas:

- Sacramento Metropolitan AQMD Rule 419 (Amended October 25, 2018)[72]
- South Coast AQMD Rule 1147 (Amended July 7, 2017)[73]
- South Coast AQMD Rule 1147.1 (Adopted August 6, 2021)[74]
- South Coast AQMD Rule 1153.1 (Adopted November 7, 2014)[75]
- Ventura County APCD Rule 74.34 (Adopted December 13, 2016)[76]

Bay Area AQMD does not have an analogous rule for this source category. The following sections compare District Rule 4309 requirements with the more recently amended rules.

Sacramento Metropolitan AQMD

- SMAQMD Rule 419 (NOx from Miscellaneous Combustion Units)

	SJVAPCD Rule 4309	SMAQMD Rule 419
Applicability	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 MMBtu/hr or greater.	Any miscellaneous combustion units and cooking units with a total rated heat input capacity of 2 million Btu per hour or greater located at a major stationary source of NOx and to any miscellaneous combustion unit or cooking unit with a total rated heat input capacity of 5 million Btu per hour or greater that is not located at a major stationary source of NOx.

Exemptions	• Column-type or tower dryers used to dry grains, or tree nuts.
	• Units to pre-condition onions or garlic prior to dehydration
	• Smokehouses or units used for roasting
	• Units to bake or fry food for human consumption
	• Charbroilers
		• Operations subject to SMAQMD Rule 411, 412, 413, or 414
		• Units exempt from Rule 201
		• Air pollution control devices
		• Duct burners
		• Specific combustion units:
		  ○ Any unit that is used exclusively by an electric utility to generate electricity
		  ○ Gas flares
		  ○ Internal combustion engines
		  ○ Cooking units

[72] SMAQMD. *Rule 419 (NOx from Miscellaneous Combustion Units)*. (Amended October 25, 2018). Retrieved from: http://www.airquality.org/ProgramCoordination/Documents/rule419.pdf
[73] SCAQMD. *Rule 1147 (NOx Reductions from Miscellaneous Sources)*. (Amended July 7, 2017). Retrieved from: http://www.aqmd.gov/docs/default-source/rule-book/reg-xi/rule-1147.pdf?sfvrsn=4
[74] SCAQMD. *Rule 1147.1 (NOx Reductions from Aggregate Dryers)*. (Adopted August 6, 2021). Retrieved from: http://www.aqmd.gov/docs/default-source/rule-book/reg-xi/r1147-1.pdf?sfvrsn=7
[75] SCAQMD. *Rule 1153.1 (Emissions of Oxides of Nitrogen from Commercial Food Ovens).* (Adopted November 7, 2014). Retrieved from: http://www.aqmd.gov/docs/default-source/rule-book/reg-xi/rule-1153-1-emissions-of-oxides-of-nitrogen-from-commercial-food-ovens.pdf?sfvrsn=2
[76] VCAPCD. *Rule 74.34 (NOx Reductions from Miscellaneous Sources)*. (Adopted December 13, 2016). Retrieved from: http://www.vcapcd.org/Rulebook/Reg4/RULE%2074.34.pdf

<table>
<tr><th></th><th colspan="2">SJVAPCD Rule 4309</th><th colspan="3">SMAQMD Rule 419</th></tr>
<tr><td></td><td colspan="2">• Units used to dry lint cotton or cotton at cotton gins
• Units with no stack for the exhaust gas and one or more sides open to the atmosphere Units subject to District Rule 4305, 4306, 4307, or 4351</td><td colspan="3">○ Crematories
○ Dryers used in asphalt manufacturing operations
○ Furnaces
○ Incinerators
○ Kilns
○ Roasters</td></tr>
<tr><td rowspan="11">Requirements (NOx Limits)</td><td colspan="5">Gaseous Fuel-Fired Equipment</td></tr>
<tr><td colspan="2" rowspan="2">SJVAPCD Rule 4309</td><td colspan="3">SMAQMD Rule 419</td></tr>
<tr><td colspan="3">Process Temperature</td></tr>
<tr><td rowspan="2">Dehydrators</td><td rowspan="2">-</td><td rowspan="2">Dehydrator, Dryer, Heater, or Oven</td><td>< 1200° F</td><td>≥ 1200° F</td></tr>
<tr><td>30 ppmvd @ 3% O2 or 0.036 lb/MMBtu

(equates to 3.3 ppmvd @ 19% O2)</td><td>60 ppmvd @ 3% O2 or 0.073 lb/MMBtu

(equates to 6.5 ppmvd @ 19% O2)</td></tr>
<tr><td>Asphalt/Concrete Plants</td><td>4.3 ppmvd @ 19% O2 (0.0492 lb/MMBtu)</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>Milk, Cheese and Dairy Processing (<20 MMBtu/hr)</td><td>3.5 ppmvd @ 19% O2 (0.04 lb/MMBtu)</td><td rowspan="2">-</td><td rowspan="2">-</td><td rowspan="2">-</td></tr>
<tr><td>Milk, Cheese and Dairy Processing (≥20 MMBtu/hr)</td><td>5.3 ppmvd @ 19% O2 (0.061 lb/MMBtu)</td></tr>
<tr><td>Other processes not described above</td><td>4.3 ppmvd @ 19% O2 (0.0492 lb/MMBtu)</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td colspan="5">Liquid Fuel-Fired Equipment</td></tr>
<tr><td rowspan="2">All Liquid Fuel-Fired Units</td><td rowspan="2">Varies from 3.5 ppmvd @ 19% O2 to 12 ppmvd @ 19% O2</td><td rowspan="2">All miscellaneous combustion units when liquid fuel-fired</td><td>< 1200° F</td><td>≥ 1200° F</td></tr>
<tr><td>40 ppmv @ 3% O2 or 0.051 lb/MMBtu

(equates to 4.3 ppmvd @ 19% O2)</td><td>60 ppmvd or 0.073 lb/MMBtu

(equates to 6.5 ppmvd @ 19% O2)</td></tr>
</table>

SMAQMD Rule 419 establishes emission limits based on the process temperature and does not consider the equipment categories, whereas District Rule 4309 does not consider the process temperature and instead establishes emissions limits based on the equipment categories. Under SMAQMD's Rule 419, the NOx limits vary from 3.3 to 6.5 ppmv at 19% O2 with an average of 4.9 ppmv, while District Rule 4309 limits NOx emissions from 3.5 to 5.3 ppmv with most categories limited to 4.3 ppmv at 19% O2, independent of the process temperature. Overall, District Rule 4309 is at least as stringent, if not more stringent than SMAQMD Rule 419.

South Coast AQMD

- SCAQMD Rule 1147.1 (NOx Reductions from Aggregate Dryers)

	SJVAPCD Rule 4309		SCAQMD Rule 1147.1	
Applicability	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 MMBtu/hr or greater.		Owners or operators of gaseous fuel-fired aggregate dryers with NOx emissions greater than or equal to one pound per day with a rated heat input greater than 2,000,000 BTU per hour.	
Requirements	Asphalt/Concrete Plants	4.3 ppmvd @ 19% O2	Aggregate Dryers	30 ppmvd (3.3 ppmvd @ 19% O2)

District Rule 4309 has previously been established as being at least as stringent as SCAQMD Rule 1147. The recently adopted SCAQMD Rule 1147.1 (Adopted August 6, 2021) established separate requirements for gaseous-fueled aggregate dryers previously subject to SCAQMD Rule 1147. The new NOx limit established in SCAQMD Rule 1147.1 for aggregate dryers is lower than District Rule 4309 requirements, however, this more stringent limit goes beyond RACT since these NOx levels have not been widely adopted in other SIP rules.

South Coast AQMD

- SCAQMD Rule 1153.1 (Emissions of Oxides of Nitrogen from Commercial Food Ovens)

	SJVAPCD Rule 4309	SCAQMD Rule 1153.1	
Applicability	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 MMBtu/hr or greater.	In-use ovens, dryers, smokers, and dry roasters with NOx emissions from fuel combustion that require SCAQMD permits and are used to prepare food or products for making beverages for human consumption.	
Exemptions	Units used to bake or fry food for human consumption	None	
Requirements	None for this source category	**Process Temperature**	
		≤ 500° F	**> 500 ° F**
		40 ppmvd (4.3 ppmvd @ 19% O2) or 0.049 lb/MMBtu	60 ppmvd (6.5 ppmvd @ 19% O2) or 0.073 lb/MMBtu

District Rule 4309 has previously been established as being at least as stringent as SCAQMD Rule 1147, which included the category of units subject to SCAQMD Rule 1153.1. Rule 1153.1 (Adopted November 7, 2014) established separate requirements for in-use ovens, dryers, smokers, and dry roasters previously subject to SCAQMD Rule 1147. According to the staff report[77], SCAQMD removed "existing (in-use) food ovens, dry roasters and smokehouses from Rule 1147 and made them subject to a new rule specific to these equipment." South Coast staff also "adopted higher NOx emission limits and a delay of the emission limit compliance dates for in-use SCAQMD permitted food ovens" when compared to Rule 1147. Additionally, SCAQMD Rule 1153.1 is the only prohibitory rule of its kind as no other air district has an analogous rule applicable to in-use ovens, dryers, smokers, and dry roasters. The requirements in SCAQMD Rule 1153.1 for commercial food ovens goes beyond RACT since these NOx levels have not been widely adopted in other SIP rules.

Potential Emission Reduction Opportunities

Asphalt Plants

PUC-quality natural gas fuel is the lowest emitting fuel for asphalt plants, and is generally required for new facilities in the District, BAAQMD, and SCAQMD, where natural gas is available. There are currently ten asphalt plants in the Valley that do not use PUC-quality natural gas because these facilities are physically too far removed from natural gas lines to use natural gas. Eight 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 use fuel oil #2; however, none of the facilities operate full time and their combined actual NOx emissions are 0.006 tpd, an insignificant contributor to the inventory.

Dehydrators

Operations in the Valley use dehydrators to process a very large variety of products such as onions, garlic, tomatoes, various fruits and vegetables. There are very specific operational and technical limitations associated with dehydrator operations depending on the type of product processed. More specifically, the District has determined that requiring low-NOx burners is not feasible for vegetable dehydration operations due to product quality issues. For instance, low NOx burners inherently emit higher CO, which causes dried garlic and onion to turn pink, negatively affecting product quality/value. The District will continue to evaluate the feasibility and cost-effectiveness of low-NOx burners for potential additional emission reduction opportunities.

[77] SCAQMD. *Rule 1153.1 (Emissions of Oxides of Nitrogen from Commercial Food Ovens) staff report.* (Adopted November 7, 2014). Retrieved from: http://www.aqmd.gov/docs/default-source/Agendas/Governing-Board/2014/2014-nov7-024.pdf?sfvrsn=2

Contingency Measure Evaluation

As discussed in Chapter 6, contingency measures are immediately implemented ONLY if triggered by an unanticipated milestone or attainment failure. The District reviewed this control measure for a potential contingency component. The District concludes that this control measure is not an appropriate contingency measure because the most stringent feasible controls are already in place, and a contingency trigger is incompatible with the technologies involved in reducing emissions from this category.

Evaluation Findings

Rule 4309 varies in stringency when compared to other air districts' requirements. For the majority of the categories, Rule 4309 is as stringent as or more stringent than the other air districts' rules, and provides, at minimum, a RACT level of control for this source category. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

C.10 RULE 4311 FLARES

Emissions Inventory (Summer Average – Tons per day)

	2017	2023	2026	2029	2032	2035	2037
NOx	0.52	0.50	0.30	0.30	0.30	0.30	0.30
VOC	1.46	1.25	1.09	1.01	0.93	0.87	0.82

District Rule 4311 Description

District Rule 4311 addresses any operation involving the use of a flare for VOC control. This source category currently includes flares associated with oil and gas production, methane and VOC gases extracted from landfills, municipal sewage treatment, wastewater treatment at food production facilities, petroleum refining, and VOC control of blowing agents at plastics product manufacturing. Flaring is a high temperature oxidation process used to burn combustible components, mostly hydrocarbons, of waste gases from industrial operations. 95 percent of the waste gases flared are natural gas, propane, pentane, ethylene, propylene, butadiene and butane. Rule 4311 contains operational requirements, flare minimization requirements for certain flares, and NOx and VOC emission limits for enclosed flares and any flare used over industry based thresholds.

Based on a comprehensive technical analysis, in-depth review of local, state, and federal regulations, and a robust public process, the District adopted amendments to Rule 4311 in December 2020 to reduce emissions from flaring in the Valley. These amendments remove the exemptions for flares operating at non-major source facilities as well as at landfills, and establish low-NOx emissions limits for multiple categories of facilities with flares used over specified annual flaring throughput thresholds.

District staff evaluated various approaches to determining thresholds to require flare operators to take action to reduce emissions. The only other rule in the nation requiring ultra low NOx flares is South Coast Air Quality Management District (SCAQMD) Rule 1118.1. SCAQMD Rule 1118.1 sets thresholds for action based on a percentage of capacity used annually. Applying a percentage-based approach would have excluded some of the most highly used flares in the Valley. As an alternative to this approach, District staff evaluated a set of annual throughput thresholds by flare type, with the goal of achieving emissions reductions in greater quantity and more cost-effectively than those achievable under the approach included in SCAQMD Rule 1118.1. The approach included in the District's proposed rule achieves greater emissions reductions than the approached included in SCAQMD Rule 1118.1 at approximately half the cost, by focusing on flares with the highest usage, resulting in a more effective proposed rule.

The District adopted these amendments to reduce emissions from flaring in the Valley by requiring operators to install the cleanest ultra-low NOx flaring technology, and encouraging operators to seek beneficial uses for waste gas, rather than flaring in the

most cost-effective manner. The ultra-low NOx flaring technology represents the lowest emission flares available, and their requirement makes Rule 4311 the most stringent flare rule in the nation.

Cost Effectiveness

As part of the December 2020 amendments to Rule 4311, the District estimated a cost effectiveness range up to $157,120 per ton of NOx reduced depending on facility type.

How does District Rule 4311 compare with federal and state rules and regulations?

Federal Regulations

There are no Control Techniques Guidelines or Alternative Control Techniques applicable to this source category.

A. New Source Performance Standards (NSPS)

District staff conducted a comprehensive evaluation of EPA NSPS requirements. EPA has not adopted updates to the following NSPS since EPA's approval of the *2014 RACT SIP*. During this approval, it was determined that the previous version of this rule met or exceeded RACT and the recent amendments have made the rule requirements even more stringent. Therefore, further evaluation is not necessary at this time.

- *40 CFR 60.18 - General Control Device and Work Practice Requirements (2008/12)*
- *40 CFR 65.147 - Flares (2000/12)*
- *40 CFR 60 Subpart OOOOa - Standards of Performance for Crude Oil and Natural Gas Facilities for Which Construction, Modification, or Reconstruction Commenced After September 15, 2015 (2016/06)*
- *40 CFR 60 Subpart Ja - Standards of Performance for Petroleum Refineries for Which Construction, Reconstruction, or Modification Commenced After May 14, 2007 (2013/12)*

State Regulations

No amendments have occurred to the following state regulation since EPA's approval of the *2014 RACT SIP*; therefore, no further evaluation is necessary at this time:

- *CCR Title 17, Div. 3, Chapter 1, Subchapter 10, Article 4, Subarticle 13 - Greenhouse Gas Emission Standards for Crude Oil and Natural Gas Facilities (2017/03)*

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

District staff compared emission limits, optional control requirements, and work practice standards in District Rule 4311 to comparable requirements in rules from the following nonattainment areas:

- Bay Area AQMD Regulation 12, Rule 11 (Amended November 3, 2021)[78]
- Bay Area AQMD Regulation 12, Rule 12 (Amended November 3, 2021)[79]
- Santa Barbara County APCD Rule 359 (Amended June 28, 1994)[80]
- South Coast AQMD Rule 1118 (Amended July 7, 2017)[81]
- South Coast AQMD Rule 1118.1 (Adopted January 4, 2019)[82]

Sacramento Metropolitan AQMD and Ventura County APCD do not have an analogous rule for this source category. The District reviewed the rule requirements implemented prior to EPA's approval of the *2014 RACT SIP*, and found that Rule 4311 continues to implement RACT levels of control. The below comparison tables demonstrate that, for more recently amended rules, District Rule 4311 continues to meet RACT.

Bay Area AQMD

- BAAQMD Regulation 12, Rule 11 (Flare Monitoring at Refineries)
- BAAQMD Regulation 12, Rule 12 (Flares at Refineries)

The District's Rule 4311 includes requirements that correspond to both BAAQMD Regulation 12 Rules 11 and 12. Therefore, the following table compares District Rule 4311 to the requirements from both BAAQMD rules.

	SJVAPCD Rule 4311	BAAQMD Reg 12, Rule 11 BAAQMD Reg 12, Rule 12
Applicability	All flares.	Flares used at refineries.
Exemptions	• Flares operated at municipal solid waste landfills that combust less than 2,000 MMscf of landfill gas per calendar year and that have ceased accepting waste; • Flares that combust only propane, butane, or a combination of propane and butane;	Flares and thermal oxidizers used for: • Emissions from organic liquid storage vessels (subj. to R. 8-5) • Emissions from loading racks (subj. to R. 8-6, 8-33, or 8-39) • Emissions from marine vessel loading terminals (subj. to R. 8-44)

[78] BAAQMD. *Regulation 12, Rule 11 (Flare Monitoring at Refineries).* (Amended November 3, 2021). Retrieved from: https://www.baaqmd.gov/~/media/dotgov/files/rules/refinery-rules-definitions/rg1211_20211103-pdf.pdf?la=en&rev=694ca947de004a788d889ad213e7955b.
[79] BAAQMD. *Regulation 12, Rule 12 (Flares at Refineries).* (Amended November 3, 2021). Retrieved from: https://www.baaqmd.gov/~/media/dotgov/files/rules/refinery-rules-definitions/rg1212_20211103-pdf.pdf?la=en&rev=7db93f23469747fc8eca3b3f2dc773ff.
[80] SBAPCD. *Rule 359 (Flares and Thermal Oxidizers).* (Adopted June 28, 1994). Retrieved from: https://ww2.arb.ca.gov/sites/default/files/classic/technology-clearinghouse/rules/RuleID2475.pdf.
[81] SCAQMD. *Rule 1118 (Control of Emissions from Refinery Flares).* (Amended July 7, 2017). Retrieved from: http://www.aqmd.gov/docs/default-source/rule-book/reg-xi/rule-1118.pdf?sfvrsn=4.
[82] SCAQMD. *Rule 1118.1 (Control of Emissions from Non-Refinery Flares).* (Adopted January 4, 2019). Retrieved from: http://www.aqmd.gov/docs/default-source/rule-book/reg-xi/R1118-1.pdf?sfvrsn=9.

	SJVAPCD Rule 4311	BAAQMD Reg 12, Rule 11 BAAQMD Reg 12, Rule 12
	• Flares used for well testing, tank degassing, and pipeline degassing operations; • Flares that combust regeneration gas	Thermal oxidizers used for: • Emissions from wastewater treatment systems (subj. to R. 8-8) • Emissions from pump seals (subj. to R. 8-18) (except when emissions from pump are routed to flare header) Rule 11 Only: Monitoring and reporting total HC or methane composition doesn't apply to flare that burns flexicoker gas if weekly sampling shows methane/non-methane content of vent gas flared is <2%/<1% by volume.
Requirements	Requires flare operators to limit flare operation not to exceed a flare throughput threshold based on vocation for two consecutive years or meet NOx limits: • Flares used at oil and gas operations, and chemical operations: 25,000 MMBtu/yr or 0.005 lb VOC/MMBtu, 0.018 ln NOx/MMBtu; • Flares at landfill pperations: 90,000 MMBtu/yr or 0.038 lb VOC/MMBtu and 0.025 lb NOx/MMBtu; • Flares at digester operations at a major source facility: 100,000 MMBtu/yr or 0.038 lb VOC/MMBtu and 0.025 lb NOx/MMBtu; • Flares at digester operations not at a major source facility: 100,000 MMBtu/yr or 0.060 lb NOx/MMBtu • Flares at organic liquid loading operations: 25,000 MMBtu/yr or 0.034 lb NOx/MMBtu; Recordkeeping and reporting. Flare minimization plan for refinery flares or flares ≥ 5.0 MMBtu/hr at major sources of NO_x or VOC, except landfill operations.	No emission limit requirements.

The District evaluated the requirements contained within BAAQMD's Regulation 12, Rules 11 and 12 and found no requirements that were more stringent than those in Rule 4311.

South Coast AQMD

- SCAQMD Rule 1118 (Control of Emissions from Refinery Flares)

	SJVAPCD Rule 4311	SCAQMD Rule 1118
Applicability	All flares.	Flares used at: • Petroleum refineries • Sulfur recovery plants • Hydrogen production plants
Exemptions	• Flares operated at municipal solid waste landfills that combust less than 2,000 MMscf of landfill gas per calendar year and that have ceased accepting waste • Flares that combust only propane, butane, or a combination of propane and butane • Flares used for well testing, tank degassing, and pipeline degassing operations • Flares that combust regeneration gas	Exempt from sampling and analyses for higher heating values and sulfur concentration for flare event that: • Results from catastrophic event • Is safety hazard to sampling personnel; SOx from flaring events caused by: • External power curtailment beyond operator's control • Natural disasters • Acts of war or terrorism (Not exempt from flare monitoring system requirements).
Requirements	Requires flare operators to limit flare operation not to exceed a flare throughput threshold based on vocation for two consecutive years or meet NOx limits: • Flares used at oil and gas operations, and chemical operations: 25,000 MMBtu/yr or 0.005 lb VOC/MMBtu, 0.018 ln NOx/MMBtu • Flares at landfill pperations: 90,000 MMBtu/yr or 0.038 lb VOC/MMBtu and 0.025 lb NOx/MMBtu • Flares at digester operations at a major source facility: 100,000 MMBtu/yr or 0.038 lb VOC/MMBtu and 0.025 lb NOx/MMBtu • Flares at digester operations not at a major source facility: 100,000 MMBtu/yr or 0.060 lb NOx/MMBtu • Flares at organic liquid loading operations: 25,000 MMBtu/yr or 0.034 lb NOx/MMBtu Recordkeeping and reporting. Flare minimization plan for refinery flares or flares ≥ 5.0 MMBtu/hr at major sources of NO_x or VOC, except landfill operations.	No emission limit requirements.

The District evaluated the requirements contained within SCAQMD's Rule 1118 and found no requirements that were more stringent than those in Rule 4311.

South Coast AQMD

- SCAQMD Rule 1118.1 (Control of Emissions from Non-Refinery Flares)

	SJVAPCD Rule 4311	SCAQMD Rule 1118.1
Applicability	All flares.	Flares that require a SCAQMD permit used at non-refinery facilities, including, but not limited to: • oil and gas production facilities • wastewater treatment facilities • landfills • organic liquid handling facilities
Exemptions	• Flares operated at municipal solid waste landfills that combust less than 2,000 MMscf of landfill gas per calendar year and that have ceased accepting waste • Flares that combust only propane, butane, or a combination of propane and butane • Flares used for well testing, tank degassing, and pipeline degassing operations • Flares that combust regeneration gas	• Flares at asphalt plants; biodiesel plants; hydrogen production plants fueled in part with refinery gas; petroleum refineries; sulfuric acid plants; and sulfur recovery plants; • Flares routing only natural gas to the burner that are subject to SCAQMD Rule 1147; • Flares combusting only propane, butane, or a combination of propane and butane • Flares at closed landfills collecting less than 2,000 MMscf of landfill gas per calendar year • Flares with a various location permit; • Flares combusting regeneration gas • Flares emitting less than 30 lb NOx/month • Flares with an annual throughput limit equivalent to 200 hr/year • Gas combusted during a utility pipeline curtailment is not used to calculate exceedance of use requirements
Requirements	Requires flare operators to limit flare operation not to exceed a flare throughput threshold based on vocation for two consecutive years or meet NOx limits: • Flares used at oil and gas operations, and chemical operations: 25,000 MMBtu/yr or 0.005 lb VOC/MMBtu, 0.018 ln NOx/MMBtu • Flares at landfill pperations: 90,000 MMBtu/yr or 0.038 lb VOC/MMBtu and 0.025 lb NOx/MMBtu	Throughput limits for new or replacement flares of 110% of replaced flare or 45 MMscf/year New flare emission limits based on type of gas flared: • Produced gas: 0.018 lb NOx/MMBtu, 0.01 lb CO/MMBtu, 0.008 lb VOC/MMBtu • Landfill gas, and digester gas at a major facility: 0.025 lb NOx/MMBtu, 0.06 lb CO/MMBtu, 0.038 lb VOC/MMBtu

	SJVAPCD Rule 4311	SCAQMD Rule 1118.1
	• Flares at digester operations at a major source facility: 100,000 MMBtu/yr or 0.038 lb VOC/MMBtu and 0.025 lb NOx/MMBtu • Flares at digester operations not at a major source facility: 100,000 MMBtu/yr or 0.060 lb NOx/MMBtu • Flares at organic liquid loading operations: 25,000 MMBtu/yr or 0.034 lb NOx/MMBtu Recordkeeping and reporting. Flare minimization plan for refinery flares or flares ≥ 5.0 MMBtu/hr at major sources of NO_x or VOC, except landfill operations.	• Digester gas at a minor facility, and other flare gas: 0.06 lb NOX/MMBtu • Organic liquid storage: 0.25 lb NOx/MMBtu, 0.37 lb CO/MMbtu • Organic liquid loading: 0.034 lb NOx/1,000 gallons loaded, 0.05 lb CO/1,000 gallons loaded Establishes requirements for existing flares not meeting the above emission limits based on exceeding a vocation based fractional use of total capacity in two consecutive calendar quarters. Fraction limits are:5% for produced gas or any open flare; 70% for digester gas; and 20% for landfill gas. Units exceeding these limits must reduce flaring or replace with a new flare meeting emission limit requirements

The District evaluated the requirements contained within SCAQMD's Rule 1118.1 and found no requirements that were more stringent than those in Rule 4311.

Potential Emission Reduction Opportunities

As demonstrated above, Rule 4311 currently has in place the most stringent measures feasible to implement in the Valley. Therefore, the District did not identify additional emission reduction opportunities at this time.

Contingency Measure Evaluation

As discussed in Chapter 6, contingency measures are immediately implemented ONLY if triggered by an unanticipated milestone or attainment failure. The District reviewed this control measure for a potential contingency component. The District concludes that this control measure is not an appropriate contingency measure because the most stringent feasible controls are already in place, and a contingency trigger is incompatible with the technologies involved in reducing emissions from this category.

Evaluation Findings

District Rule 4311 meets or exceeds federal RACT requirements for this source category based upon evaluation of applicable federal regulations, state standards, and other air districts' rules. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

C.11 RULE 4313 LIME KILNS

Emissions Inventory (Summer Average – Tons per day)

	2017	2023	2026	2029	2032	2035	2037
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VOC	0.00	0.00	0.00	0.00	0.00	0.00	0.00

The emissions inventory for the lime kiln source category is 0.00 tpd because there are no lime kilns in operation in the Valley.

District Rule 4313 Description

District Rule 4313 was adopted in 2003 to limit NOx emissions from the operation of lime kilns. Lime kilns can be used in a variety of manufacturing and processing operations, including food and agriculture. EPA approved District Rule 4313 on September 4, 2003, and deemed this rule as being at least as stringent as established RACT requirements. At the time of rule adoption, there were a total of three lime kilns in operation in the Valley. These lime kilns were operated at two sugar processing plants; however, these plants have been non-operational since 2008. There are currently no lime kilns operating in the Valley. If any lime kilns were to begin operation in the Valley in the future they would be required to meet District BACT requirements, per District Rule 2201 (New and Modified Stationary Source Review Rule). There are no lime kilns currently going through the District's permitting process to become operational in the Valley, and the District does not expect any lime kilns to operate in the Valley in the future.

How does District Rule 4313 compare with federal and state rules and regulations?

Federal Regulations

There are no Control Technique Guidelines or Alternative Control Techniques applicable to this source category.

A. New Source Performance Standards (NSPS)

- *40 CFR 60 Subpart HH – Standards of Performance for Lime Manufacturing Plants (1984/04)*

The provisions of this subpart are applicable to each rotary lime kiln used in the manufacturing of lime. However, this subpart only has requirements for PM emissions from the rotary lime kilns. The purpose of this analysis is to evaluate this source for NOx and VOC emission reduction opportunities, and is not applicable to this evaluation.

State Regulations

There are no state regulations applicable to this source category.

How does District Rule 4313 compare to rules in other air districts?

Bay Area AQMD, Sacramento Metropolitan AQMD, South Coast AQMD, and Ventura County APCD do not have analogous rules for this source category.

Potential Emission Reduction Opportunities

There are currently no lime kilns in operation in the Valley. Therefore, the District did not identify any additional emission reduction opportunities at this time.

Contingency Measure Evaluation

As discussed in Chapter 6, contingency measures are immediately implemented ONLY if triggered by an unanticipated milestone or attainment failure. The District reviewed this control measure for a potential contingency component. The District concludes that this control measure is not an appropriate contingency measure because the most stringent feasible controls are already in place, and a contingency trigger is incompatible with the technologies involved in reducing emissions from this category.

Evaluation Findings

There are no lime kilns in operation in the Valley, nor are any expected to be operated in the Valley in the future. However, if any lime kilns were to begin operating in the Valley, it would be required to meet District BACT requirements, which by definition are beyond RACT. As such, Rule 4313 meets or exceeds federal RACT requirements for this source category. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

C.12 RULE 4352 SOLID FUEL FIRED BOILERS, STEAM GENERATORS, AND PROCESS HEATERS

Emissions Inventory (Summer Average – Tons per day)

	2017	2023	2026	2029	2032	2035	2037
NOx	1.87	1.89	1.54	1.72	1.65	1.66	1.73
VOC	0.02	0.01	0.01	0.02	0.01	0.01	0.01

District Rule 4352 Description

Rule 4352 applies to solid fuel fired boilers, steam generators, and process heaters. The purpose of Rule 4352 is to limit NOx, CO, PM10, and SOx emissions from any boiler, steam generator or process heater fired on solid fuel. Operations use these units in a broad range of industrial, commercial, and institutional settings. These units have the ability to fire on a variety of solid fuels: coal, petroleum coke, biomass, tire-derived fuel, and municipal solid waste (MSW). The District currently permits ten biomass fired units in the Valley; however, only five biomass fired units are currently operating. All five operating units generate electricity for electric utilities. The remaining five units are closed and dormant. Two solid fuel fired units permitted within the District use MSW as their energy source. The MSW fired units are located at a single facility that generates electricity for electric utilities.

The adoption of Rule 4352 on September 14, 1994, established NOx limits of 200 ppmv for MSW facilities, 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. This District has amended this rule four times since adoption.

The District Governing Board adopted the most recent amendments to Rule 4352 on December 16, 2021. Based on a comprehensive technical analysis, in-depth review of local, state, and federal regulations, and a robust public process, District staff adopted several modifications to Rule 4352 to include even more stringent NOx limits, and to establish PM10 and SOx emission limits for applicable units operating in the Valley. The amendments to Rule 4352 also added language to clarify definitions, remove expired language, and establish compliance timelines. The compliance schedule would take place over two years, with full compliance with the emissions limits required by January 1, 2024.

Table C-1 Rule 4352 NOx, CO, PM10, and SOx Emission Limits

Fuel Type	Emission Limits effective on and after January 1, 2024			
	NOx Limit	CO Limit	PM10 Limit	SOx Limit
Municipal Solid Waste	110 ppmv corrected to 12% CO_2 [A] 90 ppmv corrected to 12% CO2 [C]	400 ppmv corrected to 3% O_2 [A]	0.04 lbs/MMBtu or 0.02 gr/dscf @ 12% CO_2	0.03 lbs/MMBtu [C] or 12 ppmv @ 12% CO_2 [C] 0.064 lbs/MMBtu [A] or 25 ppmv @ 12% CO_2 [A]
Biomass	65 ppmv corrected to 3% O_2 [A]		0.03 lbs/MMBtu	0.02 lbs/MMBtu [B] 0.035 lbs/MMBtu [A]
All Others	65 ppmv corrected to 3% O_2 [A]		0.03 lbs/MMBtu	0.02 lbs/MMBtu [B] 0.035 lbs/MMBtu [A]

[A] Block 24-hour average
[B] Rolling 30-day average
[C] Rolling 12-month average

Cost Effectiveness

As part of the December 2021 amendments to Rule 4352, the District estimated a cost effectiveness of $26,269 per ton of NOx reduced for municipal solid waste facilities.

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

Federal Regulations

There are no Control Techniques Guidelines applicable to this source category.

A. Alternative Control Techniques (ACT)

- *Alternative Control Techniques Document - NO_x Emissions from Industrial, Commercial, and Institutional Boilers (EPA-453/R-94-022 1994/03)*
- *Alternative Control Techniques Document - NO_x Emissions from Utility Boilers (EPA-453/R-94-023 1994/03)*

District staff conducted a comprehensive evaluation of EPA ACT requirements. EPA has not adopted updates to this ACT since EPA's approval of the *2014 RACT SIP*. During this approval, it was determined that the previous version of this rule met or exceeded RACT and the recent amendments have made the rule requirements even more stringent. Therefore, further evaluation is not necessary at this time.

B. New Source Performance Standards (NSPS)

- *40 CFR 60 Subpart Cb - Emission Guidelines and Compliance Times for Large Municipal Waste Combustors that are Constructed On or Before September 20, 1994 (1995/12)*
- *40 CFR 60 Subpart D - Standards of Performance for Fossil-Fuel-Fired Steam Generators (2007/06)*
- *40 CFR 60 Subpart Da - Standards of Performance for Electric Utility Steam Generating Units (2013/04)*
- *40 CFR 60 Subpart Db - Standards of Performance for Industrial-Commercial-Institutional Steam Generating Units (2007/06)*
- *40 CFR 60 Subpart Dc - Standards of Performance for Industrial-Commercial-Institutional Steam Generating Units (2014/02)*
- *40 CFR 60 Subpart Ea - Standards of Performance for Municipal Waste Combustors for which Construction is Commenced after December 20, 1989 and on or before September 20, 1994 (1995/12)*
- *40 CFR 60 Subpart Eb - Standards of Performance for Municipal Waste Combustors for which Construction is Commenced after September 20, 1994 or for which Modification or Reconstruction is Commenced after June 19, 1996 (2007/03)*
- *40 CFR 60 Subpart AAAA - Standards of Performance for Small Municipal Waste Combustion Units for Which Construction is Commenced after August 30, 1999 or for Which Modification is Commenced After June 6, 2001 (2003/01)*
- *40 CFR 60 Subpart BBBB - Standards of Performance for Small Municipal Waste Combustion Units Constructed on or before August 30, 1999 (2003/01)*

District staff conducted a comprehensive evaluation of EPA NSPS requirements. EPA has not adopted updates to these NSPS since EPA's approval of the *2014 RACT SIP*. During this approval, it was determined that the previous version of this rule met or exceeded RACT and the recent amendments have made the rule requirements even more stringent. Therefore, further evaluation is not necessary at this time.

State Regulations

There are no state regulations applicable to this source category.

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

District staff compared emission limits, optional control requirements, and work practice standards in District Rule 4352 to comparable requirements in rules from the following:

- Bay Area AQMD Regulation 9, Rule 7 (Amended May 4, 2011)[83]

[83] BAAQMD. *Regulation 9, Rule 7 (Nitrogen Oxides and Carbon Monoxide from Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters).* (Amended May 4, 2011). Retrieved from: https://www.baaqmd.gov/rules-and-compliance/rules/reg-9-rule-7-nitrogen-oxides-and-carbon-monoxide-from-industrial-institutional-and-commercial-boiler

- Bay Area AQMD Regulation 9, Rule 11 (Adopted May 17, 2000)[84]
- El Dorado County AQMD Rule 232 (Amended September 25, 2001)[85]
- Placer County APCD Rule 233 (Amended June 14, 2012)[86]
- Sacramento Metropolitan AQMD Rule 411 (Amended August 23, 2007)[87]
- South Coast AQMD Rule 1146 (Amended December 7, 2018)[88]
- Yolo-Solano AQMD Rule 2-43 (Amended November 10, 2010)[89]

The District reviewed the rule requirements implemented prior to EPA's approval of the *2014 RACT SIP*, and found that Rule 4352 continues to implement RACT levels of control. The below comparison tables demonstrate that, for more recently amended rules, District Rule 4352 continues to meet RACT.

South Coast AQMD

- South Coast AQMD Rule 1146 (Emissions of Oxides of Nitrogen from Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters)

	SJVAPCD Rule 4352	SCAQMD Rule 1146
Applicability	Any boiler, steam generator or process heater fired on solid fuel.	Boilers, steam generators, and process heaters ≥ 5 MMBtu/hr rated heat input capacity used in all industrial, institutional, and commercial operations and fired on fossil fuels.
Exemptions	None	Units with rated heat input capacity ≤ 5 MMBtu/hr. This rule does not apply to units used exclusively to produce electricity.
Requirements Emission Limits	NOx emission limits effective until December 31, 2023 <u>Municipal Solid Waste</u> ≤ 165 ppmv NOx corrected to 12% CO_2 <u>Biomass</u> ≤ 90 ppmv NOx corrected to 3% O_2 <u>All others</u> ≤ 65 ppmv NOx corrected to 3% O_2	No applicable limits for units in the San Joaquin Valley

[84] BAAQMD. *Regulation 9, Rule 11 (Nitrogen Oxides and Carbon Monoxide from Utility Electric Power Generating Boilers).* (Adopted May 17, 2000). Retrieved from: https://www.baaqmd.gov/rules-and-compliance/rules/reg-9-rule-11-nitrogen-oxides-and-carbon-monoxide-from-utility-electric-power-generating-boilers
[85] EDCAQMD. *Rule 232 (Biomass Boilers).* (Amended September 25, 2001). Retrieved from: https://ww2.arb.ca.gov/sites/default/files/classic/technology-clearinghouse/rules/RuleID819.pdf
[86] PCAPCD. *Rule 233 (Biomass Boilers).* (Amended June 14, 2012). Retrieved from: https://www.placerair.org/DocumentCenter/View/2205/Rule-233-PDF
[87] SMAQMD. *Rule 411 (NOx from Boilers, Process Heaters and Steam Generators).* (Amended August 23, 2007). Retrieved from: http://www.airquality.org/ProgramCoordination/Documents/rule411.pdf
[88] SCAQMD. *Rule 1146 (Emissions of Oxides of Nitrogen from Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters).* (Amended December 7, 2018). Retrieved from: http://www.aqmd.gov/docs/default-source/rule-book/reg-xi/rule-1146.pdf
[89] YSAQMD. *Rule 2-43 (Biomass Boilers).* (Amended November 10, 2010). Retrieved from: https://www.ysaqmd.org/wp-content/uploads/2020/05/2.43.pdf

SCAQMD Rule 1146 specifically exempts units that are used exclusively to produce electricity for sale. Therefore, this rule cannot be compared to District Rule 4352.

Potential Emission Reduction Opportunities

On December 16, 2021, the District Governing Board adopted amendments to Rule 4352 that lowered emission limits for NOx, and established PM and SOx emission limits for solid fuel fired boilers, steam generators, and process heaters operating in the Valley. Emissions limits were based on the results of a comprehensive review of the existing permit inventory in the Valley, the type of solid fuel used at the operation, available control technology, requirements in other air districts, and a cost-effectiveness analysis of requiring further controls for existing units. The District did not identify any additional emission reduction opportunities at this time.

Contingency Measure Evaluation

As discussed in Chapter 6, contingency measures are immediately implemented ONLY if triggered by an unanticipated milestone or attainment failure. The District reviewed this control measure for a potential contingency component. The District concludes that this control measure is not an appropriate contingency measure because the most stringent feasible controls are already in place, and a contingency trigger is incompatible with the technologies involved in reducing emissions from this category.

Evaluation Findings

Rule 4352 meets or exceeds federal RACT requirements for this source category based upon evaluation of applicable federal regulations, state standards, and other air districts' rules. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

C.13 RULE 4354 GLASS MELTING FURNACES

Emissions Inventory (Summer Average – Tons per day)

	2017	2023	2026	2029	2032	2035	2037
NOx	3.37	3.65	3.08	3.09	2.06	2.07	2.09
VOC	0.03	0.03	0.03	0.03	0.03	0.03	0.03

District Rule 4354 Description

The provisions of Rule 4354 are applicable to glass melting furnaces in the Valley. The purpose of this rule is to limit NOx, SOx, VOC, CO, and PM10 emissions from glass melting furnaces.

The District adopted Rule 4354 on September 14, 1994, and subsequently amended the rule seven times. The District recently adopted amendments to Rule 4354 on December 16, 2021. This amendment implements more stringent NOx, SOx, and PM emissions limits for glass melting furnaces, including NOx limits as low as 0.75 pounds of NOx per ton of Glass pulled, establishing requirements that are more stringent than any other rule in non-attainment areas in California and the nation. Due to the high costs associated with the control technology necessary to comply with the proposed final NOx emissions limits, a phased compliance schedule was adopted in which operators must comply with Phase I NOx emissions limits by 2024, and then must comply with the final NOx emissions limits by 2030 or upon the completion of the next furnace rebuild, whichever is sooner. The new rule limits will result in a 5% reduction in PM2.5 in 2024, and a 43% reduction in NOx by 2030.

Cost Effectiveness

As part of the December 2021 amendments to Rule 4354, the District estimated a cost effectiveness ranging up to $45,738 per ton of NOx reduced for container glass facilities, and up to $32,998 per ton of NOx reduced for flat glass facilities.

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

Federal Regulations

There are no Control Techniques Guidelines applicable to this source category.

A. Alternative Control Techniques (ACT)

District staff conducted a comprehensive evaluation of EPA ACT requirements. EPA has not adopted updates to the following ACT since EPA's approval of the *2014 RACT SIP*. During this approval, it was determined that the previous version of this rule met or

exceeded RACT and the recent amendments have made the rule requirements even more stringent. Therefore, further evaluation is not necessary at this time.

- *Alternative Control Techniques Document - NOx Emissions from Glass Manufacturing (EPA-453/R-94-37 1994/06)*

B. New Source Performance Standards (NSPS)

District staff conducted a comprehensive evaluation of EPA NSPS requirements. EPA has not adopted updates to the following NSPS since EPA's approval of the *2014 RACT SIP*. During this approval, it was determined that the previous version of this rule met or exceeded RACT and the recent amendments have made the rule requirements even more stringent. Therefore, further evaluation is not necessary at this time.

- *40 CFR 60 Subpart CC - Standards of Performance for Glass Manufacturing Plants (2000/10)*
- *40 CFR 60 Subpart PPP - Standards of Performance for Wool Fiberglass Manufacturing Plants (2000/10)*

State Regulations

There are no state regulations applicable to this source category.

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

District staff compared emission limits, optional control requirements, and work practice standards in District Rule 4354 to comparable requirements in rules from the following California nonattainment areas:

- Bay Area AQMD Regulation 9, Rule 12 (Adopted January 19, 1994)[90]
- South Coast AQMD Rule 1117 (Amended June 5, 2020)[91]

Sacramento Metropolitan AQMD and Ventura County APCD do not have an analogous rule for this source category. For the remaining above-listed rules, the District reviewed the rule requirements implemented prior to EPA's approval of the *2014 RACT SIP*, and found that Rule 4354 continues to implement RACT levels of control. The below comparison tables demonstrate that, for the more recently amended rule, District Rule 4354 continues to meet RACT.

[90] BAAQMD. *Regulation 9, Rule 12 (Nitrogen Oxides from Glass Melting Furnaces).* (Adopted January 19, 1994). Retrieved from: https://www.baaqmd.gov/~/media/dotgov/files/rules/reg-9-rule-12-nitrogen-oxides-from-glass-melting-furnaces/documents/rg0912.pdf?la=en&rev=29e7064c0e39439c9dee09b104af8dff.
[91] SCAQMD. *Rule 1117 (Emissions from Container Glass Melting and Sodium Silicate Furnaces).* (Amended June 5, 2020). Retrieved from: http://www.aqmd.gov/docs/default-source/rule-book/reg-xi/rule-1117.pdf?sfvrsn=4.

South Coast AQMD

- SCAQMD Rule 1117 (Emissions of Oxides of Nitrogen from Container Glass Melting and Sodium Silicate Furnaces)

	SJVAPCD Rule 4354		SCAQMD Rule 1117
Applicability	Any glass melting furnace for the production of, container glass, fiberglass, and flat glass		This rule limits the emission of NOx from facilities producing container glass and sodium silicate.
Exemption	• Furnaces which heat is provided by electric current from electrodes.		• Furnaces which are limited by permit to 100 tons of product pulled per calendar year. • Glass remelt facilities using exclusively glass cullet, marbles, chips, or similar feedstock in lieu of basic glass-making raw materials. • Furnaces used in the melting of glass for the production of fiberglass exclusively.
Requirements	**Container Glass:**		
	NOx Phase I (by no later than 12/31/2023)	1.1 lb/ton[B]	0.75 lb/ton[B]
	NOx Phase II (by no later than 12/31/2029)	0.75 lb/ton[B]	
	VOC (100% air-fired)	20 ppmv @ 8% O_2 (based on 3 hr avg)	No VOC Limits Specified
	VOC (oxy-fuel/oxygen assisted)	0.25 lb/ton (based on 3 hr avg)	
	Fiberglass:		
	NO_X	1.3 lb/ton[A, C]	No Limit Specified, Exempt from Rule
		3.0 lb/ton[A, D]	
	VOC	No Limit Specified	No Limit Specified, Exempt from Rule
	Flat Glass:		
	NOx Phase I (by no later than 12/31/2023)	2.8 lb/ton[A]	No Limits Specified, Outside of Rule Applicability
		2.5 lb/ton[B]	
	NOx Phase I (by no later than 12/31/2023)	1.7 lb/ton[A]	
		1.5 lb/ton[B]	
	VOC (100% air-fired)	20 ppmv @ 8% O_2 (based on 3 hr avg)	No Limits Specified, Outside of Rule Applicability
	VOC (oxy-fuel/oxygen assisted)	0.10 lb/ton (based on 3 hr avg)	

[A] Block 24-hour average
[B] Rolling 30-day average
[C] Not subject to California Public Resources Code Section 19511
[D] Subject to California Public Resources Code Section 19511

The District evaluated the control requirements in SCAQMD Rule 1117, and found no requirements that were more stringent than those already in Rule 4354.

Potential Emission Reduction Opportunities

Electric Glass Melting Furnaces

District staff considered the feasibility of using electric furnaces to reduce emissions. One of the container glass manufacturing facilities in the Valley is permitted to operate an electric glass melting furnace. However, this electric furnace has been out of glass production operation for more than ten years. During staff research, the District found that electric furnaces require a limited pull rate, and have a production capacity limited to a maximum of about 300 tons of glass per day. Furthermore, District staff found that electric furnace technology is only compatible with container glass manufacturing, and not compatible for flat glass production due to the technological design of electric furnaces and the need for a substantial float to provide heat insulation. The District did not identify any electric furnaces operating as the primary glass melting unit for flat glass manufacturing facilities. For container glass operations, multiple electric furnaces would need to be purchased to replace one existing natural-gas fired furnace, and operators would incur significant additional operation and maintenance costs, as compared to the operation of a furnace fired on natural gas. The typical electric furnace life is 4 years, compared to 10-12 years of that of a natural gas furnace with electric boost, further increasing the costs associated with operating an electric furnace in lieu of a natural gas-fired furnace.

Furthermore, electric furnaces consume more total energy per ton of glass, and would require much higher electricity capacity than is currently available from the electrical grid. For example, a modern 230 ton per day electric furnace has an electricity consumption rating of approximately 7.5 megawatts (MW), compared to a 430 ton per day natural gas furnace with electric boost where the maximum energy consumption is about 2.6 MW. More than 10 MW of additional electrical capacity at a glass production plant would be required to replace just one 430 ton per day furnace. The associated draw on the electrical grid to support required glass production levels for plants operating in the Valley would not be feasible or supported through the current electrical infrastructure or capacity in the region. While electric furnaces may be used for small production operations, or to provide additional heating boosts as an auxiliary unit at large manufacturing plants, District staff have found that the use of electric furnaces as the primary glass melting furnace for large production operations is not currently feasible or cost effective due to the above considerations.

Contingency Measure Evaluation

As discussed in Chapter 6, contingency measures are immediately implemented ONLY if triggered by an unanticipated milestone or attainment failure. The District reviewed this control measure for a potential contingency component. The District concludes that this control measure is not an appropriate contingency measure because the most stringent feasible controls are already in place, and a contingency trigger is incompatible with the technologies involved in reducing emissions from this category.

Evaluation Findings

Rule 4354 meets or exceeds federal RACT requirements for this source category based upon evaluation of applicable federal regulations, state standards, and other air districts' rules. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

C.14 RULE 4401 STEAM-ENHANCED CRUDE OIL PRODUCTION WELLS

Emissions Inventory (Summer Average – Tons per day)

	2017	2023	2026	2029	2032	2035	2037
NOx	n/a	n/a	n/a	n/a	n/a	n/a	n/a
VOC	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Emissions from this category are mapped to other emission source categories.

District Rule 4401 Description

District Rule 4401 applies to all steam-enhanced crude oil production wells and any associated VOC collection and control systems. The purpose of this rule is to limit VOC emissions from these sources. The primary source of VOC emissions from these wells is the casing vent. Operators use VOC collection and control devices to control these emissions.

The rule prohibits the operation of steam-enhanced crude oil production wells, except cyclic wells that meet certain requirements, unless the operator reduces uncontrolled VOC emissions from any well vent by at least 99 percent by weight, or, if several steam-enhanced crude oil production well vents are connected to a vapor collection and control system. This rule requires at least a 99 percent reduction of total uncontrolled VOC emissions.

Fugitive VOC emissions can also occur from oil and gas flowing through various components (such as valves and flanges) that are part of the piping from wells to emission control systems. Rule 4401 contains a schedule that specifies the number of allowable component leaks based on the number of wells connected to a vapor collection and control system. Rule 4401 requires an operator, upon detection of a leak, to affix a readily visible tag bearing the date of leak detection. Rule 4401 further requires an operator to repair a leak within fifteen calendar days. Failure to repair a leak would constitute a violation of the rule.

EPA finalized approval of the 2011 amendments to Rule 4401 on November 16, 2011, and deemed this rule as being at least as stringent as established RACT requirements.[92] EPA approved this rule as still being at least as stringent as established RACT requirements through approval of the *2014 RACT SIP*.

[92] EPA. *Revisions to the California State Implementation Plan, San Joaquin Valley Unified Air Pollution Control District; Final Rule.* 76 Fed. Reg. 221, pp. 70886 – 70887. (2011, November 16). (to be codified at 40 CFR Part 52). Retrieved from http://www.gpo.gov/fdsys/pkg/FR-2011-11-16/pdf/2011-29466.pdf

How does District Rule 4401 compare with federal and state rules and regulations?

Federal Regulations

A. Control Techniques Guidelines (CTG)

- *Control Techniques Guidelines for the Oil and Natural Gas Industry (EPA-453/B-16-001 2016/10)*

This CTG applies to equipment used in the oil and gas industry, including equipment subject to Rule 4401.

On September 30, 2022, EPA took final action in the Federal Register[93] to provide limited approval and limited disapproval of the California Oil and Gas Regulation (COGR) as well as several District Rules. As part of this action, EPA published a Technical Support Document[94] (TSD), which references EPA's *Control Techniques Guidelines for the Oil and Natural Gas Industry* (2016 CTG)[95] as containing EPA's RACT recommendations for reducing VOC emissions from special equipment and processes used in the oil and natural gas industry. As part of this action, EPA identified deficiencies in COGR and Rule 4401, along with other air district rules, which currently requires annual leak inspections with a threshold of 1,000 ppmv using EPA Reference Method 21, in comparison to the CTG (which recommends semiannual inspection frequency with threshold of 500 ppmv).

The District is currently amending Rule 4401 to address these deficiencies. Rule amendments will include lower leak thresholds, more frequent Leak Detection and Repair (LDAR) inspections, and the use of new technology as instruments for leak detection, among evaluating other potential changes. The District will incorporate the CTG recommendations as necessary to address EPA's final September 30, 2022, action.

B. Alternative Control Techniques (ACT)

- *Alternative Control Techniques Document – Control Techniques for Volatile Organic Compound Emissions from Stationary Sources (EPA-453/R-92-018 1992/12)*

District staff conducted a comprehensive evaluation of EPA ACT requirements. EPA has not updated the applicable ACT above since EPA stated that Rule 4401 met RACT requirements through EPA's approval of the *2014 RACT SIP*. EPA's approval

[93] EPA. *Limited Approval, Limited Disapproval of California Air Plan Revisions; California Air Resources Board; Final Rule.* 87 Fed. Reg. 189, pp. 59314-59320. (September 30, 2022). Retrieved from: https://www.govinfo.gov/content/pkg/FR-2022-09-30/pdf/2022-20870.pdf
[94] EPA. *Technical Support Document*. (April 2022). Retrieved from: https://www.regulations.gov/document/EPA-R09-OAR-2022-0416-0002
[95] Control Technique Guidelines for the Oil and Natural Gas Industry, EPA-453/B-16-001 https://www3.epa.gov/airquality/ctg_act/2016-ctg-oil-and-gas.pdf

determined that Rule 4401 met or exceeded RACT and therefore, further evaluation is not necessary at this time.

C. New Source Performance Standards (NSPS)

- *40 CFR 60 Subpart OOOO, Standards of Performance for Crude Oil and Natural Gas Facilities (2020/09)*

This NSPS is applicable to oil and gas facilities for which construction, modification, or reconstruction commenced between August 23, 2011, and September 18, 2015. The NSPS imposes equipment standards on several different types of new/modified/reconstructed equipment and includes leak detection and repair requirements. Notably, NSPS subpart OOOO does not include retrofit requirements for existing, unmodified equipment.

Subpart OOOO includes design standards for some component types, e.g. pumps and compressors, and leak detection and repair requirements.

The District is currently amending Rule 4401 to include lower leak thresholds, more frequent LDAR inspections, and the use of new technology as instruments for leak detection, among evaluating other potential changes. The District will consider and incorporate Subpart OOOO to the extent feasible.

- *40 CFR 60 Subpart OOOOa - Standards of Performance for Crude Oil and Natural Gas Facilities for which Construction, Modification or Reconstruction Commenced After September 18, 2015 (2016/06)*

This NSPS is applicable to oil and gas facilities for which construction, modification, or reconstruction commenced between August 23, 2011, and September 18, 2015, and after September 18, 2015, respectively. The NSPS imposes equipment standards on several different types of new/modified/reconstructed equipment and imposes leak detection and repair requirements for such equipment.

The District is currently amending Rule 4401 to include lower leak thresholds, more frequent LDAR inspections, and the use of new technology as instruments for leak detection, among evaluating other potential changes. The District will consider and incorporate Subpart OOOOa to the extent feasible.

State Regulations

- *California Code of Regulations, Title 17, Division 3, Chapter 1, Subchapter 10 Climate Change, Article 4 (Subarticle 13: Greenhouse Gas Emission Standards for Crude Oil and Natural Gas Facilities) (2018)*

On January 1, 2018, COGR took effect to establish standards for crude oil and natural gas facilities located in the State of California and California Waters. COGR is designed

to encompass components not subject to current local air district rules in California that have the potential to release greenhouse gas emissions identified in COGR. This regulation adds required flash analysis testing on all crude oil and natural gas tank systems that are not controlled by vapor recovery systems. Leak thresholds range from 1,000 ppmv to 50,000 ppmv, and have designated repair time periods depending on the leak size. COGR also establishes a number of allowable leaks within a specified range, and incorporates requirements for quarterly inspections, conducted in accordance with EPA Reference Method 21.

On September 30, 2022, EPA took final action in the Federal Register[96] to provide limited approval and limited disapproval of COGR. The District will evaluate and consider EPA's action on COGR through the development of amendments to Rule 4401.

How does District Rule 4401 compare to rules in other air districts?

District staff compared emission limits, optional control requirements, and work practice standards in District Rule 4401 to comparable requirements in rules from the following California nonattainment areas:

- Santa Barbara County APCD Rule 331 (Amended December 10, 1991)[97]
- South Coast AQMD Rule 1148 (Adopted November 5, 1982)[98]
- South Coast AQMD Rule 1173 (Amended February 6, 2009)[99]
- Ventura County APCD Rule 74.10 (Amended March 10, 1998)[100]

As part of EPA's September 2022 disapproval of COGR, EPA identified deficiencies in Rule 4401. As stated earlier, the District is currently amending Rule 4401, and proposed amendments will meet or exceed federal RACT requirements for this source category, and will be as stringent as or more stringent than analogous rules.

Potential Emission Reduction Opportunities

The District is currently amending Rule 4401 to include lower leak thresholds, more frequent LDAR inspections, and the use of new technology as instruments for leak detection among evaluating other potential changes.

---

[96] EPA. *Limited Approval, Limited Disapproval of California Air Plan Revisions; California Air Resources Board; Final Rule.* 87 Fed. Reg. 189, pp. 59314-59320. (September 30, 2022). Retrieved from: https://www.govinfo.gov/content/pkg/FR-2022-09-30/pdf/2022-20870.pdf

[97] SBAPCD. *Rule 331 (Fugitive Emissions Inspection and Maintenance)*. (Amended December 10, 1991). Retrieved from: https://www.ourair.org/wp-content/uploads/rule331.pdf

[98] SCAQMD. *Rule 1148 (Thermally Enhanced Oil Recovery Wells)*. (Adopted November 5, 1982). Retrieved from: http://www.aqmd.gov/docs/default-source/rule-book/reg-xi/rule-1148.pdf?sfvrsn=4

[99] SCAQMD. *Rule 1173 (Control of Volatile Organic Compound Leaks and Releases from Components at Petroleum Facilities and Chemical Plants)*. (Amended February 6, 2009). Retrieved from: http://www.aqmd.gov/docs/default-source/rule-book/reg-xi/rule-1173.pdf?sfvrsn=4

[100] VCAPCD. *Rule 74.10 (Components at Crude Oil and Natural Gas Production and Processing Facilities)*. (Amended March 10, 1998). Retrieved from: http://www.vcapcd.org/Rulebook/Reg4/RULE%2074.10.pdf

Contingency Measure Evaluation

As discussed in Chapter 6, contingency measures are immediately implemented ONLY if triggered by an unanticipated milestone or attainment failure. The District reviewed this control measure for a potential contingency component. The District concludes that this control measure is not an appropriate contingency measure because the contingency trigger is incompatible with the technologies involved in reducing emissions from this category.

Evaluation Findings

The District commits to amend Rule 4401 no later than 2024 to include lower leak thresholds, more frequent LDAR inspections, and the use of new technology as instruments for leak detection, among evaluating other potential changes. Once amended, District Rule 4401 will continue to meet or exceed federal RACT requirements for this source category.

C.15 RULE 4402 CRUDE OIL PRODUCTION SUMPS

Emissions Inventory (Summer Average – Tons per day)

	2017	2023	2026	2029	2032	2035	2037
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VOC	4.32	3.62	3.32	3.03	2.78	2.54	2.40

District Rule 4402 Description

District Rule 4402 controls VOC emissions from crude oil production sumps located at facilities that produce crude oil. Rule 4402 prohibits first stage sumps. Rule 4402 requires second or third stage sumps to have a flexible floating cover, rigid floating cover, or fixed roof cover, or to be replaced with a fixed roof tank that complies with the provisions of Rule 4623 (Storage of Organic Liquids).

How does District Rule 4402 compare with federal and state rules and regulations?

Federal Regulations

A. Control Techniques Guidelines (CTG)

- *Control Techniques Guidelines for the Oil and Natural Gas Industry (EPA-453/B-16-001 2016/10)*

The CTG does not specify any suggested control requirements for crude oil production sumps.

B. Alternative Control Techniques (ACT)

District staff conducted a comprehensive evaluation of EPA ACT requirements. EPA has not adopted updates to the following ACTs since EPA found that Rule 4402 met RACT requirements through EPA's approval of the *2014 RACT SIP*. Therefore, further evaluation is not necessary at this time.

- *Alternative Control Techniques Document - Control Techniques for VOC Emissions from Stationary Sources (EPA-453/R-92-018 1992/12)*

C. New Source Performance Standards (NSPS)

- *40 CFR 60 Subpart K - Standards of Performance for Storage Vessels for Petroleum Liquids for Which Construction, Reconstruction, or Modification Commenced after June 11, 1973, and Prior to May 19, 1978*
- *40 CFR 60 Subpart Ka - Standards of Performance for Storage Vessels for Petroleum Liquids for Which Construction, Reconstruction, or Modification Commenced after May 18, 1978, and Prior to July 23, 1984*
- *40 CFR 60 Subpart Kb - Standards of Performance for Volatile Organic Liquid Storage Vessels (Including Petroleum Liquids Storage Vessels) for Which Construction, Reconstruction, or Modification Commenced after July 23, 1984*

A review of these NSPS indicates that there are no requirements for crude oil production sumps.

State Regulations

There is no Air Toxic Control Measure (ATCM) that applies to the same equipment as Rule 4402.

- *California Code of Regulations, Title 17, Division 3, Chapter 1, Subchapter 10 Climate Change, Article 4 (Subarticle 13: Greenhouse Gas Emission Standards for Crude Oil and Natural Gas Facilities) (2018)*

On January 1, 2018, the Greenhouse Gas Emission Standards for Crude Oil and Natural Gas Facilities (COGR) took effect to establish standards for crude oil and natural gas facilities located in the State of California and California Waters. While the rule targets methane emissions reductions, it has a collateral benefit of reducing VOC emissions from certain separator and tank systems, including sumps.

This regulation adds required flash analysis testing on all crude oil and natural gas tank systems that are not controlled by vapor recovery systems. COGR does not require the installation of vapor control technologies on any crude oil production sumps.

As the CARB oil and gas methane rule, in practice, has not required the installation of vapor control on a sump, this rule does not require the installation of vapor control on crude oil production sumps. As such, the CARB oil and gas methane rule does not establish a RACT requirement for VOC emissions from crude oil production sumps.

How does District Rule 4402 compare to rules in other air districts?

District staff compared emission limits, optional control requirements, and work practice standards in District Rule 4402 to comparable requirements in rules from the following California nonattainment areas:

- San Luis Obispo County APCD Rule 419 (Adopted July 12, 1994)[101]
- Santa Barbara County APCD Rule 344 (Adopted November 10, 1994)[102]
- South Coast AQMD Rule 1176 (Amended September 13, 1996)[103]
- Ventura County APCD Rule 71.4 (Amended June 8, 1993)[104]

Bay Area AQMD and Sacramento Metropolitan AQMD do not have analogous rules for this source category. For the remaining above-listed rules, the District reviewed the rule requirements implemented prior to EPA's approval of the *2014 RACT SIP*, and found that Rule 4402 continues to implement RACT levels of control.

Potential Emission Reduction Opportunities

While the District's current requirements implement RACT levels of control, recent analysis to address state BARCT requirements indicates potential opportunities for further reducing emissions from this source category, particularly with respect to exemption thresholds for sumps and ponds storing produced water. Under this BARCT process, a rule making process will start in 2022 for the storage and handling of produced water in sumps and ponds. The rule development process will evaluate opportunities for a potentially more stringent definition of clean produced water to determine the maximum degree of VOC emission reductions achievable, taking into account environmental, energy and economic impacts by each class or category of source. The rule development process for Rule 4402 is in progress, and will be completed in 2023/2024 based on the public engagement and interagency consultation processes. These potential enhancements to District Rule 4402 are included as a SIP-strengthening measure in the Plan.

Contingency Measure Evaluation

As discussed in Chapter 6, contingency measures are immediately implemented ONLY if triggered by an unanticipated milestone or attainment failure. The District reviewed this control measure for a potential contingency component. The District concludes that this control measure is not an appropriate contingency measure because the most

[101] SLOCAPCD. *Rule 419 (Petroleum Pits, Ponds, Sumps, Well Cellars, and Wastewater Separators)*. (Adopted July 12, 1994). Retrieved from: https://storage.googleapis.com/slocleanair-org/images/cms/upload/files/Rule_4192.pdf
[102] SBCAPCD. *Rule 344 (Petroleum Sumps, Pits and Well Cellars)*. (Adopted November 10, 1994). Retrieved from: http://www.ourair.org/wp-content/uploads/rule344.pdf
[103] SCAQMD. *Rule 1176 (VOC Emissions from Wastewater Systems)*. (Amended September 13, 1996). Retrieved from: http://www.aqmd.gov/docs/default-source/rule-book/reg-xi/rule-1176.pdf
[104] VCAPCD. *Rule 71.4 (Petroleum Sumps, Pits, Ponds and Well Cellars)*. (Amended June 8, 1993). Retrieved from: http://www.vcapcd.org/Rulebook/Reg4/RULE%2071.4.pdf.

stringent feasible controls are already in place, and a contingency trigger is incompatible with the technologies involved in reducing emissions from this category.

Evaluation Findings

District Rule 4402 meets or exceeds federal RACT requirements for this source category based upon evaluation of applicable federal regulations, state standards, and other air districts' rules. The BARCT rule development process for Rule 4402 is in progress, and will be completed in 2023/2024 based on the public engagement and interagency consultation processes. These potential enhancements to District Rule 4402 are included as a SIP-strengthening measure in the Plan.

C.16 RULE 4404 HEAVY OIL TEST STATION —KERN COUNTY

Emissions Inventory (Summer Average – Tons per day)

	2017	2023	2026	2029	2032	2035	2037
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VOC	0.00	0.00	0.00	0.00	0.00	0.00	0.00

The inventory for this source category is 0.00 tpd because there are no heavy oil test stations (HOTS) in operation in the Valley.

District Rule 4404 Description

District Rule 4404 applies to the operation of heavy oil test stations (HOTS) with tanks that vent directly to the atmosphere. The purpose of this rule is to limit VOC emissions from the operation of HOTS. A HOTS is a tank setting comprised of both a family tank and one or more test tanks. A family tank directly receives crude oil production from more than one steam drive well through individual production lines with discharge into the tank. A test tank tests the production rate from a single steam drive well.

Rule 4404 prohibits operation of HOTS, unless operators reduce the VOC emissions by at least 99%. Except during sampling, gauging, and PV valve vent, any tank roof opening must be equipped with a cover, seal, or lid with no visible gap and maintained in a gas-tight condition.

Requirements of this rule are applicable to HOTS that are atmospheric tanks. A review of the District's permit database and observations of the Compliance Division indicate that there are no atmospheric HOTS operating in the Valley. All previous HOTS operations are now employing pressure vessels, which do not vent to the atmosphere. These unvented pressure vessels are exempt from District permitting per section 6.13 of District Rule 2020. Therefore, the VOC emissions from this source category are zero.

How does District Rule 4404 compare with federal and state rules and regulations?

Federal Regulations

There are no Control Techniques Guidelines, Alternative Control Techniques, or New Source Performance Standards applicable to this source category.

State Regulations

There are no state regulations applicable to this source category.

How does District Rule 4404 compare to rules in other air districts?

Bay Area AQMD, Sacramento Metropolitan AQMD, South Coast AQMD, and Ventura County APCD do not have analogous rules for this source category.

Potential Emission Reduction Opportunities

There are no atmospheric HOTS in operation in the Valley. All HOTS operations now employ pressure vessels that do not vent to the atmosphere, and such vessels are exempt from District permitting per section 6.13 of District Rule 2020. Therefore, the District did not identify any additional emission reduction opportunities at this time.

Contingency Measure Evaluation

As discussed in Chapter 6, contingency measures are immediately implemented ONLY if triggered by an unanticipated milestone or attainment failure. The District reviewed this control measure for a potential contingency component. The District concludes that this control measure is not an appropriate contingency measure because the most stringent feasible controls are already in place, and a contingency trigger is incompatible with the technologies involved in reducing emissions from this category.

Evaluation Findings

Rule 4404 meets or exceeds federal RACT requirements for this source category based upon evaluation of applicable federal regulations, state standards, and other air districts' rules. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

C.17 RULE 4407 IN-SITU COMBUSTION WELL VENTS

Emissions Inventory (Summer Average – Tons per day)

	2017	2023	2026	2029	2032	2035	2037
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VOC	0.00	0.00	0.00	0.00	0.00	0.00	0.00

The emission inventory for this source category is 0.00 tpd because there are no in-situ combustion well vents operating in the Valley.

District Rule 4407 Description

District Rule 4407 controls VOC emissions from in-situ combustion well vents. The rule applies to all crude oil production wells where operators enhance production by in-situ combustion. In situ-combustion is defined in the rule as a thermal crude oil recovery process in which air is injected into an oil reservoir and in-place petroleum oxidizes at an accelerated rate. The heat of combustion and combustion products enhance oil production by decreasing oil viscosity and pressurizing the reservoir. An in-situ combustion well is any crude oil production well which produces from the same zone in which an air injection well is completed and lies within 1,000 feet from an injection well.

Rule 4407 prohibits the operation of any in-situ combustion well unless the well vent connects to an emission control device, which abates 85% by weight of entering VOC gases, or to a fuel burning equipment (furnace, boiler, etc) or a smokeless flare. Operators must maintain all components (piping, valves, fittings, pumps, compressors, etc.) and inspect for leaks on a quarterly basis. If an operator determines that no more than 2% of all components of the collection system leak during each three consecutive quarterly inspections, the inspection frequency may change from quarterly to annual. The total number of leaks in a collection system should not exceed 2% of all the components in the collection system. Upon detection of a leak, the operator should affix a visible tag indicating the date of detection of the leak and the tag must remain in place until the operator repairs the leak. An operator must repair a leaking component within 15 days of leak detection, but a ten-day extension to repair a leak may be granted provided the operator demonstrates that necessary and sufficient actions have been taken to correct the leak. Failure to repair a leak after the ten-day extension constitutes a violation of the rule.

Rule 4407 requires annual testing of the VOC control efficiency of the control and collection system (testing should be conducted during June, July, August, or September of each year if the system's control efficiency is dependent upon ambient temperature). The APCO may waive the test requirement if a collection and control system collects all uncondensed VOC emissions.

Currently there are no in-situ combustion crude oil wells operating in the Valley.

How does District Rule 4407 compare with federal and state rules and regulations?

Federal Regulations

There are no Control Techniques Guidelines, Alternative Control Techniques, or New Source Performance Standards applicable to this source category.

State Regulations

There are no state regulations applicable to this source category.

How does District Rule 4407 compare to rules in other air districts?

Bay Area AQMD, Sacramento Metropolitan AQMD, South Coast AQMD, and Ventura County APCD do not have analogous rules for this source category.

Potential Emission Reduction Opportunities

There are no in-situ combustion well vents operating in the Valley, therefore the District did not identify any additional emission reduction opportunities at this time.

Contingency Measure Evaluation

As discussed in Chapter 6, contingency measures are immediately implemented ONLY if triggered by an unanticipated milestone or attainment failure. The District reviewed this control measure for a potential contingency component. The District concludes that this control measure is not an appropriate contingency measure because the most stringent feasible controls are already in place, and a contingency trigger is incompatible with the technologies involved in reducing emissions from this category.

Evaluation Findings

Rule 4407 meets or exceeds federal RACT requirements for this source category based upon evaluation of applicable federal regulations, state standards, and other air districts' rules. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

C.18 RULE 4408 GLYCOL DEHYDRATION SYSTEMS

Emissions Inventory (Summer Average – Tons per day)

	2017	2023	2026	2029	2032	2035	2037
NOx	n/a	n/a	n/a	n/a	n/a	n/a	n/a
VOC	n/a	n/a	n/a	n/a	n/a	n/a	n/a

The emissions inventory for Rule 4409 (Components at Light Crude Oil Production Facilities, Natural Gas Production Facilities, and Natural Gas Processing Facilities) account for the emissions inventory for this rule.

District Rule 4408 Description

District Rule 4408 applies to any glycol dehydration system with a glycol dehydration vent that is subject to permitting requirements pursuant to Regulation II (Permits). The purpose of this rule is to limit VOC emissions from these sources.

How does District Rule 4408 compare with federal and state rules and regulations?

Federal Regulations

There are no Control Techniques Guidelines, Alternative Control Techniques, or New Source Performance Standards applicable to this source category.

State Regulations

There are no state regulations applicable to this source category.

How does District Rule 4408 compare to rules in other air districts?

District staff compared emission limits, optional control requirements, and work practice standards in District Rule 4408 to comparable requirements in rules from the following California nonattainment areas:

- Ventura County APCD Rule 71.5 (Adopted 12/13/1994)[105]

Bay Area AQMD, Sacramento Metropolitan AQMD, and South Coast AQMD do not have analogous rules for this source category. For the remaining above-listed rule, the District reviewed the rule requirements implemented prior to EPA's approval of the *2014 RACT SIP* and found that Rule 4408 continues to implement RACT levels of control.

[105] VCAPCD. *Rule 71.5 (Glycol Dehydrators).* (Adopted December 13, 1994). Retrieved from: http://www.vcapcd.org/Rulebook/Reg4/RULE%2071.5.pdf.

Potential Emission Reduction Opportunities

As demonstrated above, Rule 4408 currently has in place the most stringent measures feasible to implement in the Valley. No additional emission reduction opportunities have been identified at this time.

Contingency Measure Evaluation

As discussed in Chapter 6, contingency measures are immediately implemented ONLY if triggered by an unanticipated milestone or attainment failure. The District reviewed this control measure for a potential contingency component. The District concludes that this control measure is not an appropriate contingency measure because the most stringent feasible controls are already in place, and a contingency trigger is incompatible with the technologies involved in reducing emissions from this category.

Evaluation Findings

Rule 4408 meets or exceeds federal RACT requirements for this source category based upon evaluation of applicable federal regulations, state standards, and other air districts' rules. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

C.19 RULE 4409 COMPONENTS AT LIGHT CRUDE OIL PRODUCTION FACILITIES, NATURAL GAS PRODUCTION FACILITIES, AND NATURAL GAS PROCESSING FACILITIES

Emissions Inventory (Average – Tons per day)

	2017	2023	2026	2029	2032	2035	2037
NOx	0.01	0.00	0.00	0.00	0.00	0.00	0.00
VOC	1.25	1.05	0.96	0.88	0.80	0.73	0.69

This emission inventory table is comprised of the emission inventory of sources subject to Rules 4408 (Glycol Dehydration Systems), Rule 4409 (Components at Light Crude Oil Production Facilities, Natural Gas Production Facilities, and Natural Gas Processing Facilities), Rule 4453 (Refinery Vacuum Producing Devices or Systems), and Rule 4454 (Refinery Process Unit Turnaround).

District Rule 4409 Description

District Rule 4409, adopted on April 20, 2005, addresses fugitive emissions from various components at light crude oil and gas production facilities and components at natural gas processing facilities. The main requirement of this rule is to reduce the number and severity of leaking components by regular inspection, repair, and replacement requirements, as well as mandating violations and penalties above certain leak thresholds.

How does District Rule 4409 compare with federal and state rules and regulations?

Federal Regulations

A. Control Techniques Guidelines (CTG)

- *Control Techniques Guidelines for the Oil and Natural Gas Industry (EPA-453/B-16-001 2016/10)*

This CTG applies to equipment used in the oil and gas industry, including equipment subject to Rule 4409.

The District is currently amending Rule 4409 to include lower leak thresholds, more frequent LDAR inspections, and the use of new technology as instruments for leak detection, among evaluating other potential changes. The District will consider and incorporate the CTG to the extent feasible.

B. Alternative Control Techniques (ACT)

- *Alternative Control Techniques Document – Control Techniques for Volatile Organic Compound Emissions from Stationary Sources (EPA-453/R-92-018 1992/12)*

District staff have conducted a comprehensive evaluation of EPA ACT requirements. EPA has not updated the applicable ACT above since EPA stated that Rule 4409 met RACT requirements through EPA's approval of the *2014 RACT SIP*. EPA's approval determined that Rule 4409 met or exceeded RACT and therefore, further evaluation is not necessary at this time.

C. New Source Performance Standards (NSPS)

- *40 CFR 60 Subpart OOOO, Standards of Performance for Crude Oil and Natural Gas Facilities (2020/09)*

This NSPS is applicable to oil and gas facilities for which construction, modification, or reconstruction commenced between August 23, 2011, and September 18, 2015. The NSPS imposes equipment standards on several different types of new/modified/reconstructed equipment and includes leak detection and repair requirements. Notably, NSPS subpart OOOO does not include retrofit requirements for existing, unmodified equipment.

Subpart OOOO includes design standards for some component types, e.g. pumps and compressors, and leak detection and repair requirements.

The District is currently amending Rule 4409 to include lower leak thresholds, more frequent LDAR inspections, and the use of new technology as instruments for leak detection, among evaluating other potential changes. The District will consider and incorporate Subpart OOOO to the extent feasible.

- *Subpart OOOOa - Standards of Performance for Crude Oil and Natural Gas Facilities for which Construction, Modification or Reconstruction Commenced After September 18, 2015 (2016/06)*

This NSPS is applicable to oil and gas facilities for which construction, modification, or reconstruction commenced between August 23, 2011, and September 18, 2015, and after September 18, 2015, respectively. The NSPS imposes equipment standards on several different types of new/modified/reconstructed equipment and imposes leak detection and repair requirements for such equipment.

The District is currently amending Rule 4409 to include lower leak thresholds, more frequent LDAR inspections, and the use of new technology as instruments for leak detection, among evaluating other potential changes. The District will consider and incorporate Subpart OOOOa to the extent feasible.

State Regulations

- *California Code of Regulations, Title 17, Division 3, Chapter 1, Subchapter 10 Climate Change, Article 4 (Subarticle 13: Greenhouse Gas Emission Standards for Crude Oil and Natural Gas Facilities) (2018)*

On January 1, 2018, COGR took effect to establish standards for crude oil and natural gas facilities located in the State of California and California Waters. COGR is designed to encompass components not subject to current local air district rules in California that have the potential to release greenhouse gas emissions identified in COGR. This regulation adds required flash analysis testing on all crude oil and natural gas tank systems that are not controlled by vapor recovery systems. Leak thresholds range from 1,000 ppmv to 50,000 ppmv, and have designated repair time periods depending on the leak size. COGR also establishes a number of allowable leaks within a specified range, and incorporates requirements for quarterly inspections, conducted in accordance with EPA Reference Method 21.

On September 30, 2022, EPA took final action in the Federal Register[106] to provide limited approval and limited disapproval of COGR. The District will evaluate and consider EPA's action on COGR through the development of amendments to Rule 4409.

How does District Rule 4409 compare to rules in other air districts?

In 2020, the District performed a review of the other air district rules for this source category. Based on the review of rule requirements, District staff found that Rule 4409 was not analogous when compared to the following rules:

- Bay Area AQMD Regulation 8, Rule 18 (Amended November 3, 2021)[107]
- Bay Area AQMD Regulation 8, Rule 22 (Amended June 1, 1994)[108]
- Bay Area AQMD Regulation 8, Rule 28 (Amended November 3, 2021)[109]

District staff compared emission limits, optional control requirements, and work practice standards in District Rule 4409 to comparable requirements in rules from the following California nonattainment areas:

- Santa Barbara County APCD Rule 331 (Amended December 10, 1991)[110]

---

[106] EPA. *Limited Approval, Limited Disapproval of California Air Plan Revisions; California Air Resources Board; Final Rule.* 87 Fed. Reg. 189, pp. 59314-59320. (September 30, 2022). Retrieved from: https://www.govinfo.gov/content/pkg/FR-2022-09-30/pdf/2022-20870.pdf

[107] BAAQMD. *Regulation 8, Rule 18 (Equipment Leaks)*. (Amended November 3, 2021). Retrieved from: https://www.baaqmd.gov/~/media/dotgov/files/rules/refinery-rules-definitions/rg0818_20211103-pdf.pdf

[108] BAAQMD. *Regulation 8, Rule 22 (Valves and Flanges at Chemical Plants)*. (Amended June 1, 1994). Retrieved from: https://www.baaqmd.gov/~/media/dotgov/files/rules/reg-8-rule-22-valves-and-flanges-at-chemical-plants/documents/rg0822.pdf?la=en&rev=94fa0b57a2ee4bf6b607acaf7d3b7c22

[109] BAAQMD. *Regulation 8, Rule 28 (Episodic Releases from Pressure Relief Devices at Petroleum Refineries and Chemical Plants)*. (Amended November 3, 2021). Retrieved from: https://www.baaqmd.gov/~/media/dotgov/files/rules/reg-8-rule-28-episodic-releases-from-pressure-relief-devices-at-petroleum-refineries-and-chemical-pl/documents/rg0828.pdf?la=en

[110] SBAPCD. *Rule 331 (Fugitive Emissions Inspection and Maintenance)*. (Amended December 10, 1991). Retrieved from: https://www.ourair.org/wp-content/uploads/rule331.pdf

- South Coast AQMD Rule 1173 (Amended February 6, 2009)[111]
- Ventura County APCD Rule 74.10 (Amended March 10, 1998)[112]
- Ventura County APCD Rule 74.7 (Amended November 10, 1995)[113]

Based on a review of rule requirements for analogous rules implemented prior to EPA's approval of the *2014 RACT SIP*, District staff found that Rule 4409 continues to implement RACT levels of control.

Potential Emission Reduction Opportunities

The District is currently amending Rule 4409 to include lower leak thresholds, more frequent LDAR inspections, and the use of new technology as instruments for leak detection among evaluating other potential changes.

Contingency Measure Evaluation

As discussed in Chapter 6, contingency measures are immediately implemented ONLY if triggered by an unanticipated milestone or attainment failure. The District reviewed this control measure for a potential contingency component. The District concludes that this control measure is not an appropriate contingency measure because the contingency trigger is incompatible with the technologies involved in reducing emissions from this category.

Evaluation Findings

The District commits to amend Rule 4409 no later than 2024 to include lower leak thresholds, more frequent LDAR inspections, and the use of new technology as instruments for leak detection, among evaluating other potential changes. Once amended, District Rule 4409 will continue to meet or exceed federal RACT requirements for this source category.

[111] SCAQMD. *Rule 1173 (Control of Volatile Organic Compound Leaks and Releases from Components at Petroleum Facilities and Chemical Plants)*. (Amended February 6, 2009). Retrieved from: http://www.aqmd.gov/docs/default-source/rule-book/reg-xi/rule-1173.pdf?sfvrsn=4
[112] VCAPCD. *Rule 74.10 (Components at Crude Oil and Natural Gas Production and Processing Facilities)*. (Amended March 10, 1998). Retrieved from: http://www.vcapcd.org/Rulebook/Reg4/RULE%2074.10.pdf
[113] VCAPCD. *Rule 74.7 (Fugitive Emissions of Reactive Organic Compounds (ROC) at Petroleum Refineries and Chemical Plants)*. (Amended October 10, 1995). Retrieved from: http://vcapcd.org/Rulebook/Reg4/RULE%2074.7.pdf

C.20 RULE 4453 REFINERY VACUUM PRODUCING DEVICES OR SYSTEMS

Emissions Inventory (Summer Average – Tons per day)

	2017	2023	2026	2029	2032	2035	2037
NOx	n/a	n/a	n/a	n/a	n/a	n/a	n/a
VOC	n/a	n/a	n/a	n/a	n/a	n/a	n/a

The emissions from this rule are accounted for in the discussion for Rule 4409 (Components at Light Crude Oil Production Facilities, Natural Gas Production Facilities, and Natural Gas Processing Facilities).

District Rule 4453 Description

District Rule 4453, last amended December 17, 1992, applies to any vacuum producing device or system, including hot wells and accumulators installed in a refinery operation. The purpose of this rule is to limit VOC emissions from refinery vacuum producing devices or systems.

How does District Rule 4453 compare with federal and state rules and regulations?

Federal Regulations

There are no Alternative Control Techniques or New Source Performance Standards applicable to this source category.

D. Control Techniques Guidelines (CTG)

District staff conducted a comprehensive evaluation of EPA CTG requirements. EPA has not adopted updates to the following CTG since EPA found that Rule 4453 met RACT requirements through EPA's approval of the *2014 RACT SIP*. Therefore, further evaluation is not necessary at this time.

- *EPA 1977 CTG for Control of Refinery Vacuum Producing Systems, Wastewater Separators, and Process Unit Turnarounds (EPA-450/2-77-025 1977/10)*

State Regulations

There are no state regulations applicable to this source category.

How does District Rule 4453 compare to rules in other air districts?

District staff compared emission limits, optional control requirements, and work practice standards in District Rule 4453 to comparable requirements in rules from the following California nonattainment areas:

- Bay Area AQMD Regulation 8, Rule 9 (Amended November 3, 2021)[114]
- South Coast AQMD Rule 465 (Amended August 13, 1999)[115]
- Ventura County APCD Rule 74.8 (Amended July 5, 1983)[116]

Based on a review of rule requirements implemented prior to EPA's approval of the District's *2014 RACT SIP,* District staff found that Rule 4453 continues to implement RACT levels of control. The below comparison table demonstrates that, for more the recently amended rule, District Rule 4453 continues to meet RACT.

Bay Area AQMD

- BAAQMD Regulation 8, Rule 9 (Vacuum Producing Systems)

	SJVAPCD Rule 4453	BAAQMD Reg 8, Rule 9
Applicability	Any vacuum producing device or system, including hot wells and accumulators installed in a refinery operation.	Limits emission of precursor organic compounds from vacuum producing systems.
Exemptions	None	• Shall not apply to vacuum tank trucks which are governed by the requirements of Rule 2 of Reg 8 • Shall not apply to chemical plants until January 1, 1985.
Requirements	• Hot wells and accumulators shall be covered. • The vapors from the vacuum producing device or system including hot wells and accumulators shall either be: ○ Collected, compressed, and added to refinery gas. ○ Controlled and combusted in an appropriate firebox or incinerator with at least 90 percent VOC control efficiency. ○ Controlled by a method that is equivalent to Section 3.2.1 or 3.2.2 and approved by the APCO.	• The control of precursor organic compound emissions from vacuum producing systems at refineries and chemical plants shall be accomplished by employing the following equipment and/or strategies: ○ Non-Condensable precursor organic emissions from vacuum producing systems must either be controlled and piped to an appropriate firebox or incinerator for combustion, or be collected, compressed, and added to the fuel gas system, or be contained and

[114] BAAQMD. *Regulation 8, Rule 9 (Vacuum Producing Systems).* (Amended November 3, 2021). Retrieved from: https://www.baaqmd.gov/~/media/dotgov/files/rules/refinery-rules-definitions/rg0809_20211103-pdf.pdf?la=en&rev=7a9eff1a60ee4b47809f152b82b223b7.
[115] SCAQMD. *Rule 465 (Refinery Vacuum-Producing Devices or Systems).* (Amended August 13, 1999). Retrieved from: http://www.aqmd.gov/docs/default-source/rule-book/rule-iv/rule-465.pdf?sfvrsn=4.
[116] VCAPCD. *Rule 74.8 (Refinery Vacuum Producing Systems, Wastewater Separators and Process Turnarounds).* (Amended July 5, 1983). Retrieved from: http://www.vcapcd.org/Rulebook/Reg4/RULE%2074.8.pdf.

	SJVAPCD Rule 4453	BAAQMD Reg 8, Rule 9
		treated so as to prevent their emission into the atmosphere. ○ Hot wells and/or accumulators associated with vacuum system condensers must be covered and the precursor organic vapors must either be incinerated or contained and treated to prevent their emission into the atmosphere.

The requirements in Rule 4453 are as stringent as those in BAAQMD Regulation 8, Rule 9.

Potential Emission Reduction Opportunities

As demonstrated above, Rule 4453 currently has in place the most stringent measures feasible to implement in the Valley. No additional emission reduction opportunities have been identified at this time.

Contingency Measure Evaluation

As discussed in Chapter 6, contingency measures are immediately implemented ONLY if triggered by an unanticipated milestone or attainment failure. The District reviewed this control measure for a potential contingency component. The District concludes that this control measure is not an appropriate contingency measure because the most stringent feasible controls are already in place, and a contingency trigger is incompatible with the technologies involved in reducing emissions from this category.

Evaluation Findings

Rule 4453 meets or exceeds federal RACT requirements for this source category based upon evaluation of applicable federal regulations, state standards, and other air districts' rules. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

C.21 RULE 4454 REFINERY PROCESS UNIT TURNAROUND

Emissions Inventory (Summer Average – Tons per day)

	2017	2023	2026	2029	2032	2035	2037
NOx	n/a	n/a	n/a	n/a	n/a	n/a	n/a
VOC	n/a	n/a	n/a	n/a	n/a	n/a	n/a

The emissions from this rule are accounted for in the discussion for Rule 4454 (Refinery Processing Unit Turnaround).

District Rule 4454 Description

District Rule 4454, last amended December 17, 1992, applies to any refinery vessel containing VOCs, unless exempted. The purpose of this rule is to limit VOC emissions resulting from the purging, repair, cleaning, or otherwise opening or releasing pressure from a refinery vessel during a process unit turnaround.

How does District Rule 4454 compare with federal and state rules and regulations?

Federal Regulations

There are no Alternative Control Techniques applicable to this source category.

A. Control Technique Guidelines (CTG)

District staff conducted a comprehensive evaluation of EPA CTG requirements. EPA has not adopted updates to the following CTGs since EPA found that Rule 4454 met RACT requirements through EPA's approval of the *2014 RACT SIP*. Therefore, further evaluation is not necessary at this time.

- *Control of Refinery Vacuum Producing Systems, Wastewater Separators, and Process Unit Turnarounds (EPA-450/2-77-025 1977/10)*

B. New Source Performance Standards (NSPS)

- *40 CFR Part 60, Subpart J Standards of Performance for Petroleum Refineries for Which Construction, Reconstruction, or Modification Commenced After May 14, 2007 (Amended 9/12/12, 12/19/13, 12/1/15)*

This subpart does not have any requirements for refinery process unit turnaround.

- *40 CFR Part 60, Subpart Ja Standards of Performance for Petroleum Refineries for Which Construction, Reconstruction, or Modification Commenced After May 14, 2007 (Amended 9/12/12, 12/19/13, 12/1/15)*

This subpart does not have any requirements or operating procedures for refinery process unit turnaround.

State Regulations

There are no state regulations applicable to this source category.

How does District Rule 4454 compare to rules in other air districts?

District staff compared emission limits, optional control requirements, and work practice standards in District Rule 4454 to comparable requirements in rules from the following California nonattainment areas:

- Bay Area AQMD Regulation 8, Rule 10 (Amended November 3, 2021)[117]
- South Coast AQMD Rule 1123 (Amended December 7, 1990)[118]
- Ventura County APCD Rule 74.8 (Amended July 5, 1983)[119]

Sacramento Metropolitan AQMD does not have an analogous rule applicable to this source category. For the remaining above-listed rules, the District reviewed the rule requirements implemented prior to EPA's approval of the *2014 RACT SIP* and found that Rule 4454 continues to implement RACT levels of control. The below comparison table demonstrates that, for the more recently amended rule, District Rule 4454 continues to meet RACT.

Bay Area AQMD

- BAAQMD Regulation 8, Rule 10 (Refinery Process Turnaround)

	SJVAPCD Rule 4454	BAAQMD Reg 8, Rule 10
Applicability	Any refinery vessel containing VOCs unless exempted under Section 3.0.	Limits emissions of organic compounds from depressurizing and opening of process vessels at refineries and chemical plants.
Exemptions	• Any process vessel that has been depressurized to less than 1020 mm Hg (5 psig)	• The provisions of this rule shall not apply to vessels that are subject to the following Regulation 8 rules ○ Regulation 8, Rule 5: Storage of Organic Liquids

[117] BAAQMD. *Regulation 8, Rule 10 (Process Vessel Depressurization).* (Amended November 3, 2021). Retrieved from: https://www.baaqmd.gov/~/media/dotgov/files/rules/refinery-rules-definitions/rg0810_20211103-pdf.pdf?la=en&rev=d4e6e14e8e29473f88a1b9965f8dcbd0.
[118] SCAQMD. *Rule 1123 (Refinery Process Turnarounds).* (Amended December 7, 1990). Retrieved from: http://www.aqmd.gov/docs/default-source/rule-book/reg-xi/rule-1123.pdf?sfvrsn=4.
[119] VCAPCD. *Rule 74.8 (Refinery Vacuum Producing Systems, Wastewater Separators and Process Turnarounds).* (Amended July 5, 1983). Retrieved from: http://www.vcapcd.org/Rulebook/Reg4/RULE%2074.8.pdf.

	SJVAPCD Rule 4454	BAAQMD Reg 8, Rule 10
		○ Regulation 8, Rule 24: Pharmaceutical and Cosmetic Manufacturing Operations ○ Regulation 8, Rule 35: Coating, Ink and Adhesive Manufacturing ○ Regulation 8, Rule 36: Resin Manufacturing ○ Regulation 8, Rule 41: Vegetable Oil Manufacturing Operations ○ Regulation 8, Rule 50: Polyester Resin Operations ○ Regulation 8, Rule 52: Polystyrene, Polypropylene, and Polyethylene Foam Product Manufacturing Operations • The provisions of Section 8-10-301 shall not apply while a process vessel is opened for a period of time reasonably necessary for measurements to determine compliance with the concentration and mass emission limits of this rule • The provisions of this Rule shall not apply to any process vessel with a volume of less than 100 cubic feet • The provisions of this rule shall not apply to any process vessel used in a batch process operation that requires periodic vessel opening as part of the routine operation of the vessel, including but not limited to delayed coking vessels.
Requirements	• The organic vapors shall either be: ○ Recovered, added to the refinery fuel gas system and combusted: ○ Controlled and piped to an appropriate firebox or incinerated for combustion. ○ Flared, until the pressure within the process vessel is as close to atmospheric pressure as is possible. • All process vessels shall be depressurized into the control facilities to less than 1020 mm Hg (5 psig) before venting/opening to atmosphere. • All organic compounds which emerge from a refinery process vessel during the purging of said vessel and which otherwise would be emitted to the	• The Emissions of organic compounds from depressurizing any process vessel at a refinery or a chemical plant shall be controlled by venting them to a fuel gas system, firebox, incinerator, thermal oxidizer, flare, or otherwise containing and treating them so as to prevent their emissions to the atmosphere. Such procedures shall continue until the pressure within the process vessel is as close to atmospheric pressure as practicably possible, in no case shall a process vessel be vented to the atmosphere until the partial pressure of organic compounds in that vessel is less than 1000 mm Hg (4.6 psig). • Effective July 1, 2004, no process vessel may be opened to the

	SJVAPCD Rule 4454	BAAQMD Reg 8, Rule 10
	atmosphere shall be either directed to a flare or incinerator or shall be used for fuel until such disposition of emissions is not technically feasible or is less safe than atmospheric venting. Compliance with this section shall not be construed to require the installation, construction or structural modification of any equipment which is not required for compliance with the above paragraph requiring controls during depressurization	atmosphere except as provided below: ○ No process vessel may be opened to the atmosphere unless the internal concentration of total organic compounds has been reduced prior to release to atmosphere to less than 10,000 ppm, expressed as methane (C1) except as provided in Section 8-10-302.2. ○ A process vessel at a refinery or chemical plant may be opened when the internal concentration of total organic compounds is 10,000 ppm or greater provided that the total number of such vessels opened with such concentration during any consecutive five year period does not exceed 10% of the total process vessel population as documented pursuant to section 8-10-401, and the organic compound emissions from the opening of these vessels shall not exceed 15 lbs/day. Vessels with an internal concentration of total organic compounds of 10,000 ppm or greater shall not be opened on any day on which the APCO predicts an exceedance of a NAAQS for ozone or declares a Spare the Air Day.

BAAQMD Regulation 8, Rule 10 requires a process vessel to be depressurized to 4.6 psig before venting to the atmosphere, as compared to the SJVAPCD Rule 4454 requirement of 5.0 psig. Additionally, BAAQMD requires that a vessel's internal concentration of total organic compounds be reduced prior to release to the atmosphere to less than 10,000 ppm, expressed as methane, whereas the District's rule has no such limit. The District evaluated the potential emissions reductions and cost-effectiveness associated with implementation of these requirements in the Valley, and calculated a cost-effectiveness between $212,447 and $1,199,500 per ton of VOC emissions reduced, which is far in excess of accepted RACT cost-effectiveness levels.[120]

[120] SJVAPCD. *AB617 BARCT Rule Analysis.* (Revised June 26, 2020). Retrieved from: https://community.valleyair.org/media/1790/final-barct-rule-analysis-july-30-2020.pdf

Potential Emission Reduction Opportunities

The District evaluated the potential emissions reductions that could be achieved by adopting enhanced control options required in analogous rules. As part of this analysis, the District evaluated the feasibility of lowering venting pressure from 5.0 to 4.6 psig, and vent concentration to 10,000 ppm. Based on an in-depth emission reduction analysis for facilities in the Valley, the District found only limited opportunity for emission reductions, at 0.15 tons of VOC per year. These potential reductions would only occur once every 3 or 4 years, further diminishing the benefits of these emissions reductions. Additionally, the District determined that implementation of these requirements would not be cost-effective. The District's cost effectiveness calculations are presented below.

Cost-Effectiveness Analysis

Assumptions:

According to San Joaquin Refining (SJR), Kern Oil and Refining (KOR), Alon, and Tricor, refinery vessels located at these facilities do not currently have pressure gauges with the accuracy to measure to 4.6 psig. Newer digital equipment with higher precision gauges would need to be installed in order to comply with this lower pressure requirement. Also, in order to vent to a lower overall pressure (such as 4.6 psig), the amount of downtime the refinery may experience will increase. Furthermore, additional costs for lowering the vented gas to below 10,000 ppm will also occur.

Lowering the degassing from 5 psig to 4.6 psig vent pressure:

a) Determine lost revenue for additional downtime associated with this measure.

According to the U.S. Energy Information Administration, the net margin for US refineries from 1977- 2009 is about $2/bbl, on average. More recent information could not be located at this time, however, this margin should be a conservative estimate due to inflation increasing over time. See the link below for more details:

https://www.eia.gov/finance/performanceprofiles/refining_marketing.php

Table C-2, below, shows the processing capacity and operating status for all four refineries located in the SJVAPCD.

Table C-2 San Joaquin Valley Petroleum Refining Operations

Facility Name	Location	Processing Capacity (barrels/day)	Status of Refining (2019 CEC Report)
Alon Bakersfield Refining (Delek US)	Rosedale Highway, Bakersfield, CA	66,000	Non-Refining
San Joaquin Refining Company	Shell Street, Bakersfield, CA	15,000	Operational
Kern Oil & Refining Co.	Panama Lane, Bakersfield, CA	26,000	Operational
Tricor Refining, LLC	Manor Street, Bakersfield, CA	12,500	Non-Refining

SJR

For San Joaquin Refining, with a capacity of 15,000 bbl/day, the estimated net margin would be:

SJR Net Margin = $2/bbl x 15,000 lb/day capacity = $30,000
Therefore the lost profit for each day SJR operation is down is $30,000.

KOR

For Kern Oil and Refining, with a capacity of 26,000 bbl/day, the estimated net margin would be:

KOR Net Margin = $2/bbl x 26,000 lb/day capacity = $52,000
Therefore the lost profit for each day KOR operation is down is $52,000.

Alon (currently idle)

For Alon, with a capacity of 66,000 bbl/day, the estimated net margin would be:

Alon Net Margin = $2/bbl x 66,000 lb/day capacity = $132,000
Therefore the lost profit for each day Alon operation is down is $132,000.

Tricor (currently idle)

For Tricor, with a capacity of 12,500 bbl/day, the estimated net margin would be:

Tricor Net Margin = $2/bbl x 12,500 lb/day capacity = $25,000
Therefore the lost profit for each day Tricor operation is down is $25,000.

The average cost estimate for calculating cost effectiveness with respect to emission controls is a daily loss in profit for each day down is:

Average Lost Profit per Day for the 4Refineries

Average lost profit per day for 4 refineries = ($30K + $52K + $132K + $25K)/4
= **$59,750/day**

b) Determine down time for Lowering Venting Pressure from 5.0 to 4.6 psig

Kern Oil Refinery states that by observing vessels depressurizing that it estimates the total time for their 200 vessels to depressurize between 5.0 to 4.6 psig would add approximately 6 hours to their downtime. Alon, San Joaquin and Tricor refining state that they believe that no additional down time would be required.

The average time is: (0 + 6 + 0 + 0)/4 = **1.5 hours**

Therefore, the average cost (lost income) associated for lowering venting pressure from 5.0 to 4.6 psig is:

$59,750/day x 1 day/24 hours x 1.5 hours = **$3,734**

c) Determine the average cost for changing analog gauges to digital gauges and to measure 4.6 psig from the control room with recordkeeping. It is too dangerous to monitor analogue gauges while vessels are venting while standing next to the vessels. Many times analogue gauges are out of reach.

Reported cost from each refinery:

SJR

Analog gauges would need to be replaced with digital gauges at a cost of $100 each. There are about 100 vessels.
Total cost = $100*100 = **$10,000**

KOR

Analog gauges would need to be replaced with digital gauges at a cost of $100 each. There are about 200 vessels.
Total cost = $100*200 = **$20,000**

Alon Refinery

Analog gauges would need to be replaced with certified digital gauges at a cost of $295 each. There are 569 vessels.
Total cost = $295*569 = **$167,855**

Tricor

Analog gauges would need to be replaced with digital gauges at a cost of $100 each. There are about 200 vessels.
Total cost = $100*200 = **$20,000**

Average Cost for the 4 Refineries

Average cost for the 4 refineries = ($10K + $20K + $168K + $20K)/4 = **$54,464**

Limiting Effluent gas to less than 10,000 ppm (current Rule 4454 has no concentration limit):

SJR

Based on information received from SJR, the cost to implement this control option would be **$229** for staff labor and **$5,000** for one delivery truck of nitrogen.

KOR

No significant extra cost to implement: **$0**

Alon

No significant extra cost to implement: **$0**

Tricor

Tricor did not respond to inquiries to obtain the extra cost to implement this control option. However, as both SJR and Tricor are owned by the same parent company, the cost to implement this control option is assumed to be the same as for SJR, i.e. **$229** for staff labor and **$5,000** for one delivery truck of nitrogen.

Average Cost for the 4 Refineries:

Average cost for 4 refineries = ($5,229 + $0 + $0 + $5,229)/4 = **$2,615**

Total Cost for Control Option:

The total average cost per facility is presented in the table below:

	Item	Method of Calculation	COST ($)
	DIRECT CAPITAL COSTS		
A	TOTAL PURCHASED EQUIP COST (PEC)	industry survey (replace pressure gauges)	$54,464
B	FREIGHT	5% Purchased Equip. Cost (PEC)	$2,723
C	SALES TAX	8.25% PEC	$4,493
D	DIRECT INSTALLATION COSTS	25% PEC	$13,616
E	*TOTAL DIRECT CAPITAL COSTS*	*A+B+C+D*	*$75,296*
	INDIRECT CAPITAL COSTS		
F	FACILITIES	5% PEC	$2,723
G	ENGINEERING	10% PEC	$5,446
H	PROCESS CONTINGENCY	5% PEC	$2,*723*
I	*TOTAL INDIRECT CAPITAL COSTS*	*F+G+H*	*$10,893*
J	PROJECT CONTINGENCY	20% PEC	$10,893
K	***TOTAL CAPITAL COSTS (TCC)***	***E+I+J***	***$97,082***
L	*ANNUALIZED CAPITAL COSTS (10 YEARS @ 10%)*	*0.1627*K*	*$15,795*
	DIRECT ANNUAL COSTS		
	OPERATING COSTS		$0
M	OPERATOR	industry survey (for nitrogen purge)	$115
N	SUPERVISOR	15% of operator	$17
	MAINTENANCE COSTS		$0
O	LABOR	0.5 hr/shift, $25/hr	$0
P	MATERIAL	delivery of nitrogen to purge vessels	$5,000
	UTILITY COSTS		$0
Q	ELECTRICITY COSTS	Variable	$0
Q*	LOST INCOME DUE TO ADDITIONAL DOWNTIME	industry survey	$3,734
R	*TOTAL DIRECT ANNUAL COSTS*	*M+N+O+P+Q+Q**	*$8,866*

	Item	Method of Calculation	COST ($)
	INDIRECT ANNUAL COSTS		
S	OVERHEAD	60% of O&M (M+N+O+P)	$3,079
T	ADMINISTRATIVE	0.02 x PEC	$1,089
U	INSURANCE	0.01 x PEC	$545
V	PROPERTY TAX	0.01 x PEC	$545
W	CAPITAL RECOVERY	0.13 x PEC	$7,080
X	ADMINISTRATIVE	(10% int. rate, 15 yr period)	$0
Y	*TOTAL INDIRECT ANNUAL COSTS*	*S+T+U+V+W+X*	*$12,338*
TOTAL ANNUALIZED COST =		**L+R+Y**	**$31,867**

The cost effectiveness ($/ton) of implementing these controls (lowering venting pressure and lowering venting concentration), can be calculated as follows:

Cost effectiveness = $31,867/year / 0.15 ton-VOC/year
= $212,447/ton-VOC

Based on the discussions above, this control option is determined to not be cost-effective. Therefore, the District did not identify additional emission reduction opportunities at this time.

Contingency Measure Evaluation

As discussed in Chapter 6, contingency measures are immediately implemented ONLY if triggered by an unanticipated milestone or attainment failure. The District reviewed this control measure for a potential contingency component. The District concludes that this control measure is not an appropriate contingency measure because the most stringent feasible controls are already in place, and a contingency trigger is incompatible with the technologies involved in reducing emissions from this category.

Evaluation Findings

Rule 4454 meets or exceeds federal RACT requirements for this source category based upon evaluation of applicable federal regulations, state standards, and other air districts' rules. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

C.22 RULE 4455 COMPONENTS AT PETROLEUM REFINERIES, GAS LIQUIDS PROCESSING FACILITIES, AND CHEMICAL PLANTS

Emissions Inventory (Summer Average – Tons per day)

	2017	2023	2026	2029	2032	2035	2037
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VOC	0.15	0.15	0.15	0.15	0.15	0.15	0.15

District Rule 4455 Description

District Rule 4455, adopted on April 20, 2005, addresses fugitive emissions from various components at petroleum refineries and chemical plants. The main requirement of this rule is to reduce the number and severity of leaking components by regular inspection, repair, and replacement, as well as mandating violations and penalties above certain leak thresholds.

How does District Rule 4455 compare with federal and state rules and regulations?

Federal Regulations

A. Control Techniques Guidelines (CTG)

District staff conducted a comprehensive evaluation of EPA CTG requirements. EPA has not adopted updates to the following CTG since EPA found that Rule 4455 met RACT requirements through EPA's approval of the *2014 RACT SIP*. Therefore, further evaluation is not necessary at this time.

- *Control of Volatile Organic Compound Leaks from Petroleum Refinery Equipment (EPA-450/2-78-036 1978/06)*
- *Control of Volatile Organic Compound Equipment Leaks from Natural Gas/Gasoline Processing Plants (EPA EPA-450/3-83-0071983/12)*
- *Control of Volatile Organic Compound Emissions from Air Oxidation Processes in Synthetic Organic Chemical Manufacturing Industry (EPA-450/3-84-015 1984/12)*

B. Alternative Control Techniques (ACT)

District staff conducted a comprehensive evaluation of EPA ACT requirements. EPA has not adopted updates to the following ACT since EPA found that Rule 4455 met RACT requirements through EPA's approval of the *2014 RACT SIP*. Therefore, further evaluation is not necessary at this time.

- *Alternative Control Techniques Document – Control Techniques for Volatile Organic Compound Emissions from Stationary Sources (EPA-453/R-92-018 1992/12)*

C. New Source Performance Standards (NSPS)

District staff conducted a comprehensive evaluation of EPA NSPS requirements. EPA has not adopted updates to the following NSPS since EPA found that Rule 4455 met RACT requirements through EPA's approval of the *2014 RACT SIP*. Therefore, further evaluation is not necessary at this time.

- *40 CFR Part 60, Subpart GGGa - Standards of Performance for Equipment Leaks of VOC in Petroleum Refineries for Which Construction, Reconstruction, or Modification Commenced After November 7, 2006 (2008/06)*

For the following, more recently amended NSPS, District staff is providing an evaluation.

- *40 CFR Part 60, Subpart OOOO - Standards of Performance Crude Oil and Natural Gas Production, Transmission and Distribution (2016/08)*

This NSPS is applicable to oil and gas facilities for which construction, modification, or reconstruction commenced between August 23, 2011, and September 18, 2015. The NSPS imposes equipment standards on several different types of new/modified/reconstructed equipment and includes leak detection and repair requirements. Notably, NSPS subpart OOOO does not include retrofit requirements for existing, unmodified equipment.

Subpart OOOO includes design standards for some component types, e.g. pumps and compressors, and leak detection and repair requirements.

The District is currently amending Rule 4455 to include a lower minor leak threshold, more frequent LDAR inspections, and the use of new technology as instruments for leak detection, among evaluating other potential changes. The District will consider and incorporate Subpart OOOO to the extent feasible.

- *40 CFR 60 Subpart OOOOa - Standards of Performance for Crude Oil and Natural Gas Facilities for which Construction, Modification or Reconstruction Commenced After September 18, 2015 (2016/06)*

This NSPS is applicable to oil and gas facilities for which construction, modification, or reconstruction commenced between August 23, 2011, and September 18, 2015, and after September 18, 2015, respectively. The NSPS imposes equipment standards on several different types of new/modified/reconstructed equipment and imposes leak detection and repair requirements for such equipment.

The District is currently amending Rule 4455 to include a lower minor leak threshold, more frequent LDAR inspections, and the use of new technology as instruments for leak

detection among evaluating other potential changes. The District will consider and incorporate Subpart OOOOa to the extent feasible.

State Regulations

There are no state regulations applicable to this source category.

How does District Rule 4455 compare to rules in other air districts?

District staff compared emission limits, optional control requirements, and work practice standards in District Rule 4455 to comparable requirements in rules from the following California nonattainment areas:

- Bay Area AQMD Regulation 8, Rule 18 (Amended November 3, 2021)[121]
- Bay Area AQMD Regulation 8, Rule 22 (Amended June 1, 1994)[122]
- Bay Area AQMD Regulation 8, Rule 28 (Amended November 3, 2021)[123]
- Sacramento Metropolitan AQMD Rule 443 (Amended September 5, 1996)[124]
- South Coast AQMD Rule 1173 (Amended February 6, 2009)[125]
- Ventura County APCD Rule 74.7 (Amended October 10, 1995)[126]
- Ventura County APCD Rule 74.10 (Amended March 10, 1998)[127]

For the remaining above-listed rules, the District reviewed the rule requirements implemented prior to EPA's approval of the *2014 RACT SIP*, and found that Rule 4455 continues to implement RACT levels of control.

Bay Area AQMD

- BAAQMD Regulation 8, Rule 18 (Equipment Leaks)

	SJVAPCD Rule 4455	BAAQMD Reg 8, Rule 18
Applicability	Components containing or contacting VOC at petroleum refineries, gas liquids processing facilities, and chemical plants.	Limits emissions of total organic compounds from equipment leaks at refineries, chemical plants, bulk plants, and bulk terminals including, but not

[121] BAAQMD. *Regulation 8, Rule 18 (Equipment Leaks)*. (Amended November 3, 2021). Retrieved from: https://www.baaqmd.gov/~/media/dotgov/files/rules/refinery-rules-definitions/rg0818_20211103-pdf.pdf
[122] BAAQMD. *Regulation 8, Rule 22 (Valves and Flanges at Chemical Plants)*. (Amended June 1, 1994). Retrieved from: https://www.baaqmd.gov/~/media/dotgov/files/rules/reg-8-rule-22-valves-and-flanges-at-chemical-plants/documents/rg0822.pdf?la=en&rev=94fa0b57a2ee4bf6b607acaf7d3b7c22
[123] BAAQMD. *Regulation 9, Rule 28 (Episodic Releases from Pressure Relief Devices at Refineries and Chemical Plants)*. (Amended November 3, 2021). Retrieved from: https://www.baaqmd.gov/~/media/dotgov/files/rules/refinery-rules-definitions/rg0828_20211103-pdf.pdf?la=en&rev=62bfec2ecda7433d9775b1b180f51b48
[124] SMAQMD. *Rule 443 (Leaks from Synthetic Organic Chemical and Polymer Manufacturing)*. (Amended September 5, 1996). Retrieved from: http://www.airquality.org/ProgramCoordination/Documents/rule443.pdf
[125] SCAQMD. *Rule 1173 (Control of Volatile Organic Compound Leaks and Releases from Components at Petroleum Facilities and Chemical Plants)*. (Amended February 6, 2009). Retrieved from: http://www.aqmd.gov/docs/default-source/rule-book/reg-xi/rule-1173.pdf?sfvrsn=4
[126] VCAPCD. *Rule 74.7 (Fugitive Emissions of Reactive Organic compounds (ROC) at Petroleum Refineries and Chemical Plants)*. (Amended October 10, 1995). Retrieved from: http://vcapcd.org/Rulebook/Reg4/RULE%2074.7.pdf
[127] VCAPCD. *Rule 74.10 (Components at Crude Oil and Natural Gas Production and Processing Facilities)*. (Amended March 10, 1998). Retrieved from: http://www.vcapcd.org/Rulebook/Reg4/RULE%2074.10.pdf

	SJVAPCD Rule 4455	BAAQMD Reg 8, Rule 18
		limited to: valves, connectors, pumps, compressors, pressure relief devices, diaphragms, hatches, sight-glasses, fittings, sampling ports, meters, pipes, and vessels.
Exemptions	• Components subject to Rule 4623 (Storage of Organic Liquids); to components included in the inspection and maintenance (I&M) program implemented pursuant to Section 5.7 of Rule 4623; or to components subject to Rule 4401 (Steam Enhanced Crude Oil Production Well Vents) • Pressure relief devices, pumps, and compressors equipped with a closed-vent system ○ Pressure relief devices, pumps, and compressors equipped with a closed-vent system as defined in Section 3.0. ○ Components buried below ground. ○ Components exclusively handling liquid streams which have less than 10% by weight evaporation at 1500 C ○ Components exclusively handling liquid streams with a VOC content less than 10% by weight ○ Components exclusively handling gas/vapor streams with a VOC content of less than 1% by weight ○ Components incorporated in lines exclusively in vacuum service. ○ Components exclusively handling commercial natural gas. ○ One-half inch nominal or less stainless steel tube fittings which have been demonstrated to the APCO to be leak-free based on initial inspection.	• Seal systems and pressure relief devices vented to a vapor recovery or disposal system which reduces the emissions of organic compounds from the equipment by 95% or greater. • Facilities which have less than 100 valves or less than 10 pumps and compressors. Such facilities are subject to the requirements of Regulation 8, Rule 22. • Those connections at the interface between the loading rack and the loading vehicle. • Until January 1, 2018, the provisions of Sections 8-18-400 shall not apply to equipment which handle organic liquids having an initial boiling point greater than 302° F. • The provisions of Sections 8-18-401, 402 and 502 shall not apply to research and development plants which produce only non-commercial products solely for research and development purposes. • Appurtenances on storage tanks including pressure relief devices, which are subject to requirements contained in Regulation 8, Rule 5: Storage of Organic Liquids.
Requirements	• The operator shall not use any component that leaks in excess of the applicable leak standards of this rule, or found to be in violation of rule provisions. Components that have been found leaking in excess of the applicable leak standards of this rule may be used provided such	• Except for valves, pumps and compressors, connections and pressure relief devices subject to the requirements of Sections 8-18-302, 303, 304, 305 and 306, a person shall not use any equipment that leaks total organic compounds in excess of 100 ppm unless the

	SJVAPCD Rule 4455	BAAQMD Reg 8, Rule 18
	leaking components have been identified with a tag for repair, are repaired, or are awaiting re-inspection after being repaired, within the applicable time period specified in this rule. • Each hatch shall be closed at all times except during sampling or adding of process material through the hatch, or during attended repair, replacement, or maintenance operations, provided such activities are done as expeditiously as possible and with minimal spillage of material and VOC emissions to the atmosphere • Operator shall be in violation if any District inspection demonstrates that one or more of the conditions in Sections 5.1.4 exist at the facility • Except for annual operator inspection, any operator inspection that demonstrates one or more of the conditions in Section 5.1.4 exist at the facility shall not constitute a violation of this rule if the leaking components are repaired as soon as practicable but not later than the time frame specified in this rule. The determination of compliance with the provisions of Section 5.1.4 do not count these components. • Leaking components detected during operator inspection that are not repaired, replaced, or removed from operation as soon as practicable but not later than the time frame specified in this rule shall be counted toward determination of compliance with the provisions of Section 5.1.4. • Any operator inspection conducted annually for a component type that demonstrates one or more of the conditions in Section 5.1.4 exist at the facility shall constitute a violation of this rule regardless of whether or not the leaking components are repaired, replaced, or removed from operation within the allowable repair time frame specified in this rule	leak has been discovered by the operator, minimized within 24 hours and repaired within 7 days. • A person shall not use any valve that leaks total organic compounds in excess of 100 ppm unless one of the following conditions is met: ○ If the leak has been discovered by the operator, minimized within 24 hours and repaired within 7 days ○ If the APCO discovers a leak, repairs must be complete within 24 hours. ○ A person shall not use any pump or compressor that leaks total organic compounds in excess of 500 ppm unless one of the following conditions is met: ○ If the leak has been discovered by the operator, minimized within 24 hours and repaired within 7 days ○ If the APCO discovers a leak, repairs must be complete within 24 hours. • A person shall not use any pressure relief device that leaks total organic compounds in excess of 500 ppm unless the operator discovers the leak, minimized within 24 hours and repaired within 15 days; or if the APCO discovers a leak, minimized within 24 hours and repaired within 7 days. • Any essential equipment leak must be less than 10,000 ppm and mass emissions must be determined within 30 days of placing on the non-repairable list. • A notification sent to the APCO no less than 96 hours prior to conducting mass emissions measurements. • A person shall not use any equipment that leaks liquid unless • The operator discovers the leak the, minimizes within 24 hours and repaired within 7 days. • Open-ended valves or lines shall be equipped with a cap, blind flange, plug or second valve which shall seal the open end at all times

	SJVAPCD Rule 4455	BAAQMD Reg 8, Rule 18
	• A component shall be considered leaking if one or more of the following conditions exist: ○ An open-ended line or a valve located at the end of the unsealed line with a blind flange, plug, cap, or a second closed valve that does not remained closed at all times, except during attended operations requiring process fluid flow through the open-ended lines. ○ A component with a major liquid leak ○ A component with a gas leak greater than 50,000 ppmv ○ A component leak described below, and numbering in excess of the max. allowable number or percent of leaking components per inspection period ▪ A component with a minor and/or major liquid leak. ▪ A gas leak greater than 10,000 ppmv up to 50,000ppmv. • Other inspection and re-inspection requirements	except during operations requiring process fluid flow through the open-ended valve or line. ○ Upon installation of a double block and bleed system, the operation of the second valve manner such that the process fluid end of the valve remains closed before the second valve is closed. ○ When a double block and bleed system is in use, the bleed valve or line may remain open during operations that require venting the line between the block valves. ○ When a double block and bleed system is not in use, the open end of the second valve shall not leak greater than 100 ppm. ○ If a valve, pump, compressor or pressure relief device (PRD) is found leaking more than 3 consecutive quarters, the inspection frequency shall change from quarterly to monthly ○ A person shall not use any equipment that emits total organic compounds in excess of five pounds per day except during any repair periods

Leaks Allowed Per Inspection Period

Component	SJVAPCD Rule 4409		BAAQMD Reg 8 Rule 18	
	Max. No. of Leaks for 200 or less components inspected	Max. No. of Leaks for >200 components inspected	Max. No. of Leaks for 200 or less components inspected	Max. No. of Leaks for >200 components inspected
Valves	1	0.5%	No direct comparison of component leak allowance	
Pumps	2	1%		
Compressors	1	1 Leak		
Atmospheric PRDs	1	1 Leak		
Threaded Connections	1	0.5%		
Connectors	1	0.05%		
Other Components	1	1 Leak		

Leak Source	Leaks Threshold			
	SJVAPCD Rule 4455		BAAQMD Reg 8 Rule 18	
	Minor Gas Leak		Liq Leak	Gas Leak
	Liq. Service	Gas Service		
Valves	3 drops/min	400ppmv	3 drops/min	100ppmv
Threaded Connections	3 drops/min	400ppmv	3 drops/min	100ppmv
Flanges	3 drops/min	400ppmv	3 drops/min	100ppmv
Pumps	3 drops/min	1,000ppmv	3 drops/min	500ppmv
Compressors	3 drops/min	1,000ppmv	3 drops/min	500ppmv
PRD	3 drops/min	200ppmv	3 drops/min	500ppmv
Other Components	3 drops/min	1,000ppmv	3 drops/min	500ppmv

BAAQMD Regulation 8, Rule 18 applies to more source categories than those covered by District Rule 4455. Rule 4623 (Organic Liquid Storage), and Rule 4624 (Transfer of Organic Liquid) apply to the same source categories as BAAQMD Regulation 8, Rule 18. As such, the requirements of Rule 4455 are not directly comparable to BAAQMD Regulation 8, Rule 18 for specific categories of sources. BAAQMD has lower leak repair thresholds for some categories while the District has lower thresholds for pressure relief devices (PRDs). However, BAAQMD has no requirement to replace/control components that have repeated leaks at high levels. The District's current Rule 4455 meets RACT requirements. The District is also in the process of amending Rule 4455, which will further strengthen rule requirements.

Bay Area AQMD

- BAAQMD Regulation 8, Rule 28 (Episodic Releases from Pressure Relief Devices at Refineries and Chemical Plants)

	SJVAPCD Rule 4455	BAAQMD Reg 8, Rule 28
Applicability	Components containing or contacting VOC at petroleum refineries, gas liquids processing facilities, and chemical plants.	Prevents the episodic emissions of organic compounds from pressure relief devices on equipment handling gaseous organic compounds at refineries, and to collect information on episodic organic and inorganic compound emissions from pressure relief devices at refineries and chemical plants.
Exemptions	• Components subject to Rule 4623 (Storage of Organic Liquids) • Pressure relief devices, pumps, and compressors equipped with a closed-vent system • Components exclusively handling liquid streams which have less than 10% by weight evaporation at 150°C	• PRDs on storage tanks • Thermal relief valves that are vented to process drains or back to a pipeline • PRDs that exclusively handle organic compounds exhibiting a 10% evaporation point greater than 150°C. • Research or development facilities that produce only non-commercial

	SJVAPCD Rule 4455	BAAQMD Reg 8, Rule 28
	• Components exclusively handling liquid streams with a VOC content less than 10% by weight • Components exclusively handling gas/vapor streams with a VOC content of less than 1% by weight • Components incorporated in lines exclusively in vacuum service. • Components exclusively handling commercial natural gas.	products for research and development purposes • Refineries processing less than 20,000 barrels per stream day of crude.
Requirements	• The operator shall not use any component that leaks in excess of the applicable leak standards, or found to be in violation of rule provisions. • The operator shall audio-visually inspect for leaks all accessible PRDs in service at least once every 24 hours, except when operators do not report to the facility for that given 24 hour. • The operator shall monitor process PRD by using electronic process control instrumentation that allows for real time continuous parameter monitoring or by using telltale indicators for the process PRD where parameter monitoring is not feasible • The operator shall also check for leaks quarterly using a hydrocarbon detector utilizing EPA Method 21. • The operator shall notify the APCO of any process PRD release in excess of 100 pounds of VOC. • The operator of a refinery processing greater than 20,000 barrels of crude oil per day shall connect all process PRD serving that process equipment to an APCO-approved closed vent system after a second release from any process PRD serving the same piece or pieces of equipment and each release is in excess of 500 pounds of VOC in a continuous 24-hour period and provided the second release occurs within any five year period of the first release. • The operator shall initially inspect a process PRD that releases to the atmosphere as soon as practicable but not later than 24 hours after the time of the release using EPA	• Existing source PRD must be vented to a vapor recovery or disposal system with at least a 95% by weight organic compounds control efficiency. ○ or implement Process Safety Requirements for PRDs that vent to the atmosphere (these requirements attempt to prevent releases to atmosphere) • Visually monitor telltale indicators of PRD every 24 hours or receive permission to use an automatic monitoring system. • Facility must report any release of more than 10 pounds of emissions as a Release Event from the PRD • Within one year of the second Release Event from a pressure relief device in organic compound service on the same source, including those in parallel service, the facility shall vent all the pressure relief devices that vent the second Release Event, including those in parallel service, to a vapor recovery or disposal system with at least 95 percent by weight organic compounds control efficiency, and the control system shall be properly sized per manufacturer's recommendations to handle the material from all devices it is intended to serve. • Reinspect within five days of a Release Event

	SJVAPCD Rule 4455	BAAQMD Reg 8, Rule 28
	Method 21. For any PRD that has incurred five repair actions for leaks within a continuous 12-month period, the operator shall: • Replace the PRD and install rupture disc upstream, or • Replace with BACT approved equipment, or • Vent to an approved closed vent system, or • Remove the PRD from operation.	

Bay Area AQMD Regulation 8, Rule 28 applies only to PRDs at chemical plants and refineries, whereas Rule 4455 applies to all components. SJVAPCD contains lower leak repair thresholds and required electronic process control instrumentation monitoring of process PRDs. The District evaluated the requirements contained within BAAQMD Regulation 8, Rule 28, and determined that it is at least as equivalent to the requirements in Rule 4455.

Potential Emission Reduction Opportunities

The District is currently amending Rule 4455 to include a lower minor leak threshold, more frequent LDAR inspections, and the use of new technology as instruments for leak detection among evaluating other potential changes.

Contingency Measure Evaluation

As discussed in Chapter 6, contingency measures are immediately implemented ONLY if triggered by an unanticipated milestone or attainment failure. The District reviewed this control measure for a potential contingency component. The District concludes that this control measure is not an appropriate contingency measure because the contingency trigger is incompatible with the technologies involved in reducing emissions from this category.

Evaluation Findings

The District commits to amend Rule 4455 no later than 2024 to include lower leak thresholds, more frequent LDAR inspections, and the use of new technology as instruments for leak detection, among evaluating other potential changes. Once amended, District Rule 4455 will continue to meet or exceed federal RACT requirements for this source category.

C.23 RULE 4565 BIOSOLIDS, ANIMAL MANURE, AND POULTRY LITTER OPERATIONS

Emissions Inventory (Summer Average – Tons per day)

	2017	2023	2026	2029	2032	2035	2037
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VOC	21.50	22.01	22.98	23.77	24.87	26.03	26.86

This emission inventory table includes emissions for sources subject to this rule and Rule 4566 (Organic Material Composting Operations).

District Rule 4565 Description

The District adopted District Rule 4565 on March 15, 2007 to limit VOC emissions from facilities whose throughput consists entirely or in part of biosolids, animal manure, or poultry litter and the operator who landfills, land applies, composts, or co-composts these materials. Sewage treatment plants or other wastewater treatment facilities are not subject to this rule unless the operator landfills, land applies, composts, or co-composts the treated material (biosolids) on site.

How does District Rule 4565 compare with federal and state rules and regulations?

Federal Regulations

There are no Control Techniques Guidelines, Alternative Control Techniques, or New Source Performance Standards applicable to this source category.

State Regulations

There are no state regulations applicable to this source category.

How does District Rule 4565 compare to rules in other air districts?

District staff compared emission limits, optional control requirements, and work practice standards in District Rule 4565 to comparable requirements in rules from the following California nonattainment areas:

- South Coast AQMD Rule 1133.2 (Adopted January 10, 2003)[128]

Bay Area AQMD, Sacramento Metropolitan AQMD, and Ventura County APCD do not have analogous rules for this source category. For the remaining above-listed rule, the

[128] SCAQMD. *Rule 1133.2 (Emission Reductions from Co-Composting Operations).* (Adopted January 10, 2003). Retrieved from: http://www.aqmd.gov/docs/default-source/rule-book/reg-xi/rule-1133-2.pdf?sfvrsn=4

District reviewed the rule requirements implemented prior to EPA's approval of the *2014 RACT SIP* and found that Rule 4565 continues to implement RACT levels of control.

Potential Emission Reduction Opportunities

As demonstrated above, Rule 4565 currently has measures in place that clearly meet all RACT requirements and are at least as stringent as analogous rules adopted by other air district rules within California. No additional emission reduction opportunities have been identified at this time.

Contingency Measure Evaluation

As discussed in Chapter 6, contingency measures are immediately implemented ONLY if triggered by an unanticipated milestone or attainment failure. The District reviewed this control measure for a potential contingency component. The District concludes that this control measure is not an appropriate contingency measure because the most stringent feasible controls are already in place, and a contingency trigger is incompatible with the technologies involved in reducing emissions from this category.

Evaluation Findings

Rule 4565 meets or exceeds federal RACT requirements for this source category based upon evaluation of applicable federal regulations, state standards, and other air districts' rules. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

C.24 RULE 4566 ORGANIC MATERIAL COMPOSTING OPERATIONS

Emissions Inventory (Summer Average – Tons per day)

	2017	2023	2026	2029	2032	2035	2037
NOx	n/a	n/a	n/a	n/a	n/a	n/a	n/a
VOC	n/a	n/a	n/a	n/a	n/a	n/a	n/a

The emissions from this source category are included in the emission inventory table for Rule 4565 (Biosolids, Animal Manure, and Poultry Litter Operations).

District Rule 4566 Description

The District adopted District Rule 4566 on August 18, 2011, to limit VOC emissions from composting facilities whose feedstock consists of greenwaste and/or foodwaste. District Rule 4566 applies to operations that stockpile and compost greenwaste and foodwaste.

How does District Rule 4566 compare with federal and state rules and regulations?

Federal Regulations

There are no Control Techniques Guidelines, Alternative Control Techniques, or New Source Performance Standards applicable to this source category.

State Regulations

There are no state regulations applicable to this source category.

How does District Rule 4566 compare to rules in other air districts?

District staff compared emission limits, optional control requirements, and work practice standards in District Rule 4566 to comparable requirements in rules from the following California nonattainment areas:

- South Coast AQMD Rule 1133.3 (Adopted July 8, 2011)[129]

Bay Area AQMD, Sacramento Metropolitan AQMD, and Ventura County APCD do not have analogous rules for this source category.

[129] SCAQMD. *Rule 1133.3 (Emission Reductions from Greenwaste Composting Operations).* (Adopted July 8, 2011). Retrieved from: http://www.aqmd.gov/docs/default-source/rule-book/reg-xi/rule-1133-3.pdf?sfvrsn=4.

South Coast AQMD

- SCAQMD Rule 1133.3 (Emission Reductions from Greenwaste Composting Operations)

	SJVAPCD Rule 4566	SCAQMD Rule 1133.3
Applicability	All composting facilities that compost and/or stockpile organic material.	All operators of greenwaste composting operations producing compost using greenwaste, foodwaste, or manure.
Exemptions	• Stockpiles for composting that are subject to Rule 4565. • Facilities only composting wood material, finished compost, overs, and organic material for uses outside of compost. • Agriculture, community, household, nursery, and recreational composting facilities. • Facilities that stockpile organic material but are not considered a composting facility. • Operations/facilities subject or exempt from Rules 4204, 4550, and 4570.	• Co-composting operations subject to Rule 1133.2. • Greenwaste composting operations are exempt if an appropriate emission control device meeting all control requirements is installed. • Community, nursery, backyard, and recreation facility composting facilities are exempt given the operation is not subject to the Local Enforcement Agency Notification or Permit regulations pursuant to Title 14 Division 7, Chapter 3.1, Section 17857.1 of the California Code of Regulations
Requirements	<u>Stockpile Requirements</u> If the facility annual throughput is less than 100,000 wet tons/year, the operator shall implement one of the following within three days of receipt of the organic material. • Remove organic material from the facility. • Start the active phase of composting. • Cover organic material with a securely attached waterproof cover that has at least six feet overlap of adjacent sheets. • Implement an APCO approved alternative mitigation measure. If the facility annual throughput is less than 100,000 wet tons/year, the operator shall implement one of the following within three days of receipt of the organic material. • Remove organic material from the facility. • Start the active phase of composting. • Cover organic material with a securely attached waterproof cover that has at least six feet overlap of adjacent sheets.	Facilities composting greenwaste only, greenwaste with up to 20% manure, or greenwaste with less than 5,000 tons/year of foodwaste. • Cover each active phase pile with screened or unscreened finished compost within 24 hours of initial pile formation such that the top is at least 6” thick and the pile shall not be turned for the first 7 days of the active phase of composting • For the first 15 days after initial pile formation for the active phase period of composting, within 6 hours before turning, apply water as necessary to the surface area of each active phase pile such that the top one half of the pile is wet at a depth of at least 3”. Alternatively, the operator may apply water during turning using a windrow turner which is equipped with water spraying technology during the entire windrow turning process • The operator may implement an alternative mitigation measure that will reduce VOC emissions by 40%, by weight, and NH3 emissions by 20%, by weight.

	SJVAPCD Rule 4566	SCAQMD Rule 1133.3
	• Implement an APCO approved alternative mitigation measure. <u>Composting Requirements</u> Annual throughput is less than 200,000 wet-tons/year. • Implement at least three turns during the active phase and one mitigation measure for the Watering System. • Implement a single mitigation measure that demonstrates at least 19% VOC reduction. Annual Throughput 200,000 ≤ wet-ton/year < 750,000. • Implement at least three turns during the active phase • One mitigation measures for Water Systems and the Finished Compost Cover mitigation measure • Implement a mitigation measure that demonstrates at least 60% VOC reduction. Annual Throughput ≥ 750,000 wet-ton/year. • Implement a mitigation measure that demonstrates at least 80% VOC reduction by weight. <u>Recordkeeping:</u> • Operations must submit a Facility Mitigation Plan to incorporate approved mitigation measures from the facility. • Operations selecting alternative mitigation measures must submit an Alternative Mitigation Measures Compliance Plan. • Operators of exempt organic materials shall complete quarterly records. • Daily recordkeeping requirements for throughput, stockpiles, and composting operations logs.	Greenwaste with greater than 5,000 tons/year of foodwaste. • Any active phase of composting containing more than 10% food waste, by weight, shall be conducted using an emission control device designed and operated with an overall system control efficiency of at least 80%, by weight, for VOC and NH3 emissions • The operator may implement an alternative mitigation measure that will reduce VOC and NH3 emissions of at least 80%, by weight. Records shall be maintained for the prior five years of operation.

Rule 4566 requires nearly identical management practices and control requirements as Rule 1133.3; however, the throughput levels at which the stricter control requirements in Rule 4566 become triggered are higher than in Rule 1133.3. The throughput and control levels in Rule 4566 are based on cost-effectiveness evaluations and socioeconomic studies conducted by the District as part its Final Staff Report for the

Revised Proposed Rule 4566 (Appendices C and D, August 18, 2011).[130] While Rule 1133.3 appears to be more stringent than Rule 4566, SCAQMD Rule 1133.3 only applies to facilities that compost green waste. SJVAPCD Rule 4566 applies to all types of composting facilities, which have far greater throughput than facilities limited to only processing green waste.

In addition to rule requirements, District Rule 4566 contains more stringent recordkeeping requirements and requires operations to submit Facility Mitigation Plans or Alternative Mitigation Measures Compliance Plans. Based on the rule comparison above, District Rule 4566 is at least as stringent as SCAQMD Rule 1133.3.

Potential Emission Reduction Opportunities

As demonstrated above, District Rule 4566 has in place the most stringent measures feasible to implement in the Valley. Therefore, the District did not identify additional emission reduction opportunities at this time.

Contingency Measure Evaluation

As discussed in Chapter 6, contingency measures are immediately implemented ONLY if triggered by an unanticipated milestone or attainment failure. The District reviewed this control measure for a potential contingency component. The District concludes that this control measure is not an appropriate contingency measure because the most stringent feasible controls are already in place, and a contingency trigger is incompatible with the technologies involved in reducing emissions from this category.

Evaluation Findings

Rule 4566 meets or exceeds federal RACT requirements for this source category based upon evaluation of applicable federal regulations, state standards, and other air districts' rules. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

[130] SJVAPCD. *Final Draft Staff Report Proposed New Rule 4566 (Organic Material Composting Operations).* (August 18, 2011). Retrieved from: http://www.valleyair.org/workshops/postings/2011/6-23-11-rule4566/5%20Appendix%20C.pdf

C.25 RULE 4570 CONFINED ANIMAL FACILITIES

Emissions Inventory (Summer Average – Tons per day)

	2017	2023	2026	2029	2032	2035	2037
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VOC	93.79	93.57	93.49	93.44	93.40	93.37	93.35

District Rule 4570 Description

Rule 4570, last amended on October 21, 2010, limits VOC emissions from Confined Animal Facilities (CAF). The District defines CAF as facilities where operations corral, pen, or otherwise restrict their animals to areas for commercial purposes and feed the animals by a means other than grazing for at least forty-five (45) days in any twelve (12) month period.

Types of Confined Animal Facilities

Confined Animal Facilities are used for the raising of animals including, but not limited to, cattle, calves, chickens, ducks, goats, horses, sheep, swine, rabbits, and turkeys, which are corralled, penned, or otherwise caused to remain in restricted areas for commercial agricultural purposes and fed by a means other than grazing. (CH&SC §39011.5 (a)(1)). The major categories of Confined Animal Facilities are listed below.

- Dairy Operations - Dairy operations are those operations producing milk or animals for facilities that produce milk.
- Poultry Operations - Poultry facilities operate either as layer ranches for egg production or as broiler ranches where birds are grown for the fresh meat market.
- Beef Cattle Feeding Operations – Beef cattle facilities are facilities that raise beef cattle (heifers and steers) for their meat.
- Swine Operations – These operations raise pigs for their meat. The production cycle for hogs has three (3) phases: farrowing (giving birth), nursing, and finishing.

Rule 4570 Applicability Thresholds

This rule is applicable to the following CAF operations:

Table C-3 Confined Animal Facilities Applicability Thresholds

Livestock Category	Regulatory Threshold
Dairy	500 milking cows
Beef Feedlots	3,500 beef cattle
Other Cattle Facility	7,500 calves, heifers, or other cattle

Livestock Category	Regulatory Threshold
Poultry Facilities	
Chicken	400,000 head
Duck	400,000 head
Turkey	100,000 head
Swine Facility	3,000 head
Horses Facility	3,000 head
Sheep and Goat Facilities	15,000 head of sheep, goats, or any combination of the two
Any livestock facility not listed above	30,000 head

Emission Control Requirements of District Rule 4570

District Rule 4570 requires multiple mitigation measures from the following CAF categories: Dairy, Beef Feedlots, Other Cattle Facilities, Swine Facilities, Poultry facilities, and various other smaller operations. Each of these facilities consists of multiple sources of emissions within the facility. Since these facilities generally cover a large area and have different processes, a single mitigation measure or technology is generally not sufficient to control overall emissions from the facility. Mitigation measures required by Rule 4570 have been tailored for each source of emissions, thereby ensuring that the overall emissions from a facility are reduced. The current methodology in Rule 4570 allows for the greatest overall control from the entire facility.

District Rule 4570 recognized the following five emission sources for all of the CAFs: Feed, Housing, Solid Waste, Liquid Waste, and Land Application of Manure. Rule 4570 requires each CAF to implement a certain number of mitigation measures for each of these sources. District Rule 4570 also distinguishes between the different types of housing configurations (freestall vs open corrals) for cattle and, as such, requires specific mitigation measures for each type of housing. By requiring mitigation measure(s) for each source of emissions at a facility, District Rule 4570 ensures that reductions are achieved throughout the facility.

How does District Rule 4570 compare with federal and state rules and regulations?

Federal Regulations

There are no Control Techniques Guidelines, Alternative Control Techniques, or New Source Performance Standards applicable to this source category.

State Regulations

There are no state regulations applicable to this source category.

How does District Rule 4570 compare to rules in other air districts?

District staff compared emission limits, optional control requirements, and work practice standards in District Rule 4570 to comparable requirements in rules from the following California nonattainment areas:

- Bay Area AQMD Regulation 2, Rule 10 (Adopted July 19, 2006)[131]
- Imperial County APCD Rule 217 and Policy Number 38 (Amended February 9, 2016)[132]
- Sacramento Metropolitan AQMD Rule 496 (Adopted August 24, 2006)[133]
- South Coast AQMD Rule 223 (Adopted June 2, 2006)[134]
- South Coast AQMD Rule 1127 (Adopted August 6, 2004)[135]
- Ventura County APCD Rule 23 (Amended November 12, 2013)[136]

Notably, only District Rule 4570, SMAQMD Rule 496, and SCAQMD Rule 1127 are prohibitory rules. For this reason, these rules include detailed recordkeeping as well as monitoring and testing requirements. Generally, the level of detail in a prohibitory rule is absent from permits rules because the purpose of a permit rule is different from the purpose of a prohibitory rule.

The District reviewed the rule requirements implemented prior to EPA's approval of the *2014 RACT SIP*, and found that Rule 4570 continues to implement RACT levels of control. The below comparison tables demonstrate that, for more recently amended rules, District Rule 4570 continues to meet RACT.

[131] BAAQMD. *Regulation 2, Rule 10 (Large Confined Animal Facilities)*. (Amended July 19, 2006). Retrieved from: https://www.baaqmd.gov/~/media/dotgov/files/rules/reg-2-rule-10-large-confined-animal-facilities/documents/rg0210.pdf?la=en&rev=7094359f029c4216b98e03d524ff0d2c.
[132] ICAPCD. *Rule 217 (Large Confined Animal Facilities (LCAF) Permits Required)*. (Amended February 9, 2016). Retrieved from: https://apcd.imperialcounty.org/wp-content/uploads/2020/01/1RULE217.pdf
[133] SMAQMD. *Rule 496 (Large Confined Animal Facilities)*. (Adopted August 24, 2006). Retrieved from: http://www.airquality.org/ProgramCoordination/Documents/rule496.pdf.
[134] SCAQMD. *Rule 223 (Emission Reduction Permits for Large Confined Animal Facilities)*. (Adopted June 2, 2006). Retrieved from: http://www.aqmd.gov/docs/default-source/rule-book/reg-ii/rule-223.pdf?sfvrsn=4.
[135] SCAQMD. *Rule 1127 (Emission Reductions from Livestock Waste)*. (Adopted August 6, 2004). Retrieved from: http://www.aqmd.gov/docs/default-source/rule-book/reg-xi/rule-1127.pdf
[136] VCAPCD. *Rule 23 (Exemptions from Permit)*. (Amended November 12, 2013). Retrieved from: http://www.vcapcd.org/Rulebook/Reg2/RULE%2023.pdf.

Imperial County APCD

- ICAPCD Rule 217 (Large Confined Animal Facilities Permits Required)

	SJVAPCD Rule 4570	ICAPCD Rule 217
Applicability	Large CAFs and other Confined Animal Facilities with the following numbers of animals: • Dairy: 500 Milk Cows • Beef Feedlots: 3,500 Beef Cattle • Other Cattle: 7,500 cattle • Chickens: 400,000 birds • Ducks: 400,000 birds • Turkeys: 100,000 birds • Swine: 3,000 head • Horses: 3,000 head • Sheep and Goats: 15,000 head • Other: 30,000 head	Large CAFs and other Confined Animal Facilities with the following numbers of animals: • Dairy: 500 Milk Cows • Beef Feedlots: 3,500 Beef Cattle • Other Cattle: 3,500 cattle • Chickens: 400,000 birds • Ducks: 400,000 birds • Turkeys: 100,000 birds • Swine: 3,000 head • Horses: 2,500 head • Sheep and Goats: 15,000 head • Other: 30,000 head

Requirements for Dairy CAFs		
	SJVAPCD Rule 4570	**ICAPCD Rule 217**
Feed Mitigation Measures	Operators must implement four mandatory feed mitigation measures (excluding silage) and chose one other option from a list of three, for a total of five feed mitigation measures	Operators must implement four mandatory feed mitigation measures (excluding silage) and chose one other option from a list of three, for a total of five feed mitigation measures
Milk Parlor Mitigation Measures	Flush or hose milking parlor immediately prior to, immediately after, or during each milking.	Flush or hose milking parlor immediately prior to, immediately after, or during each milking.
Freestall Mitigation Measures	Operators must implement a total of three mitigation measures - two mandatory mitigation measures and choose one additional measure from three possible options	Operators must implement a total of three mitigation measures - two mandatory mitigation measures and choose one additional measure from three possible options
Corral Mitigation Measures	Operators must implement a total of seven mitigation measures – six mandatory mitigation measures and choose one additional measure from three possible options	Operators must implement a total of seven mitigation measures – six mandatory mitigation measures and choose one additional measure from three possible options
Solid Manure and Separated Solids Mitigation Measures	Operators must choose to implement at least one mitigation measure from two possible options	Operators must choose to implement at least one mitigation measure from two possible options
Liquid Manure Mitigation Measures	Operators must choose to implement at least one mitigation measure from four possible options	Operators must choose to implement at least one mitigation measure from four possible options

Requirements for Dairy CAFs		
	SJVAPCD Rule 4570	**ICAPCD Rule 217**
Manure Land Application Mitigation Measures	Operators must choose to implement one mitigation measure for solid manure land application and one mitigation measure for liquid manure land application measures from six possible options	Operators must choose to implement one mitigation measure for solid manure land application and one mitigation measure for liquid manure land application measures from six possible options

Requirements for Beef CAFs		
	SJVAPCD Rule 4570	**ICAPCD Rule 217**
Feed Mitigation Measures	Operators must implement two feed mitigation measures from four possible options	Operators must implement two feed mitigation measures from four possible options
Housing Mitigation Measures	Operators must implement a total of five mitigation measures - four mandatory mitigation measures and choose one additional measure from two possible options	Operators must implement a total of five mitigation measures - four mandatory mitigation measures and choose one additional measure from two possible options
Solid Manure and Separated Solids Mitigation Measures	Operators must choose to implement at least one mitigation measure from two possible options	Operators must choose to implement at least one mitigation measure from two possible options
Liquid Manure Mitigation Measures	Operators must choose to implement at least one mitigation measure from four possible options	Operators must choose to implement at least one mitigation measure from four possible options
Manure Land Application Mitigation Measures	Operators must choose to implement one mitigation measure for solid manure land application and one mitigation measure for liquid manure land application measures from six possible options	Operators must choose to implement one mitigation measure for solid manure land application and one mitigation measure for liquid manure land application measures from six possible options

Requirements for Other Cattle CAFs		
	SJVAPCD Rule 4570	**ICAPCD Rule 217**
Feed Mitigation Measures	Operators must implement two feed mitigation measures from four possible options	Operators must implement two feed mitigation measures from four possible options
Freestall Mitigation Measures	Operators must implement a total of three mitigation measures - two mandatory mitigation measures and choose one additional measure from two possible options	Operators must implement a total of three mitigation measures - two mandatory mitigation measures and choose one additional measure from two possible options
Corral Mitigation Measures	Operators must implement a total of six mitigation measures – five mandatory mitigation measures and choose one additional measure from three possible options	Operators must implement a total of six mitigation measures – five mandatory mitigation measures and choose one additional measure from three possible options
Solid Manure and Separated Solids Mitigation Measures	Operators must choose to implement at least one mitigation measure from two possible options	Operators must choose to implement at least one mitigation measure from two possible options

Requirements for Other Cattle CAFs		
	SJVAPCD Rule 4570	**ICAPCD Rule 217**
Liquid Manure Mitigation Measures	Operators must choose to implement at least one mitigation measure from four possible options	Operators must choose to implement at least one mitigation measure from four possible options
Manure Land Application Mitigation Measures	Operators must choose to implement one mitigation measure for solid manure land application and one mitigation measure for liquid manure land application measures from six possible options	Operators must choose to implement one mitigation measure for solid manure land application and one mitigation measure for liquid manure land application measures from six possible options

Requirements for Swine CAFs		
	SJVAPCD Rule 4570	**ICAPCD Rule 217**
Feed Mitigation Measures	Operators must implement two feed mitigation measures	Operators must implement two feed mitigation measures
Housing Mitigation Measures	Operators must implement three housing mitigation measures	Operators must implement three housing mitigation measures
Liquid Manure Mitigation Measures	Operators must implement one liquid manure mitigation measures	Operators must implement one liquid manure mitigation measures
Manure Land Application Mitigation Measures	Operators must choose to implement one mitigation measure for manure land application	Operators must choose to implement one mitigation measure for manure land application

Requirements for Poultry CAFs		
	SJVAPCD Rule 4570	**ICAPCD Rule 217**
Feed Operations	Operators must choose to implement one feed mitigation measure from four possible options	Operators must choose to implement one feed mitigation measure from four possible options
Poultry Housing	Operators are required to implement two mitigation measures for layers, four mitigation measures for broilers or ducks, and five mitigation measures for turkeys	Operators are required to implement two mitigation measures for layers, four mitigation measures for broilers or ducks, and five mitigation measures for turkeys
Solid Manure or Separated Solids	Operators must choose to implement one mitigation measure	Operators must choose to implement one mitigation measure
Liquid Manure	Operators that handle manure in liquid form must choose to implement one mitigation measure	Operators that handle manure in liquid form must choose to implement one mitigation measure

Suspension and Substitution of Mitigation Measures		
	SJVAPCD Rule 4570	**ICAPCD Rule 217**
Requirements	Allows temporary suspension of a mitigation measure upon the determination by a certified veterinarian or nutritionist that such a suspension is necessary for animal health purposes. The District must be notified within 48 hours, and a new measure must be implemented if the suspension is expected to last longer than 30 days. Allows for substitution of one mitigation measure with an equivalent or more stringent measure	Allows temporary suspension of a mitigation measure upon the determination by a certified veterinarian or nutritionist that such a suspension is necessary for animal health purposes. The District must be notified within 48 hours, and a new measure must be implemented if the suspension is expected to last longer than 30 days. Allows for substitution of one mitigation measure with an equivalent or more stringent measure

ICAPCD Rule 217 was originally adopted on October 10, 2006, but was recently amended on February 9, 2016. The amendments were intended to address deficiencies that EPA and CARB identified in the rule as originally adopted and resulted in requirements that were essentially identical to District Rule 4570, which had already been approved for inclusion in the SIP. District Rule 4570 and ICAPCD Rule 217 contain fundamentally identical requirements and therefore are of equal stringency.

Potential Emission Reduction Opportunities

As demonstrated above, Rule 4570 currently has in place the most stringent measures feasible to implement in the Valley. Therefore, the District did not identify additional emission reduction opportunities at this time.

Contingency Measure Evaluation

As discussed in Chapter 6, contingency measures are immediately implemented ONLY if triggered by an unanticipated milestone or attainment failure. The District reviewed this control measure for a potential contingency component. The District concludes that this control measure is not an appropriate contingency measure because the most stringent feasible controls are already in place, and a contingency trigger is incompatible with the measures involved in reducing emissions from this category.

Evaluation Findings

Rule 4570 meets or exceeds federal RACT requirements for this source category based upon evaluation of applicable federal regulations, state standards, and other air districts' rules. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

C.26 RULE 4601 ARCHITECTURAL COATINGS

Emissions Inventory (Summer Average – Tons per day)

	2017	2023	2026	2029	2032	2035	2037
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VOC	3.94	4.11	4.22	4.36	4.49	4.61	4.68

District Rule 4601 Description

The District adopted District Rule 4601 on April 11, 1991, and subsequently amended it six times. This rule reduces VOC emissions from sources subject to this rule by establishing VOC content limits for architectural coatings. Rule 4601 is applicable to any person who supplies, sells, offers for sale, applies, or solicits the application of any architectural coating, or who manufactures, blends, or repackages any architectural coating for use within the District. The purpose of this rule is to limit VOC emissions from these sources. District Rule 4601 specifies VOC coating limits from CARB's 2019 SCM. The SJVAPCD was the first air district in California to adopt the provisions of the 2019 SCM.

Cost Effectiveness

As part of the April 2020 amendments to Rule 4601, the District reviewed cost effectiveness analyses conducted by CARB during the development of the 2019 SCM. Overall, CARB estimated that the SCM cost-effectiveness ranges from a net savings, to a cost of $19.93 per pound of VOC reduced. When weighted by sales, this results in an overall cost-effectiveness of $1.85 per pound of VOC reduced in 2019 dollars (approximately $3,700 per ton VOC).

How does District Rule 4601 compare with federal and state rules and regulations?

Federal Regulations

There are no Control Technique Guidelines, Alternative Control Techniques, or New Source Performance Standards applicable to this source category.

State Regulations

- *CARB SCM for Architectural Coatings 2019*

The table below identifies the requirements of the SCM:

Table C-4 Comparison between CARB's Suggested Control Measure for Architectural Coatings and SJVAPCD Rule 4601

Rule Comparisons g-VOC/L (lb-VOC/gal)		
Coating Category	**SJVAPCD (Rule 4601)**	**SCM**
Bond Breakers	350	350
Building Envelope Coating	50	50
Concrete Curing Compounds	350	350
Driveway Sealers	50	50
Dry Fog Coatings	50	50
Faux Finishing Coatings	350	350
Fire Resistive Coatings	150	150
Flat Coatings	50	50
Floor Coatings	50	50
Form-Release Compounds	100	100
Graphic Arts Coatings (Sign Paints)	500	500
Industrial Maintenance Coatings	250	250
High Temperature Coatings	420	420
Zinc-Rich Primers	340	340
Low Solids Coatings	120	120
Magnesite Cement Coatings	450	450
Mastic Texture Coatings	100	100
Metallic Pigmented Coatings	500	500
Multi-Color Coatings	250	250
Nonflat Coatings	50	50
Pre-Treatment Wash Primers	420	420
Primers, Sealers, and Undercoaters	100	100
Reactive Penetrating Sealers	350	350
Recycled Coatings	150	150
Roof Coatings	50	50
Roof Coatings, Aluminum	100	100
Roof Primers, Bituminous	350	350
Rust Preventative Coatings	100	100
Sacrificial Anti-Graffiti Coatings	50	50
Shellac	730/550	730/550

Rule Comparisons g-VOC/L (lb-VOC/gal)		
Coating Category	**SJVAPCD (Rule 4601)**	**SCM**
Clear	730	730
Pigmented	550	550
Specialty Primers	100	100
Stains	100	100
Stains, Interior	250	250
Stone Consolidants	450	450
Swimming Pool Coatings	340	340
Repair	340	340
Other	340	340
Tile and Stone Sealers	100	100
Traffic Coatings	100	100
Waterproofing Sealers	100	100

As shown in the table above, the SCM does not contain any requirements more stringent than District Rule 4601.

How does District Rule 4601 compare to rules in other air districts?

District staff compared emission limits, optional control requirements, and work practice standards in District Rule 4601 to comparable requirements in rules from the following California nonattainment areas:

- Bay Area AQMD Regulation 8, Rule 3 (Amended July 1, 2009)[137]
- El Dorado County AQMD Rule 215 (Amended August 25, 2020)[138]
- Mojave Desert AQMD Rule 1113 (Amended October 10, 2020)[139]
- Monterey Bay ARD Rule 426 (Amended September 16, 2020)[140]
- Sacramento Metropolitan AQMD Rule 442 (Amended September 24, 2015)[141]
- San Diego County APCD Rule 67.01 (Amended February 10, 2021)[142]

[137] BAAQMD. *Regulation 8, Rule 3 (Architectural Coatings).* (Amended July 1, 2009). Retrieved from: https://www.baaqmd.gov/~/media/dotgov/files/rules/reg-8-rule-3-architectural-coatings/documents/rg0803_0709.pdf?la=en&rev=f865de8d8a194eaf96970b766689468a
[138] EDCAQMD. *Rule 215 (Architectural Coatings).* (Amended August 25, 2020). Retrieved from: https://www.edcgov.us/Government/AirQualityManagement/Documents/Final%20Rule%20215%20-%20Architectural%20Coatings,%20effect.%201-1-2018.pdf
[139] MDAQMD. *Rule 1113 (Architectural Coatings).* (Amended October 10, 2020). Retrieved from: https://www.mdaqmd.ca.gov/home/showpublisheddocument/8480/637393276806270000
[140] MBARD. *Rule 426 (Architectural Coatings).* (Amended September 16, 2020). Retrieved from: https://ww2.arb.ca.gov/sites/default/files/classic/technology-clearinghouse/rules/RuleID4683.pdf
[141] SMAQMD. *Rule 442 (Architectural Coatings).* (Amended February 10, 2021). Retrieved from: http://www.airquality.org/ProgramCoordination/Documents/rule442.pdf
[142] SDAPCD. *Rule 67.01 (Architectural Coatings).* (Amended February 10, 2021). Retrieved from: https://www.sdapcd.org/content/dam/sdapcd/documents/rules/current-rules/Rule-67.0.1-eff010122.pdf

- South Coast AQMD Rule 1113 (Amended February 2, 2016)[143]
- Ventura County APCD Rule 74.2 (Amended November 11, 2020)[144]

The District reviewed the rule requirements implemented prior to EPA's approval of the *2014 RACT SIP*, and found that Rule 4601 continues to implement RACT levels of control. The below comparison tables demonstrate that, for more recently amended rules, District Rule 4601 continues to meet RACT.

South Coast AQMD

- SCAQMD Rule 1113 (Architectural Coatings)

	SJVAPCD Rule 4601	SCAQMD 1113
Applicability	Any person who supplies, markets, sells, offers for sale, applies, or solicits the application of any architectural coating, or who manufactures, blends or repackages any architectural coating for use within the District.	Any person who supplies, sells, markets, offers for sale, or manufactures any architectural coating that is intended to be field applied within the District to stationary structures or their appurtenances, and to fields and lawns; as well as any person who applies, stores at a worksite, or solicits the application of any architectural coating within the District.
Exemptions	• Coatings that are supplied, sold, offered for sale or manufactured for use outside of the District • Coatings in containers having a capacity of one liter or less • Aerosol coating products • Colorants added at the factory or at the worksite	• Coatings that are supplied, sold, offered for sale or manufactured for use outside of the District • Certain categories of coatings in containers having a capacity of one liter or less • Any coating in containers having a capacity of two fluid ounces or less • Emulsion type bituminous pavement sealers • Aerosol coatings products • Use of stains and lacquers in areas at an elevation of 4,000 feet or greater • Facilities which apply coatings to test specimens for purposes of research and development of those coatings
Requirements		
	VOC Limit (g/l)	**VOC Limit (g/l)**
Flat Coatings	50	50
Nonflat Coatings	50	50
Specialty Coatings		
Nonflat - High Gloss Coatings	50	50
Aluminum Roof Coatings	100	100

[143] SCAQMD. *Rule 1113 (Architectural Coatings).* (Amended February 2, 2016). Retrieved from: http://www.aqmd.gov/docs/default-source/rule-book/reg-xi/r1113.pdf?sfvrsn=24
[144] VCAPCD. *Rule 74.2 (Architectural Coatings).* (Amended November 11, 2020). Retrieved from: http://www.vcapcd.org/Rulebook/Reg4/RULE%2074.2.pdf

	SJVAPCD Rule 4601	SCAQMD 1113
Basement Specialty Coatings	400	-
Bituminous Roof Coatings	50	50
Bituminous Roof Primers	350	350
Bond Breakers	350	350
Building Envelope Coatings	50	50
Concrete Curing Compounds	350	100
Concrete Curing Compounds for Roadways and Bridges	50	350
Concrete/Masonry Sealers	100	100
Driveway Sealers	50	50
Dry Fog Coatings	50	50
Faux Finishing Coatings:	350	-
Clear Topcoat	50	100
Decorative Coatings	50	350
Glazes	50	350
Japan	50	350
Trowel Applied Coatings	50	50
Fire Resistive Coatings	150	150
Floor Coatings	50	50
Form-Release Compounds	100	100
Graphic Arts Coatings (Sign Paints)	500	200
High Temperature Coatings	420	-
Industrial Maintenance Coatings:	250	100
Color Indicating Safety Coatings	50	480
High Temperature IM Coatings	50	420
Non-Sacrificial Anti-Graffiti Coatings	50	100
Zinc-Rich IM Primers	50	100
Low Solids Coatings	120	-
Magnesite Cement Coatings	450	450

	SJVAPCD Rule 4601	SCAQMD 1113
Mastic Texture Coatings	100	100
Metallic Pigmented Coatings	500	150
Multi-Color Coatings	250	250
Pre-Treatment Wash Primers	420	420
Primers, Sealers, and Undercoaters	100	100
Reactive Penetrating Sealers	350	350
Recycled Coatings	250	150
Roof Coatings	50	50
Rust Preventative Coatings	250	100
Sacrificial Anti-Graffiti Coatings	50	50
Shellacs:		
Clear	730	730
Opaque	550	550
Specialty Primers, Sealers, and Undercoaters	100	100
Stains:		
Exterior/Dual	100	100
Interior	250	250
Stone Consolidants	450	450
Swimming Pool Coatings	340	340
Tile and Stone Sealer	50	100
Traffic Marking Coatings	100	100
Tub and Tile Refinish Coatings	420	420
Waterproofing Membranes	100	100
Wood Coatings	275	275
Wood Conditioners	50	100
Wood Preservatives	350	350
Zinc-Rich Primers	340	-

As shown in the table above, SJVAPCD Rule 4601 is at least as stringent as SCAQMD Rule 1113.

Other District Rules

- El Dorado County AQMD Rule 215 (Architectural Coatings)
- Mojave Desert AQMD Rule 1113 (Architectural Coatings)
- Monterey Bay ARD Rule 426 (Architectural Coatings)
- San Diego County APCD Rule 67.0.1 (Architectural Coatings)
- Ventura County APCD Rule 74.2 (Architectural Coatings)

The districts above amended their rules after CARB's adoption of the Architectural Coating SCM, and the April 16, 2020 amendment of District Rule 4601. The sole purpose of the amendments of the above district rules were to incorporate the provisions of the SCM. District Rule 4601 includes all of the provisions of the SCM and is therefore as stringent as or more stringent than these rules.

Potential Emission Reduction Opportunities

The District is currently implementing the most stringent requirements feasible for the Valley. Therefore, the District did not identify any potential emission reductions opportunities at this time.

Contingency Measure Evaluation

As discussed in Chapter 6, contingency measures are immediately implemented ONLY if triggered by an unanticipated milestone or attainment failure. The District reviewed this control measure for a potential contingency component. The District concludes that this control measure is not an appropriate contingency measure because the most stringent feasible controls are already in place through adopted control and contingency measures.

Evaluation Findings

Rule 4601 meets or exceeds federal RACT requirements for this source category based upon evaluation of applicable federal regulations, state standards, and other air districts' rules. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

C.27 RULE 4602 MOTOR VEHICLE ASSEMBLY COATINGS

Emissions Inventory (Summer Average – Tons per day)

	2017	2023	2026	2029	2032	2035	2037
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VOC	0.00	0.00	0.00	0.00	0.00	0.00	0.00

The emissions inventory for this source category is 0.00 tpd because there are no facilities operating in the Valley.

District Rule 4602 Description

This rule is applicable to any person who applies VOC-containing coatings to new automobiles, light-duty trucks, heavier vehicles, and other parts coated along with these body parts during the assembly process and associated solvent cleaning activities. The purpose of this rule is to limit VOC emissions from motor vehicle assembly coating operations.

There are currently no motor vehicle assembly operations in the Valley. Any such facilities beginning operation in the Valley in the future would be required to meet District BACT requirements, per District Rules 2201 (New and Modified Stationary Source Review Rule), and 4001 (New Source Performance Standards), which by definition are equal to or more stringent than RACT.

How does District Rule 4602 compare with federal and state rules and regulations?

Federal Regulations

There are no Alternative Control Techniques or New Source Performance Standards applicable to this source category.

A. Control Techniques Guidelines (CTG)

District staff conducted a comprehensive evaluation of EPA CTG requirements. EPA has not adopted updates to the following CTGs since EPA found that Rule 4602 met RACT requirements through EPA's approval of the *2014 RACT SIP*. Therefore, further evaluation is not necessary at this time.

- *Control Techniques Guidelines for Automobile and Light-Duty Truck Assembly Coatings (EPA 453/R-08-006 2008/09)*
- *Control Techniques Guidelines for Miscellaneous Metal and Plastic Parts Coatings (EPA 453/R-08-003 2008/09)*

State Regulations

There are no state regulations applicable to this source category.

How does District Rule 4602 compare to rules in other air districts?

District staff compared emission limits, optional control requirements, and work practice standards in District Rule 4602 to comparable requirements in rules from the following California nonattainment areas:

- Antelope Valley AQMD Rule 1151.1 (Amended June 20, 2017)[145]
- Bay Area AQMD Regulation 8, Rule 13 (Amended December, 20, 1995)[146]
- South Coast AQMD Rule 1115 (Amended March 4, 2022)[147]

Antelope Valley AQMD

- AVAQMD Rule 1151.1 (Motor Vehicle Assembly Coating Operations)

	SJVAPCD Rule 4602	AVAQMD Rule 1151.1
Applicability	Any person who applies VOC-containing coatings to new automobiles, light-duty trucks, heavier vehicles, and other parts coated along with these bodies or body parts during the assembly process, and associated solvent cleaning activities.	All Motor Vehicle Assembly Coating Operations who apply Coatings that contain VOCs to new Motor Vehicles, new Light-Duty Trucks, new Heavier Vehicles and other parts that are coated along with these body or body parts during the vehicle assembly process and associated solvent cleaning activities.
Exemptions	• Materials supplied in containers with a net volume of 16 fluid ounces or less, or a net weight of one pound or less. • Except record keeping requirements, the provisions of this rule shall not apply to an operation where the total VOC emissions from all motor vehicle assembly coating operations, including cleaning activities, at that facility are less than 6.5 kg/day (15 lb/day) before controls.	• Any operation that is subject to the provisions of Rule 1151 • Materials supplied in containers with a net volume of 16 fluid ounces or less, or a net weight of 1 pound or less. • Except record keeping requirements, the provisions of this rule shall not apply to an operation where the total VOC emissions from all motor vehicle assembly coating operations, including cleaning activities, at that facility are less than 6.5 kg/day (15 lb/day) before controls.

[145] AVAQMD. *Rule 1151.1 (Motor Vehicle Assembly Coating Operations).* Amended June 20, 2017). Retrieved from: https://avaqmd.ca.gov/files/c707be8be/AV+Rule+1151.1+062017a.pdf
[146] BAAQMD. *Regulation 8, Rule 13 (Light and Medium Duty Motor Vehicle Assembly Plants).* (Amended December 20, 1995). Retrieved from: https://www.baaqmd.gov/~/media/dotgov/files/rules/reg-8-rule-13-light-and-medium-duty-motor-vehicle-assembly-plants/documents/rg0813.pdf?la=en&rev=37f14a7c14734a669648f05c2dc51219
[147] SCAQMD. *Rule 1115 (Motor Vehicle Assembly Line Coating Operations).* (Amended March 4, 2022). Retrieved from: http://www.aqmd.gov/docs/default-source/rule-book/reg-xi/rule-1115.pdf?sfvrsn=4

	SJVAPCD Rule 4602		AVAQMD Rule 1151.1
Motor Vehicle Assembly Coatings	**VOC Emission Limits**		
Electrodeposition primer operations (including application area, spray/rinse stations, and curing oven)	R_T > 0.16 (Solid turnover ratio)	0.084 kg VOC/L of coating solids	0.084 kg VOC per liter (0.7 lb/gal) of solids deposited
	0.040 < R_T < 0.160	0.084 x 350 $^{0.160-RT}$ kg VOC/liter	0.084 x 350 $^{0.160-RT}$ kg VOC per liter
	R_T <.040	No VOC limit	No VOC limit
Primer-surfacer operations (including application area, flash off area, and oven)	1.44 kg of VOC/liter of deposited solids (12.0 lb VOC/gal of deposited solids) on a daily weighted average basis as determined by following the procedures in the revised Automobile Topcoat Protocol.		1.44 kg VOC per liter (12.0 lb VOC/gal) of solids deposited
Topcoat operations (including application area, flash-off area, and oven)	1.44 kg of VOC/liter of deposited solids (12.0 lb VOC/gal of deposited solids) on a daily weighted average basis as determined by following the procedures in the revised Automobile Topcoat Protocol.		1.44 kg VOC per liter (12.0 lb VOC/gal) of solids deposited
Final repair operations	0.58 kg VOC/liter (4.8 lb VOC/gallon of coating) less water and less exempt solvents on a daily weighted average basis or as an occurrence weighted average.		0.580 kg VOC per liter (4.8 lb VOC/gal) of Coating less water and less exempt solvents
Combined primer-surfacer and topcoat operations	1.44 kg of VOC/liter of deposited solids (12.0 lb VOC/gal of deposited solids) on a daily weighted average basis as determined by following the procedures in the revised Automobile Topcoat Protocol.		1.44 kg VOC per liter (12.0 lb VOC/gal) of solids deposited
VOC Content Limits for Miscellaneous Materials Used at Motor Vehicle Assembly Coating Operations	**Material**	**VOC limit (g/L)**	**VOC limit (g/L)**
	Glass bonding primer	900	900
	Adhesive	250	250
	Cavity wax	650	650
	Sealer	650	650
	Deadener	650	650
	Gasket/gasket sealing material	200	200
	Underbody coating	650	650
	Trunk interior coating	650	650
	Bedliner	200	200
	Weatherstrip adhesive	750	750
	Lubricating wax/compound	700	700

	SJVAPCD Rule 4602	AVAQMD Rule 1151.1
Alternative Compliance Options	In lieu of complying with VOC emission limits, coating application, and organic solvent cleaning requirements, an operator may use a VOC emission control system that meets the following requirements: • The VOC emission control system shall be approved by the APCO. • The VOC emission control system shall achieve an overall control efficiency of at least 90% by weight. • Use of a VOC emission control system shall result in VOC emissions equal to or less than VOC emissions which would result from compliance with the applicable requirements.	In lieu of complying with the requirements in section (C)(1), an operator may use a Emission Control System that meets all of the following requirements: • The Emission Control System shall be approved in writing by the APCO. • The approved Emission Control System shall achieve an overall capture and control efficiency of at least 90% by weight. • Use of an Emission Control System shall result in VOC emissions equal to or less than VOC emissions which would result from compliance with the applicable requirements.

Coating Application Methods	The operator shall apply coatings using one of the following methods:
	• Brush, dip, or roll coating
	• Electrostatic application
	• Electrodeposition
	• Flow coating
	• Continuous Coating
	• Any coating method demonstrated to the APCO capable of achieving ≥ 65% transfer efficiency
	• High-Volume, Low-Pressure (HVLP) spray equipment
	  ○ Spray equipment must meet HVLP equipment standards
	  ○ Any HVLP equipment for sale must denote the maximum inlet air pressure.
		The operator shall apply Coatings using one of the following methods:
		• Brush, Dip or Roll Coating
		• Electrostatic Application
		• Flow Coating
		• Continuous Coating
		• High Volume, Low Pressure (HVLP) spray equipment operated in accordance with the manufacturer's recommendations.
		• Any other coating application method which is demonstrated in accordance with the provisions of (E)(1)(e) to be capable of achieving equivalent or better transfer efficiency than the automotive Coating application listed in (C)(3)(a)(v).
		An operator may control emissions from application equipment with a VOC Emission Control System that meets the requirements of section (C)(2).

Organic Solvent Cleaning	For solvent cleaning operations, other than for bug and tar removal, the operator shall use solvents that have VOC content equal to or less than 25 g VOC/L of cleaning material. For bug and tar removal, a person shall not use any material other than bug and tar remover regulated under the Consumer Products Regulation (California Code of Regulations Section 94507 et seq.)	Solvent Cleaning Operations shall use solvents that have a VOC content equal to or less than 25 grams VOC/liter of cleaning material Cleaning activities that use solvents shall be performed by one or more of the following methods: • Wipe cleaning • Application of solvent from hand-held spray bottles without a propellant induced force

	SJVAPCD Rule 4602	AVAQMD Rule 1151.1
	Solvent cleaning activities must be performed using one of the following methods: • Wipe cleaning • Application of solvent from hand-held spray bottles from which • solvents are dispensed without a propellant-induced force • Non-atomized solvent flow method in which the cleaning solvent is collected in a container or a collection system which is closed except for solvent collection openings and to avoid excessive pressure build-up inside the container. • Solvent flushing method in which the cleaning solvent is discharged into a container that is closed except for solvent collection openings and to avoid excessive pressure build-up inside the container. The discharged solvent from the equipment must be collected into containers without atomizing into the open air. The solvent may be flushed through the system by air or hydraulic pressure, or by pumping. Solvent shall not be atomized into the open air unless it is vented to an APCO-approved VOC emission control system. An operator shall not use VOC-containing materials to clean spray equipment used for the application of coatings, adhesives, or ink, unless an enclosed system or equipment that is proven equally effective at controlling emissions. Operators may control VOC emissions from solvent cleaning with an APCO-approved VOC emission control system for the solvent cleaning operation that meets the requirements in the rule.	• Non-atomized solvent flow method in which the cleaning system is collected in a container or a collection system which is closed except for solvent collection openings and openings to avoid excessive pressure build-up inside the container. • Solvent Flushing method in which the cleaning solvent is discharged into a container that is closed except for solvent collection openings and, if necessary, openings to avoid excessive pressure build up inside the container. The discharged solvent from the equipment must be collected into containers without atomizing into the open air. The solvent may be flushed through the system by air or hydraulic pressure, or by pumping. Solvent shall not be atomized into the open air unless it is vented to an APCO-approved VOC emission control system. An operator shall not use VOC-containing materials to clean spray equipment used for the application of Coatings, Adhesives or ink, unless an enclosed system or equipment is proven to be equally effective at controlling emissions is used for cleaning. If an enclosed system is used, it must totally enclose spray guns, cups, nozzles, bowls, and other parts during washing, rinsing and draining procedures. The enclosed system must be closed when not in use. Operators may control VOC emissions from solvent cleaning with an APCO-approved VOC emission control system for the solvent cleaning operation that meets the requirements in the rule.

	SJVAPCD Rule 4602	AVAQMD Rule 1151.1
Organic Solvent Disposal and Storage	Store or dispose of fresh or spent solvents, waste solvent cleaning materials such as cloth, paper, etc., coatings, adhesives, catalysts, and thinners in closed, non-absorbent and non-leaking containers. The containers shall remain closed at all times except when depositing or removing the contents of the containers	Store or dispose of fresh or spent solvents, waste solvent cleaning materials such as cloth, paper, etc., coatings, adhesives, catalysts, and thinners in closed, non-absorbent and non-leaking containers. The containers shall remain closed at all times except when depositing or removing the contents of the containers

Based on the rule comparison above, District Rule 4602 is as stringent as AVAQMD Rule 1151.1 for motor vehicle assembly coatings.

Bay Area AQMD

- BAAQMD Regulation 8, Rule 13 (Light and Medium Duty Motor Vehicle Assembly Plants)

	SJVAPCD Rule 4602		BAAQMD Reg 8, Rule 13
Applicability	Any person who applies VOC-containing coatings to new automobiles, light-duty trucks, heavier vehicles, and other parts coated along with these bodies or body parts during the assembly process, and associated solvent cleaning activities.		Light- and medium-duty motor vehicle assembly plants.
Exemptions	• Materials supplied in containers with a net volume of 16 fluid ounces or less, or a net weight of one pound or less. • Except record keeping requirements, operations where the total VOC emissions from all motor vehicle assembly coating operations, including cleaning activities, at that facility are less than 6.5 kg/day (15 lb/day) before controls.		None.
Motor Vehicle Assembly Coatings	**VOC Emission Limits**		
Electrodeposition primer operations (including application area, spray/rinse stations, and curing oven)	R_T > 0.16 (Solid turnover ratio)	0.084 kg VOC/L of coating solids	145 grams per liter (1.2 lbs/gal) of coating applied, excluding water, unless emissions are controlled by an air pollution abatement device with an efficiency of at least 90%.
	0.040 < R_T < 0.160	$0.084 \times 350^{0.160-RT}$ kg VOC/liter	
	R_T <.040	No VOC limit	
Primer-surfacer operations (including application area, flash off area, and oven)	1.44 kg of VOC/liter of deposited solids (12.0 lb VOC/gal of deposited solids) on a daily weighted average basis as determined by following the procedures in the revised Automobile Topcoat Protocol.		1.80 kilograms of VOC per liter (15.0 lbs/gal) of applied coating solids from each primer surfacer operation.

<table>
<tr><th></th><th colspan="2">SJVAPCD Rule 4602</th><th>BAAQMD Reg 8, Rule 13</th></tr>
<tr><td>Topcoat operations (including application area, flash-off area, and oven)</td><td colspan="2">1.44 kg of VOC/liter of deposited solids (12.0 lb VOC/gal of deposited solids) on a daily weighted average basis as determined by following the procedures in the revised Automobile Topcoat Protocol.</td><td>1.80 kilograms of VOC per liter (15.0 lbs/gal) of applied coating solids from each topcoat operation.</td></tr>
<tr><td>Final repair operations</td><td colspan="2">0.58 kg VOC/liter (4.8 lb VOC/gallon of coating) less water and less exempt solvents on a daily weighted average basis or as an occurrence weighted average.</td><td>A person shall not apply on any light- or medium-duty vehicle coating line any final repair coat with a VOC content in excess of 580 g/L of coating applied, excluding water (4.8 lbs/gal), on a daily weighted average basis</td></tr>
<tr><td>Combined primer-surfacer and topcoat operations</td><td colspan="2">1.44 kg of VOC/liter of deposited solids (12.0 lb VOC/gal of deposited solids) on a daily weighted average basis as determined by following the procedures in the revised Automobile Topcoat Protocol.</td><td>-</td></tr>
<tr><td>Flexible Parts Coatings</td><td colspan="2">-</td><td>A person shall not apply to any flexible part which has a VOC content in excess of the following limits, excluding water, unless emissions are controlled by an air pollution abatement device with 90% efficiency.
flexible primer: 490 grams/liter (4.1 lbs/gal)
color topcoat: 450 grams/liter (3.8 lbs/gal)
basecoat/clearcoat: 540 grams/liter (4.5 lbs/gal)</td></tr>
<tr><td>Spray Primer Operations</td><td colspan="2">-</td><td>1.80 kilograms of VOC per liter (15.0 lbs/gal) of applied coating solids from each spray primer operation.</td></tr>
<tr><td rowspan="12">VOC Content Limits for Miscellaneous Materials Used at Motor Vehicle Assembly Coating Operations</td><td>Material</td><td>VOC limit (g/L)</td><td rowspan="12"></td></tr>
<tr><td>Glass bonding primer</td><td>900</td></tr>
<tr><td>Adhesive</td><td>250</td></tr>
<tr><td>Cavity wax</td><td>650</td></tr>
<tr><td>Sealer</td><td>650</td></tr>
<tr><td>Deadener</td><td>650</td></tr>
<tr><td>Gasket/gasket sealing material</td><td>200</td></tr>
<tr><td>Underbody coating</td><td>650</td></tr>
<tr><td>Trunk interior coating</td><td>650</td></tr>
<tr><td>Bedliner</td><td>200</td></tr>
<tr><td>Weatherstrip adhesive</td><td>750</td></tr>
<tr><td>Lubricating wax/compound</td><td>700</td></tr>
<tr><td>VOC Emission Control System Requirements</td><td colspan="2">In lieu of complying with VOC emission limits, coating application, and organic solvent cleaning</td><td>An abatement device must control the emissions from the following coating</td></tr>
</table>

	SJVAPCD Rule 4602	BAAQMD Reg 8, Rule 13
	requirements, an operator may use a VOC emission control system that meets the following requirements: • The VOC emission control system shall be approved by the APCO. • The VOC emission control system shall achieve an overall control efficiency of at least 90% by weight. Use of a VOC emission control system shall result in VOC emissions equal to or less than VOC emissions which would result from compliance with the applicable requirements.	methods with an abatement efficiency of at least 90%. • Electrodeposition • Combined primer-surfacer and topcoat • Off-line coatings
Coating Application Methods	The operator shall apply coatings using one of the following methods: • Brush, dip, or roll coating • Electrostatic application • Electrodeposition • Flow coating • Continuous Coating • Any coating method demonstrated to the APCO capable of achieving ≥ 65% transfer efficiency • HVLP spray equipment ○ Spray equipment must meet HVLP equipment standards Any HVLP equipment for sale must denote the maximum inlet air pressure.	
Organic Solvent Cleaning	For solvent cleaning operations, other than for bug and tar removal, the operator shall use solvents that have VOC content equal to or less than 25 g VOC/L of cleaning material. For bug and tar removal, a person shall not use any material other than bug and tar remover regulated under the Consumer Products Regulation (California Code of Regulations Section 94507 et seq.) Solvent cleaning activities must be performed using one of the following methods: • Wipe cleaning • Application of solvent from hand-held spray bottles from which • solvents are dispensed without a propellant-induced force	A person shall not use organic compounds for the cleanup of spray equipment, including paint lines, unless equipment for collecting the organic compounds and minimizing their evaporation to the atmosphere is used. A person shall use closed containers for the storage or disposal of cloth or paper used for solvent surface preparation and cleanup. A person shall store fresh or spent solvent in closed containers.

	SJVAPCD Rule 4602	BAAQMD Reg 8, Rule 13
	• Non-atomized solvent flow method in which the cleaning solvent is collected in a container or a collection system which is closed except for solvent collection openings and to avoid excessive pressure build-up inside the container. • Solvent flushing method in which the cleaning solvent is discharged into a container that is closed except for solvent collection openings and to avoid excessive pressure build-up inside the container. The discharged solvent from the equipment must be collected into containers without atomizing into the open air. The solvent may be flushed through the system by air or hydraulic pressure, or by pumping. Solvent shall not be atomized into the open air unless it is vented to an APCO-approved VOC emission control system that complies with Section 5.2. An operator shall not use VOC-containing materials to clean spray equipment used for the application of coatings, adhesives, or ink, unless an enclosed system or equipment that is proven to be equally effective at controlling emissions. Operators may control VOC emissions from solvent cleaning with an APCO-approved VOC emission control system for the solvent cleaning operation that meets the requirements of Section 5.2.	
Organic Solvent Disposal and Storage	The operator shall store or dispose of fresh or spent solvents, waste solvent cleaning materials such as cloth, paper, etc., coatings, adhesives, catalysts, and thinners in closed, non-absorbent and non-leaking containers. The containers shall remain closed at all times except when depositing or removing the contents of the containers	A person shall use closed containers for the storage or disposal of cloth or paper used for solvent surface preparation and cleanup. A person shall store fresh or spent solvent in closed containers.

Based on the rule comparison above, District Rule 4602 is as stringent or more stringent as BAAQMD Regulation 8, Rule 13 for motor vehicle assembly coatings.

South Coast AQMD

- SCAQMD Rule 1115 (Motor Vehicle Assembly Line Coating Operations)

	SJVAPCD Rule 4602		SCAQMD Rule 1115
Applicability	Any person who applies VOC-containing coatings to new automobiles, light-duty trucks, heavier vehicles, and other parts coated along with these bodies or body parts during the assembly process, and associated solvent cleaning activities.		An owner or operator engaged in assembly line coating operations conducted during the manufacturing of new motor vehicles and other automotive parts that are coated during the vehicle assembly process as well as during associated solvent cleaning operations.
Exemptions	• Materials supplied in containers with a net volume of 16 fluid ounces or less, or a net weight of one pound or less. • Except record keeping requirements, the provisions of this rule shall not apply to an operation where the total VOC emissions from all motor vehicle assembly coating operations, including cleaning activities, at that facility are less than 6.5 kg/day (15 lb/day) before controls.		The provisions of paragraph (d)(1) of this rule shall not apply to the following manufacturing uses: • Wheel Topcoat Application • Antirust Coatings • Flexible Coatings • Plastic Parts
Motor Vehicle Assembly Coatings	**VOC Emission Limits**		
Electrodeposition primer operations (including application area, spray/rinse stations, and curing oven)	R_T > 0.16 (Solid turnover ratio)	0.084 kg VOC/L of coating solids	0.084 kg VOC per liter (0.7 lb/gal) of solids deposited
	0.040 < R_T < 0.160	0.084 x 350 $^{0.160-RT}$ kg VOC/liter	0.084 x 350 $^{0.160-RT}$ kg VOC per liter
	R_T <.040	No VOC limit	No VOC limit
Primer-surfacer operations (including application area, flash off area, and oven)	1.44 kg of VOC/liter of deposited solids (12.0 lb VOC/gal of deposited solids) on a daily weighted average basis as determined by following the procedures in the revised Automobile Topcoat Protocol.		1.44 kg VOC per liter (12.0 lb VOC/gal) of solids deposited
Topcoat operations (including application area, flash-off area, and oven)	1.44 kg of VOC/liter of deposited solids (12.0 lb VOC/gal of deposited solids) on a daily weighted average basis as determined by following the procedures in the revised Automobile Topcoat Protocol.		1.44 kg VOC per liter (12.0 lb VOC/gal) of solids deposited
Final repair operations	0.58 kg VOC/liter (4.8 lb VOC/gallon of coating) less water and less exempt		0.580 kg VOC per liter (4.8 lb VOC/gal) of Coating less

	SJVAPCD Rule 4602		SCAQMD Rule 1115
	solvents on a daily weighted average basis or as an occurrence weighted average.		water and less exempt solvents
Combined primer-surfacer and topcoat operations	1.44 kg of VOC/liter of deposited solids (12.0 lb VOC/gal of deposited solids) on a daily weighted average basis as determined by following the procedures in the revised Automobile Topcoat Protocol.		1.44 kg VOC per liter (12.0 lb VOC/gal) of solids deposited
VOC Content Limits for Miscellaneous Materials Used at Motor Vehicle Assembly Coating Operations	**Material**	**VOC limit (g/L)**	**VOC limit (g/L)**
	Glass bonding primer	900	900
	Adhesive	250	250
	Cavity wax	650	650
	Sealer	650	650
	Deadener	650	650
	Gasket/gasket sealing material	200	200
	Underbody coating	650	650
	Trunk interior coating	650	650
	Bedliner	200	200
	Weatherstrip adhesive	750	750
	Lubricating wax/compound	700	700
Alternative Compliance Options	In lieu of complying with VOC emission limits, coating application, and organic solvent cleaning requirements, an operator may use a VOC emission control system that meets the following requirements: • The VOC emission control system shall be approved by the APCO. • The VOC emission control system shall achieve an overall control efficiency of at least 90% by weight. Use of a VOC emission control system shall result in VOC emissions equal to or less than VOC emissions which would result from compliance with the applicable requirements.		In lieu of complying with the VOC content limits, an owner or operator may complete an Alternative Emission Control Plan pursuant to SCAQMD Rule 108 (Alternative Emission Control Plans). In lieu of complying with the VOC content limits, an owner or operator may use an approved emission control system for reducing VOC emissions. The approved emission control system shall reduce the VOC emissions by an equivalent or greater level to that which would have been achieved by the provisions of paragraph (d)(1).
Coating Application Methods	The operator shall apply coatings using one of the following methods: • Brush, dip, or roll coating • Electrostatic application • Electrodeposition • Flow coating • Continuous Coating • Any coating method demonstrated to the APCO		An owner or operator of an assembly line coating operation shall not apply coatings to any motor vehicle or any associated parts or components to a motor vehicle on an assembly line except by the use of one of the following methods: • Electrostatic application • HVLP spray

	SJVAPCD Rule 4602	SCAQMD Rule 1115
	capable of achieving ≥ 65% transfer efficiency • HVLP spray equipment ○ Spray equipment must meet HVLP equipment standards Any HVLP equipment for sale must denote the maximum inlet air pressure.	• Brush, dip, or roller • Spray gun application, provided the owner or operator demonstrates that the spray gun meets the HVLP definition in paragraph (c)(19) in design and use. • Any other automotive coating application methods approved by the Executive Officer and as demonstrated in accordance with the provisions of subparagraph (f)(2) capable of achieving equivalent or better transfer efficiency than the automotive coating application method listed in clause (d)(5)(A)(ii).
Organic Solvent Cleaning	For solvent cleaning operations, other than for bug and tar removal, the operator shall use solvents that have VOC content equal to or less than 25 g VOC/L of cleaning material. For bug and tar removal, a person shall not use any material other than bug and tar remover regulated under the Consumer Products Regulation (California Code of Regulations Section 94507 et seq.) Solvent cleaning activities must be performed using one of the following methods: • Wipe cleaning • Application of solvent from hand-held spray bottles from which • solvents are dispensed without a propellant-induced force • Non-atomized solvent flow method in which the cleaning solvent is collected in a container or a collection system which is closed except for solvent collection openings and to avoid excessive pressure build-up inside the container. • Solvent flushing method in which the cleaning solvent is discharged into a container that is closed except for solvent collection openings and to avoid excessive pressure build-up inside the container. The discharged solvent from the	Solvent cleaning of application equipment, parts, products, tools, machinery, equipment, general work areas, and the storage and disposal of VOC-containing materials used in solvent cleaning operations shall be subject to Rule 1171 – Solvent Cleaning Operations.

	SJVAPCD Rule 4602	SCAQMD Rule 1115
	equipment must be collected into containers without atomizing into the open air. The solvent may be flushed through the system by air or hydraulic pressure, or by pumping. Solvent shall not be atomized into the open air unless it is vented to an APCO-approved VOC emission control system. An operator shall not use VOC-containing materials to clean spray equipment used for the application of coatings, adhesives, or ink, unless an enclosed system or equipment that is proven equally effective at controlling emissions. Operators may control VOC emissions from solvent cleaning with an APCO-approved VOC emission control system for the solvent cleaning operation that meets the requirements of Section 5.2.	
Organic Solvent Disposal and Storage	The operator shall store or dispose of fresh or spent solvents, waste solvent cleaning materials such as cloth, paper, etc., coatings, adhesives, catalysts, and thinners in closed, non-absorbent and non-leaking containers. The containers shall remain closed at all times except when depositing or removing the contents of the containers	

Based on the rule comparison above, District Rule 4602 is as stringent as SCAQMD Rule 1115 for motor vehicle assembly coatings.

Potential Emission Reduction Opportunities

Currently, the District does not have any motor vehicle assembly coating operations in the Valley. Therefore, the District did not identify any potential emission reduction opportunities at this time.

Contingency Measure Evaluation

As discussed in Chapter 6, contingency measures are immediately implemented ONLY if triggered by an unanticipated milestone or attainment failure. The District reviewed this control measure for a potential contingency component. The District concludes that

this control measure is not an appropriate contingency measure because the most stringent feasible controls are already in place, and a contingency trigger is incompatible with the technologies involved in reducing emissions from this category.

Evaluation Findings

Rule 4602 meets or exceeds federal RACT requirements for this source category based upon evaluation of applicable federal regulations, state standards, and other air districts' rules. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

C.28 RULE 4603 SURFACE COATING OF METAL PARTS AND PRODUCTS, PLASTIC PARTS AND PRODUCTS, AND PLEASURE CRAFTS

Emissions Inventory (Summer Average – Tons per day)

	2017	2023	2026	2029	2032	2035	2037
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VOC	1.18	1.33	1.39	1.42	1.49	1.60	1.70

District Rule 4603 Description

District Rule 4603 (last amended on September 17, 2009) controls VOC emissions from the coating of miscellaneous metal part and products (including large appliances and metal furniture), plastic parts and products (including automotive/transportation and business machines), and pleasure crafts. The rule also controls VOC emissions from organic solvent cleaning, storage and disposal of solvents, and waste solvent materials associated with such coating operations.

Rule 4603 establishes VOC content limits for coatings used in the manufacturing and fabrication of metal parts and products as well as separate VOC limits for coatings used in large appliances and metal furniture. Except for large appliances or metal furniture, the general VOC limits for baked coatings and for air-dried coatings is 275 grams/liter (2.3 pounds/gallon) and 340 grams/liter (2.8 pounds/gallon), respectively. Except for large appliances or metal furniture coating operations, the VOC limits for specialty coatings range from 360 grams/liter (3.0 pounds/gallon) to 880 grams/liter (7.3 pounds/gallon) for baked coatings and 420 grams/liter (3.5 pounds/gallon) to 880 grams/liter (7.3 pounds/gallon) for air-dried coatings, depending on the coating type. For large appliances or metal furniture coating operations, the coating VOC limits range from 275 grams/liter (2.3 pounds/gallon) to 420 grams/liter (3.5 pounds/gallon) depending on the type of coating and whether baked or air-dried. The VOC content limit for organic solvent cleaning materials is 25 grams/liter (0.2 pounds/gallon).

Rule 4603 also establishes VOC content limits for coatings used in the manufacturing and fabrication of plastic parts and products as well as separate VOC limits for automotive/transportation and business machine plastic parts and products, and pleasure craft coating operations at a stationary source with total VOC emissions of greater than 2.7 tons per 12-month rolling period. Except for automotive/transportation and business machine plastic parts and products, the VOC limits of the coatings range from 280 grams/liter (2.3 pounds/gallon) to 800 grams/liter (6.7 pounds/gallon) depending on the coating type. For automotive/transportation and business machine plastic parts and products coating operations, the coating VOC limits range from 350 grams/liter (2.9 pounds/gallon) to 620 grams/liter (5.2 pounds/gallon) depending on the type of coating and whether it is baked or air-dried. For pleasure craft coating

operations, the coating VOC limits range from 330 grams/liter (2.8 pounds/gallon) to 780 grams/liter (6.5 pounds/gallon) depending on the type of coating.

In lieu of using compliant coatings and solvents, District Rule 4603 allows the use of an APCO-approved VOC emission control system with an overall capture and control efficiency of at least 90 percent by weight. In addition, the rule includes coating application methods, work practice standards, recordkeeping, and test methods.

How does District Rule 4603 compare with federal and state rules and regulations?

Federal Regulations

A. Control Techniques Guidelines (CTG)

District staff conducted a comprehensive evaluation of EPA CTG requirements. EPA has not adopted updates to the following CTGs since EPA found that Rule 4603 met RACT requirements when they approved the *2014 RACT SIP*. Therefore, further evaluation is not necessary at this time.

- *Control Techniques Guidelines for Large Appliance Coatings (EPA-453/R-07-004 2007/09)*
- *Control Techniques Guidelines for Metal Furniture Coatings (EPA-453/R-07-005 2007/09)*
- *EPA 1978 CTG for Surface Coating of Miscellaneous Metal Parts and Products (EPA 450/2-78-015 1978/06)*
- *EPA 2008 CTG for Miscellaneous Metal and Plastic Parts Coatings (EPA 453/R-08-003 2008/09)*

B. Alternative Control Techniques (ACT)

District staff conducted a comprehensive evaluation of EPA ACT requirements. EPA has not adopted updates to the following ACTs since EPA found that Rule 4603 met RACT requirements when they approved the *2014 RACT SIP*. Therefore, further evaluation is not necessary at this time.

- *Alternative Control Techniques Document - Industrial Cleaning Solvents (EPA-453/R-94-015 1994/02)*
- *Alternative Control Techniques Document - Surface Coating of Automotive/Transportation and Business Machine Plastic Parts (EPA-453/R-94-017 1994/02)*

C. New Source Performance Standards (NSPS)

District staff conducted a comprehensive evaluation of EPA NSPS requirements. EPA has not adopted updates to the following NSPS since EPA found that Rule 4603 met

RACT requirements when they approved the *2014 RACT SIP*. Therefore, further evaluation is not necessary at this time.

- *40 CFR Part 60 Subpart EE – Standards of Performance for Surface Coating of Metal Furniture (2000/10)*
- *40 CFR Part 60 Subpart SS – Standards of Performance for Industrial Surface Coating: Large Appliances (1982/10)*
- *40 CFR Part 60 Subpart TTT – Standards of Performance for Industrial Surface Coating: Surface Coating of Plastic Parts for Business Machines (1989/06)*

State Regulations

There are no state regulations applicable to this source category.

How does District Rule 4603 compare to rules in other air districts?

District staff compared emission limits, optional control requirements, and work practice standards in District Rule 4603 to comparable requirements in rules from the following California nonattainment areas:

- Bay Area AQMD Regulation 8, Rule 14 (Amended October 16, 2002)[148]
- Bay Area AQMD Regulation 8, Rule 19 (Amended October 16, 2002)[149]
- Bay Area AQMD Regulation 8, Rule 31 (Amended October 16, 2002)[150]
- Bay Area AQMD Regulation 8, Rule 43 (Amended October 16, 2002)[151]
- Sacramento Metropolitan AQMD Rule 451 (Amended October 28, 2010)[152]
- Sacramento Metropolitan AQMD Rule 468 (Amended March 22, 2018)[153]
- South Coast AQMD Rule 1106 (Amended May 3, 2019)[154]
- South Coast AQMD Rule 1107 (Amended February 7, 2020)[155]

[148] BAAQMD. *Regulation 8, Rule 14 (Surface Coating of Large Appliances and Metal Furniture). (Amended October 16, 2002).* Retrieved from: https://www.baaqmd.gov/~/media/dotgov/files/rules/reg-8-rule-14-surface-coating-of-large-appliances-and-metal-furniture/documents/rg0814.pdf?la=en&rev=19d3a2ddd706432ab083b4e4de269d60

[149] BAAQMD. *Regulation 8, Rule 19 (Surface Coating of Miscellaneous Metal Parts and Products).* (Amended October 16, 2002). Retrieved from: https://www.baaqmd.gov/~/media/dotgov/files/rules/reg-8-rule-19-surface-coating-of-miscellaneous-metal-parts-and-products/documents/rg0819.pdf?la=en&rev=6ff27adac8a14dc5a5022521c845ec6d

[150] BAAQMD. *Regulation 8, Rule 31 (Surface Coating of Plastic Parts and Products).* (Amended October 16, 2002). Retrieved from: https://www.baaqmd.gov/~/media/dotgov/files/rules/reg-8-rule-31-surface-coating-of-plastic-parts-and-products/documents/rg0831.pdf?la=en&rev=92e1c8a0d467404d947e0c4f2fb6a964

[151] BAAQMD. *Regulation 8, Rule 43 (Surface Coating of Marine Vessels).* (Amended October 16, 2002). Retrieved from: https://www.baaqmd.gov/~/media/dotgov/files/rules/reg-8-rule-43-surface-coating-of-marine-vessels/documents/rg0843.pdf?la=en&rev=a8257b8f22574695af9636b5cb8f6971

[152] SMAQMD. *Rule 451 (Surface Coating of Miscellaneous Metal Parts and Products).* (Amended October 28, 2010). Retrieved from: http://www.airquality.org/ProgramCoordination/Documents/rule451.pdf

[153] SMAQMD. *Rule 468 (Surface Coating of Plastic Parts and Products).* (Amended March 22, 2018). Retrieved from: http://www.airquality.org/ProgramCoordination/Documents/rule468.pdf

[154] SCAQMD. *Rule 1106 (Marine and Pleasure Craft Coatings).* (Amended May 3, 2019). Retrieved from: https://www.aqmd.gov/docs/default-source/rule-book/reg-xi/r1106.pdf?sfvrsn=4

[155] SCAQMD. *Rule 1107 (Coating of Metal Parts and Products).* (Amended February 7, 2020). Retrieved from: https://www.aqmd.gov/docs/default-source/rule-book/reg-xi/r1107.pdf?sfvrsn=4

- South Coast AQMD Rule 1145 (Amended December 4, 2009)[156]
- Ventura County APCD Rule 74.12 (Amended April 8, 2008)[157]
- Ventura County APCD Rule 74.24.1 (Amended November 10, 2020)[158]

The District reviewed the rule requirements implemented prior to EPA's approval of the *2014 RACT SIP* in 2012, and found that Rule 4603 continues to implement RACT levels of control. The following sections compare District Rule 4603 with the more recently amended rules.

Sacramento Metropolitan AQMD

- SMAQMD Rule 468 (Surface Coating of Plastic Parts and Products)

The following table compares SMAQMD Rule 468 to District Rule 4603 for plastic parts and products coating operations under the listed categories.

	SJVAPCD Rule 4603	SMAQMD Rule 468
Applicability	Surface coating of metal parts or products, large appliances parts or products, metal furniture, and plastic parts and products, automotive/transportation and business machine plastic parts and products, and pleasure crafts, and to the organic solvent cleaning, and the storage and disposal of all solvents and waste solvent materials.	Any person who uses, applies, or solicits the use or application of any coating or cleaning material for miscellaneous plastic parts and products, transportation plastic parts, or business machine plastic parts within the SMAQMD.
Exemptions	• Facilities in full compliance with this rule are exempt from the requirements of Rule 4661 (Organic Solvents). • The application of coatings to aircraft, aerospace vehicles, marine vessels, can, coils, and magnetic wire. • Operations subject to District Rules 4602 (Motor Vehicle Assembly Coatings), 4612 (Motor Vehicle and Mobile Equipment Operations), or 4684 (Polyester Resin Operations). • For plastic parts and products coating operations (except for automotive/transportation and business machine plastic parts), the coating VOC limits and the solvent cleaning requirements shall not apply to the type of coatings and coating operations as follows, provided the operator complies with the work	• Facilities subject to this rule are not subject to the requirements of SMAQMD Rule 441 (Organic Solvents). • Operations subject to SMAQMD Rules 442 (Architectural Coatings), 450 (Graphic Arts Operations), 456 (Aerospace Assembly and Component Coating Operations), 459 (Automotive, Truck and Heavy Equipment Refinishing Operations), 460 (Adhesives and Sealants), or 465 (Polyester Resin Operations). • Except for recordkeeping requirements for end users, the requirements of this rule do not apply to miscellaneous plastic parts and products, transportation plastic parts, and business machine plastic parts coating operations at a

[156] SCAQMD. *Rule 1145 (Plastic, Rubber, Leather, and Glass Coatings).* (Amended December 4, 2009). Retrieved from: https://www.aqmd.gov/docs/default-source/rule-book/reg-xi/rule-1145.pdf?sfvrsn=4
[157] VCAPCD. *Rule 74.12. (Surface Coating of Metal Parts and Products).* (Amended April 8, 2008). Retrieved from: http://www.vcapcd.org/Rulebook/Reg4/RULE%2074.12.pdf
[158] VCAPCD. *Rule 74.24.1. (Pleasure Craft Coating and Commercial Boatyard Operations).* (Amended January 8, 2002). Retrieved from: http://www.vcapcd.org/Rulebook/Reg4/RULE%2074.24.1.pdf

	SJVAPCD Rule 4603	SMAQMD Rule 468
	practice standards and coating application methods of this rule: A) Touch-up and repair coatings; B) Stencil coatings applied on clear or transparent substrates; C) Clear or translucent coatings; D) Coatings applied at a paint manufacturing facility while conducting performance tests on coatings; E) Any individual coating category used in volumes < 50 gallons in any one year, if substitute compliance coatings are not available, and the total usage of all such coatings does not exceed 200 gallons/year/ stationary source; F) Reflective coatings applied to highway cones; G) Mask coatings that are < 0.5 millimeter thick (dried) and the area coated is < 25 square inches; H) Electro-Magnetic Interference/ Radio Frequency Interference shielding coatings; I) Heparin-bezalkonium chloride containing coatings applied to medical devices, provided that the total usage of all such coatings does not exceed 100 gallons/year/source. • For plastic parts and products coating operations (except for automotive/transportation and business machine plastic parts), the coating application requirements of this rule shall not apply to airbrush operations using ≤ 5 gallons of coatings per year, provided the operator complies with the applicable VOC coating limits, work practice standards, and applicable recordkeeping requirements. • For automotive/transportation and business machine plastic parts and products coating operations, the VOC coating limits and the solvent cleaning requirements shall not apply to the following, provided the operator complies with the work practice standards and coating application methods of this rule: Texture Coatings; Texture Topcoats; Gloss Reducers; Vacuum Metalizing Coatings;	stationary source with total actual emissions < 2.7 tons of VOC per 12-month rolling period prior to an emission control system from all onsite coating and cleaning activities. • Coatings sold in non-refillable aerosol containers having a capacity of one liter (1.1 quart) or less. • The coating application requirements of this rule do not apply to airbrush operations using ≤ 5 gallons per calendar year of coatings on miscellaneous plastic parts and products. • Facilities may use ≤ 55 gallons of non-compliant coatings per 12-month rolling period per stationary source provided the recordkeeping for end user requirements are satisfied. • The VOC limits for miscellaneous plastic parts and products do not apply to the following: 1) Touch up and repair coatings; 2) Stencil coatings applied on clear or transparent substrates; 3) Clear or translucent coatings; 4) Coatings applied at a paint manufacturing facility while conducting performance tests on coatings; 5) Reflective coatings applied to highway cones; 6) Mask coatings that are less than 0.5 millimeters thick (dried) and the area coated is < 25 square inches; 7) Electro-Magnetic Interference (EMI)/Radio Frequency Interference (RFI) shielding coatings; and 8) Heparin-bezalkonium chloride (HBAC)-containing coatings applied to medical devices, provided that the total usage of all such coatings do not exceed 100 gallons/year/ stationary source, provided the recordkeeping for end user requirements are satisfied. • The VOC limits for transportation and business machine plastic parts do not apply to the following: 1) Texture Coatings applied to transportation plastic parts; 2) Vacuum metalizing coatings;

<table>
<tr><th></th><th>SJVAPCD Rule 4603</th><th>SMAQMD Rule 468</th></tr>
<tr><td></td><td>Adhesion Primers; Electrostatic Preparation Coatings; Resist Coatings; and Stencil Coatings.
• Stripping of cured coatings, cured adhesives, and cured inks, except stripping of such materials from spray application equipment.</td><td>3) Gloss Reducers;
4) Adhesion primers;
5) Electrostatic preparation coatings;
6) Resist coatings; and
7) Stencil Coatings.
• Automobile and light-duty truck assembly coating operations.
• Pleasure craft coating operations.</td></tr>
<tr><td>Coating VOC or ROC Content Limits in grams/liter (pounds/gallon) less water and exempt compounds</td><td colspan="2">For Automotive/Transportation and Business Machine plastic parts and products coating operations, an operator whose VOC emissions from coating operations, including related cleaning activities, at a stationary source ≥ 2.7 tons VOC/ 12-month rolling period, before consideration of controls, shall comply with the following coating VOC limits (grams/liter)
<table>
<tr><th rowspan="2">Coating Type</th><th colspan="2">SJVAPCD Rule 4603</th><th colspan="2">SCAQMD Rule 1107</th></tr>
<tr><th>Air-Dried</th><th>Baked</th><th>Air-Dried</th><th>Baked</th></tr>
<tr><td>Low Bake/Air-Dried – Interior Parts</td><td>600</td><td>-</td><td colspan="2">-</td></tr>
<tr><td>Touch-Up and Repair Coatings</td><td colspan="2">620</td><td colspan="2">620</td></tr>
<tr><td colspan="5">High Baked Coatings (Interior and Exterior)</td></tr>
<tr><td>Flexible Primer:</td><td colspan="2">540</td><td>Interior: 600
Exterior: 580</td><td>Interior: 540
Exterior: 540</td></tr>
<tr><td>Non-Flexible Primer</td><td colspan="2">420</td><td>Interior: 600
Exterior: 580</td><td>Interior: 420
Exterior: 420</td></tr>
<tr><td>Base Coat</td><td colspan="2">520</td><td>Interior: 600
Exterior: 600</td><td>Interior: 520
Exterior: 520</td></tr>
<tr><td>Clear Coat</td><td colspan="2">480</td><td>Interior: 600
Exterior: 540</td><td>Interior: 480
Exterior: 480</td></tr>
<tr><td>Non-Base Coat/Clear Coat</td><td colspan="2">520</td><td>-</td><td>-</td></tr>
<tr><td>All Other Coatings</td><td colspan="2">-</td><td>Interior: 600
Exterior: 600</td><td>Interior: 520
Exterior: 520</td></tr>
<tr><td colspan="5">Business Machine Plastic Parts and Products</td></tr>
<tr><td>Primer</td><td colspan="2">350</td><td colspan="2">350</td></tr>
<tr><td>Topcoat</td><td colspan="2">350</td><td colspan="2">350</td></tr>
<tr><td>Texture Coat</td><td colspan="2">350</td><td colspan="2">350</td></tr>
<tr><td>Fog Coat</td><td colspan="2">260</td><td colspan="2">260</td></tr>
<tr><td>Touch-Up and Repair</td><td colspan="2">350</td><td colspan="2">350</td></tr>
<tr><td>All Other Coatings</td><td colspan="2">-</td><td colspan="2">350</td></tr>
<tr><td colspan="5">Low Bake/Air-Dried Coatings – Exterior Parts</td></tr>
<tr><td>Primer</td><td colspan="2">580</td><td>Interior: 600
Exterior: 580</td><td>420-540 based on flexibility</td></tr>
<tr><td>Base Coat</td><td colspan="2">600</td><td>Interior: 600
Exterior: 600</td><td>Interior: 520
Exterior: 520</td></tr>
<tr><td>Clear Coat</td><td colspan="2">540</td><td>Interior: 600</td><td>Interior: 480</td></tr>
</table></td></tr>
</table>

	SJVAPCD Rule 4603		SMAQMD Rule 468	
			Exterior: 540	Exterior: 480
	Non-Base Coat/Clear Coat	600	-	-
	Except for Automotive/Transportation and Business Machine plastic parts and products coating operations, an operators whose VOC emissions from coating operations, including related cleaning activities, at a stationary source ≥ 2.7 tons VOC/ 12-month rolling period, before consideration of controls, shall comply with the following coating VOC limits for plastic parts and products coating operations (grams/liter)			
	Coating Type	**SJVAPCD Rule 4603**	**SCAQMD Rule 1107**	
	General One-Component Coatings	280	-	
	General Multi-Component Coatings	420	420	
	Electric Dissipating Coatings and Shock-Free Coatings	800	800	
	Extreme Performance Coating	420 for 2-pack coating	280 - 420 based on component count	
	Metallic Coatings	420	420	
	Military Specification for 1-Pack Coatings	340	340	
	Military Specification for 2-Pack Coatings	420	420	
	Mold-Seal Coatings	760	760	
	Optical Coatings	800	800	
	Vacuum-Metalizing	800	800	
	All other coatings	-	280	
Application Equipment Requirements	Only apply coatings using the following methods: • Electrostatic application; • Electrodeposition; • HVLP spray; • Flow, Roll, Dip, Brush, Continuous coating; or • Other application method with demonstrated transfer efficiency ≥ 65% with prior APCO written approval.		Only apply coatings using the following methods: • Electrostatic spray; • Flow coat, roll coater, Dip coat; Hand application; • HVLP application equipment; • Low-Volume, Low-Pressure (LVLP) application equipment; or • Other equivalent coating application method with demonstrated transfer efficiency of ≥ HVLP application equipment and with approval by APCO and EPA.	

	SJVAPCD Rule 4603	SMAQMD Rule 468
Solvent Cleaning VOC Content Limits	25 grams/liter 0.21 pounds/gallon (material VOC content)	25 grams/liter 0.21 pounds/gallon (material VOC content)
Solvent Storage and Disposal Requirements	Store or dispose of fresh or spent solvents, waste solvent cleaning materials, coatings, adhesives, catalysts, and thinners in closed, non-absorbent and non-leaking containers. Containers shall remain closed except when depositing or removing the contents of the containers.	Use closed containers for the disposal of materials used for surface preparation, cleanup, coating application and coating removal. VOC-containing materials shall be stored in closed containers, shall be disposed of in a manner that VOC are not emitted into the atmosphere.

District Rule 4603 and SMAQMD Rule 468 contain similar VOC content requirements for plastic parts and products coating operations. District Rule 1107 contains additional categories and more stringent VOC limits in some cases. Based on the rule comparison above, District Rule 4603 is as stringent as or more stringent than SMAQMD Rule 468.

South Coast AQMD

- SCAQMD Rule 1106 (Marine and Pleasure Craft Coatings)

The following discussion will only apply to pleasure craft coating operations since District Rule 4603 does not apply to marine vessel coating operations.

	SJVAPCD Rule 4603	SCAQMD Rule 1106
Applicability	Surface coating of metal parts or products, large appliances parts or products, metal furniture, and plastic parts and products, automotive/transportation and business machine plastic parts and products, and pleasure crafts, and to the organic solvent cleaning, and the storage and disposal of all solvents and waste solvent materials.	Any person who supplies, sells, offers for sale, markets, manufactures, blends, packages, repackages, possesses or distributes any Marine or Pleasure Craft Coating and any associated solvent for use within the SCAQMD, as well as any person who applies, stores at a worksite, or solicits the application of any Marine or Pleasure Craft Coating and any associated solvent within the SCAQMD.

	SJVAPCD Rule 4603	SCAQMD Rule 1106
Exemptions	• Facilities in full compliance with this rule are exempt from the requirements of Rule 4661 (Organic Solvents). • The requirements of this rule shall not apply to the application of coatings to aircraft, aerospace vehicles, marine vessels, can, coils, and magnetic wire. • For pleasure craft coating operations, the application method requirements shall not apply to extreme gloss coating provided the operator complies with the extreme gloss coating VOC limit and the work practice standards in this rule. • Stripping of cured coatings, cured adhesives, and cured inks, except the stripping of such materials from spray application equipment. • An operator of pleasure craft coating operations whose VOC emissions from coating operations, including related cleaning activities < 2.7 tons VOC per 12-month rolling period are not subject to the VOC limits of this rule provided records are maintained.	• Marine or pleasure craft coatings with VOC content ≤ 50 g/L (less water and exempt compounds) as applied. • Marine coatings applied to interior surfaces of potable water containers. • Touch-up coatings. • Any aerosol coating products. • Application equipment transfer efficiency requirements for coatings with viscosity of 650 centipoise or greater, as applied. • Coating limit requirements for marine coatings for vessels that are intended to submerge to at least 500 feet below the surface water level with a total usage of ≤ 12 gal/year.

VOC Content Limits for Pleasure Craft Coating Operations (grams of VOC/liter of coating, less water and less exempt compounds)

Coating Type	SJVAPCD Rule 4603	SCAQMD Rule 1106
Extreme High Gloss Topcoat	490	490
High Gloss Topcoat	420	420
Pretreatment Wash Primer	780	780
Finish Primer Surfacer	420	420
High Build Primer Surfacer	340	340
Aluminum Substrate Antifoulant Coating	560	560
Other Substrate Antifoulant Coating	330	330
All other pleasure craft surface coatings for metal or plastic	420	420
Sealers	420	550
Varnishes	420	490
Teak Primer	420	775
Low-Solids	420	120

	SJVAPCD Rule 4603	SCAQMD Rule 1106
Application Equipment Requirements	Only apply coatings using the following methods: • Electrostatic application; • Electrodeposition; • HVLP spray; • Flow, Roll, Dip, Brush, Continuous coating; or • Other application method with demonstrated transfer efficiency ≥ 65% with prior APCO written approval.	Only apply coatings using the following methods: • Electrostatic application; • HVLP spray; • Brush, Dip, Roller; or • Spray application equivalent to HVLP spray; or • Other application method with demonstrated transfer efficiency ≥ HVLP spray with prior APCO written approval.
Solvent Cleaning VOC Content Limits	25 grams/liter 0.21 pounds/gallon (material VOC content)	25 grams/liter 0.21 pounds/gallon (material VOC content)
Solvent Storage and Disposal Requirements	Store or dispose of fresh or spent solvents, waste solvent cleaning materials, coatings, adhesives, catalysts, and thinners in closed, non-absorbent and non-leaking containers. Containers shall remain closed except when depositing or removing the contents of the containers.	All VOC-containing solvents used in solvent cleaning operations shall be stored in non-absorbent, non-leaking containers, which shall remain closed at all times except when filling or emptying. It is recommended that cloth or paper moistened with VOC-containing solvents be stored in closed, non-absorbent, non-leaking containers.

As demonstrated above, District Rule 4603 is as stringent as SCAQMD Rule 1106.

South Coast AQMD

- SCAQMD Rule 1107 (Coating of Metal Parts and Products)

The following table compares SCAQMD Rule 1107 to District Rule 4603 for metal parts and products coating operations under the listed categories.

	SJVAPCD Rule 4603	SCAQMD Rule 1107
Applicability	The surface coating of metal parts or products, large appliances parts or products, metal furniture, and plastic parts and products, automotive/transportation and business machine plastic parts and products, and pleasure crafts, and to the organic solvent cleaning, and the storage and disposal of all solvents and waste solvent materials.	All metal coatings operations except those performed on aerospace assembly, magnet wire, marine craft, motor vehicle, metal container, and coil coating operations. This rule does not apply to the coating of architectural components coated at the structure site or at a temporary unimproved location designated exclusively for the coating of structural components.
Exemptions	• Facilities may use of up to 55 gallons of non-compliant coatings per rolling consecutive 365-day period. All other provisions of this rule shall apply to the use of non-compliant coatings. • Facilities in full compliance with this rule are exempt from the	• The following are exempt from the coating application equipment requirements and VOC content coating limits: Stencil coatings; Safety-indicating coatings; Magnetic data storage disk coatings; Solid film lubricants; Electric-insulating and thermal-conducting coatings.

<table>
<tr><th></th><th>SJVAPCD Rule 4603</th><th>SCAQMD Rule 1107</th></tr>
<tr><td></td><td>requirements of Rule 4661 (Organic Solvents).
• The application of coatings to aircraft, aerospace vehicles, marine vessels, can, coils, and magnetic wire.
• Operations subject to District Rules 4602 (Motor Vehicle Assembly Coatings), 4612 (Motor Vehicle and Mobile Equipment Operations), or 4684 (Polyester Resin Operations).
• Stripping of cured coatings, cured adhesives, and cured inks, except stripping of such materials from spray application equipment.
• Use of 66 gallons of electrocoatings/month/facility provided the VOC content does not exceed 450 grams/liter (3.8 pounds/gallon), less water and less exempt compounds as applied.
• Photoresist operations applying coatings used for photofabrication of metal substrates with a thickness not exceeding 0.060 inch provided the usage does not exceed 10 gallons per year per facility.</td><td>• Coatings and cleaning solvents used in performance tests on coatings at paint manufacturing facilities.
• Aerosol coating products.
• Use of aggregate 55 gallons or less of essential public service coatings per year per facility.
• Use of aggregate 10 gallons or less of optical anti-reflective coatings per year per facility.
• VOC content limits for organic solvents (Table 6 of the Rule) for: Cleaning of solar cells, laser hardware, scientific instruments, or high precision optics; Cleaning in laboratory tests and analyses, or bench scale or research and development projects; Cleaning of paper-based gaskets; Cleaning of clutch assemblies where rubber is bonded to metal by means of an adhesive.
• VOC content limits for organic solvents (Table 6, Category C of the Rule) for the cleaning of application equipment used to apply coatings on satellites or to apply radiation effect coatings.</td></tr>
<tr><td>Coating VOC or ROC Content Limits in grams/liter (pounds/gallon) less water and exempt compounds</td><td colspan="2">General Coatings for Metal Parts and Products, and Large Appliance Parts or Products, or Metal Furniture Coating Operations with VOC emissions from coatings including related cleaning < 3 tons VOC per 12-month rolling period:
<table>
<tr><th rowspan="2">Coating Type</th><th colspan="2">SJVAPCD Rule 4603</th><th colspan="2">SCAQMD Rule 1107</th></tr>
<tr><th>Air-Dried</th><th>Baked</th><th>Air-Dried</th><th>Baked</th></tr>
<tr><td>General Coatings</td><td>340 (2.8)</td><td>275 (2.3)</td><td>275-340, depending on component count</td><td>275</td></tr>
<tr><td>Dip Coating of Steel Joists: Coatings with a viscosity of > 45.6 centistokes at 78°F or an average dry-film thickness of > 2.0 mils</td><td>340 (2.8)</td><td>-</td><td></td><td></td></tr>
<tr><td>Dip Coating of Steel Joists: Coatings with a viscosity of ≤ 45.6 centistokes at 78°F or an average dry-film thickness of ≤ 2.0 mils</td><td>400 (3.32)</td><td>-</td><td></td><td></td></tr>
</table>
Specialty Coatings for Metal Parts and Products, and Large Appliance Parts or Products, or Metal Furniture Coating Operations with VOC emissions from coatings including related cleaning < 3 tons VOC per 12-month rolling period:
<table>
<tr><th rowspan="2">Coating Type</th><th colspan="2">SJVAPCD Rule 4603</th><th colspan="2">SCAQMD Rule 1107</th></tr>
<tr><th>Air-Dried</th><th>Baked</th><th>Air-Dried</th><th>Baked</th></tr>
<tr><td>Camouflage</td><td>420</td><td>360</td><td>420</td><td>360</td></tr>
<tr><td>Extreme Performance</td><td>420</td><td>360</td><td>420</td><td>360</td></tr>
<tr><td>Heat Resistant</td><td>420</td><td>360</td><td>420</td><td>360</td></tr>
<tr><td>Extreme High Gloss</td><td>420</td><td>360</td><td>420</td><td>360</td></tr>
<tr><td>High Performance Architectural</td><td>420</td><td>420</td><td>420</td><td>420</td></tr>
</table></td></tr>
</table>

	SJVAPCD Rule 4603		SCAQMD Rule 1107		
	High Temperature	420	420	420	420
	Metallic Coating	420	360	420	360
	Pretreatment Coating	420	420	420	420
	Touch Up and Repair	420	360	420	360
	Silicone Release	420	420	420	420
	Solar Absorbent	420	360	420	360
	Solid Film Lubricant	880	880	Exempt	Exempt
	Large Appliance Parts or Products, or Metal Furniture Coating Operations with VOC emissions from coatings including related cleaning ≥ 3 tons VOC per 12-month rolling period:				
	Coating Type	**SJVAPCD Rule 4603**		**SCAQMD Rule 1107**	
		Air-Dried	**Baked**	**Air-Dried**	**Baked**
	General, One Component	275	275	275	275
	General, Multi-Component	340	275	340	275
	Extreme High Gloss	340	275	420	360
	Extreme Performance	420	360	420	360
	Heat Resistant	420	360	420	360
	Metallic	420	420	420	360
	Pretreatment Coating	420	420	420	420
	Solar Absorbent	420	360	420	360
Application Equipment Requirements	Only apply coatings using the following methods: • Electrostatic application; • Electrodeposition; • HVLP spray; • Flow, Roll, Dip, Brush, Continuous coating; or • Other application method with demonstrated transfer efficiency ≥ 65% with APCO approval.		Only apply coatings using the following methods: • Electrostatic application, • Flow, Dip, Roll, • HVLP spray, • Hand application methods, or • Other application methods with demonstrated transfer efficiency ≥ HVLP spray with APCO approval.		
Solvent Cleaning VOC Content Limits	25 grams/liter 0.21 pounds/gallon (material VOC content)		25 grams/liter 0.21 pounds/gallon (material VOC content)		
Solvent Storage and Disposal Requirements	Store or dispose of fresh or spent solvents, waste solvent cleaning materials, coatings, adhesives, catalysts, and thinners in closed, non-absorbent and non-leaking containers. Containers shall remain closed except when depositing or removing the contents of the containers.		All VOC-containing solvents used in solvent cleaning operations shall be stored in non-absorbent, non-leaking containers which shall remain closed at all times. It is recommended that materials moistened with VOC-containing solvents be stored in closed, non-absorbent, non-leaking containers.		

District Rule 4603 and South Coast Rule 1107 contain similar VOC content requirements for metal parts and products. Based on the rule comparison above, District Rule 4603 is as stringent as SCAQMD Rule 1107 for coating of metal parts and products.

Ventura County APCD

- VCAPCD Rule 74.24.1 (Pleasure Craft Coating and Commercial Boatyard Operations)

The following discussion will only apply to pleasure craft coating operations since District Rule 4603 does not apply to marine vessel coating operations.

	SJVAPCD Rule 4603	VCAPCD 74.24.1
Applicability	The surface coating of metal parts or products, large appliances parts or products, metal furniture, and plastic parts and products, automotive/transportation and business machine plastic parts and products, and pleasure crafts, and to the organic solvent cleaning, and the storage and disposal of all solvents and waste solvent materials.	Any person who applies, specifies the use of, or supplies coatings for marine and fresh water vessels, drilling vessels, and navigational aids, and their parts or components, including any parts subjected to unprotected shipboard conditions.
Exemptions	• Facilities in full compliance with this rule are exempt from requirements of Rule 4661 (Organic Solvents). • Application of coatings to aircraft, aerospace vehicles, marine vessels, can, coils, and magnetic wire. • For pleasure craft coating operations, the application method requirements shall not apply to extreme gloss coating provided the operator complies with the extreme gloss coating VOC limit and the work practice standards in this rule. • Stripping of cured coatings, cured adhesives, and cured inks, except stripping of such materials from spray application equipment. • An operator of pleasure craft coating operations whose VOC emissions from coating operations, including related cleaning activities < 2.7 tons VOC per 12-month rolling period are not subject to the VOC limits of this rule provided records are maintained.	• Aerosol coating products subject to California Code of Regulations, Title 17, Article 3, Aerosol Coating Products. • Coating application transfer efficiency requirements for application of any topcoat above the vessel water line. • Prohibition sales requirements to any supplier or seller of any pleasure craft coating that is shipped outside of the District for use outside the District. Prohibition sales requirements to any manufacturer of any pleasure craft coatings if the manufacturer has provided an accurate compliance statement and if: 1) The pleasure craft coating was not sold directly to a user or a sales outlet located in the District; or 2) The pleasure craft coating was sold to an independent distributor that is not a subsidiary of, or under the direct control of the manufacturer. • Surface preparation requirements to the surface preparation of fiberglass substrates.

Coating VOC or ROC Content Limits in grams/liter (pounds/gallon) less water and exempt compounds	**Coating Type**	**SJVAPCD Rule 4603**	**VCAPCD Rule 76.24.1**
	Aluminum Substrate Antifoulant	560	560
	Other Substrate Antifoulant Coating	330	Commercial – 400 Pleasure Craft – 330
	Extreme High Gloss Topcoat	490	490
	High Gloss Topcoat	420	420

	SJVAPCD Rule 4603		VCAPCD 74.24.1	
	Pretreatment Wash Primer	780		780
	Finish Primer Surfacer	420		420
	High Build Primer Surfacer	340		340
	All other pleasure craft coatings for metal or plastic	420		420
	Low-Solids Coatings	420		120
Application Equipment Requirements	Only apply coatings using the following methods: • Electrostatic application; • Electrodeposition; • HVLP spray; • Flow, Roll, Dip, Brush, Continuous coating; or • Other application method with demonstrated transfer efficiency ≥ 65% with APCO approval.		Only apply coatings using one of following methods properly: • Hand application methods; • HVLP spray; or • Any other application method which has been demonstrated to be capable of achieving a transfer efficiency of at least that of an HVLP application or an alternative method that is capable of achieving a transfer efficiency equal to or better than HVLP spray.	
Solvent Cleaning VOC Content Limits	25 grams/liter 0.21 pounds/gallon (material VOC content)		• 200 grams/liter (1.7 pounds/gallon) ROC for surface preparation. • No person shall use methylene chloride as a cleanup solvent.	
Solvent Storage and Disposal Requirements	Store or dispose of fresh or spent solvents, waste solvent cleaning materials, coatings, adhesives, catalysts, and thinners in closed, non-absorbent and non-leaking containers. Containers shall remain closed except when depositing or removing the contents of the containers.		All ROC containing materials shall be stored in nonabsorbent, non-leaking containers, which shall be closed except when adding or removing materials.	

District Rule 4603 and VCAPCD Rule 74.24.1 contain similar VOC content requirements for pleasure crafts. VCAPCD contains a VOC limit for low-solids coatings, however District Rule 1107 contains more stringent solvent cleaning VOC content limits. Based on the rule comparison above, District Rule 4603 is overall as stringent as VCAPCD Rule 74.24.1 for pleasure craft coating operations.

Potential Emission Reduction Opportunities

As demonstrated above, Rule 4603 currently has in place the most stringent measures feasible to implement in the Valley. Therefore, the District did not identify any additional emission reduction opportunities at this time.

Contingency Measure Evaluation

As discussed in Chapter 6, contingency measures are immediately implemented ONLY if triggered by an unanticipated milestone or attainment failure. The District reviewed this control measure for a potential contingency component. The District concludes that this control measure is not an appropriate contingency measure because the most stringent feasible controls are already in place, and a contingency trigger is incompatible with the technologies involved in reducing emissions from this category.

Evaluation Findings

Rule 4603 meets or exceeds federal RACT requirements for this source category based upon evaluation of applicable federal regulations, state standards, and other air districts' rules. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

C.29 RULE 4604 CAN AND COIL COATING OPERATIONS

Emissions Inventory (Summer Average – Tons per day)

	2017	2023	2026	2029	2032	2035	2037
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VOC	0.15	0.16	0.17	0.17	0.17	0.18	0.19

District Rule 4604 Description

District Rule 4604 applies to can and coil coating operations, and to organic solvent cleaning, storage and disposal associated with can and coil coating operations.

The rule limits the VOC content of different compliant coatings and allows the use of non-compliant coatings with an emission control device to reduce VOC emissions. These conditions also include alternative emission control plans. The emission control system or alternative emission control plan must reduce emissions to no more than the amount of VOCs that would have been emitted had rule-compliant coatings been used. The rule contains provisions for organic solvent cleaning, organic solvent storage, disposal requirements, application methods for coatings, monitoring, and recordkeeping.

The recordkeeping requirement in Section 6.2 of Rule 4604 is consistent with EPA's policy to keep and maintain records for at least five years.

Rule 4604 VOC Limits

Rule 4604, last amended on September 20, 2007, requires units to meet the following VOC limits, expressed as grams of VOC per liter of coating, as applied, excluding water and exempt compounds.

Table C-5 VOC Content Limits for Two-Piece Can Coating Operations

Two-Piece Can Coating Operations			
Coating Type	**Application Method**	**g/l**	**lb/gal**
Interior Sheet Base Coating	Any	225	1.9
Interior Body Spray	Spray	420	3.5
Exterior Sheet Base Coating	Any	250	2.1
Exterior Body Spray	Spray	420	3.5
Interior Overvarnish	Any	225	1.9
Exterior Overvarnish	Any	250	2.1
End Coating (Interior or Exterior)	Spray or roll coat	420	3.5
End Seal Compound	Any	20	0.2
Repair Coating	Spray	750	6.3

Table C-6 VOC Content Limits for Three-Piece Can Coating Operations

Three-Piece Can Coating Operations			
Coating Type	**Application Method**	**g/l**	**lb/gal**
Sheet Base Coating (Interior or Exterior)	Any	225	1.9
Interior Body Spray	Spray	360	3.0
Exterior Body Spray	Spray	420	3.5
Overvarnish (Interior or Exterior)	Any	225	1.9
End Coating (Interior or Exterior)	Spray or roll coat	225	1.9
Side Seam Coating	Spray	660	5.5
End Seal Compound	Any	20	0.2
Repair Coating	Spray	750	6.3
Sheet Base Coating (Interior or Exterior)	Any	225	1.9

Table C-7 VOC Content Limits for Drums, Pails and Lids Coating Operations

Drums, Pails and Lids Coating Operations			
Coating Type	**Application Method**	**g/l**	**lb/gal**
Sheet Base Coating (Interior or Exterior)	Any	225	1.9
Interior Body Spray	Spray		
New		420	3.5
Reconditioned		510	4.3
Exterior Body Spray	Spray		
New		340	2.8
Reconditioned		420	3.5
Overvarnish (Interior or Exterior)	Any	225	1.9
Interior End Coating	Spray or roll coat		
New		420	3.5
Reconditioned		510	4.3
Exterior End Coating	Spray or roll coat		
New		340	2.8
Reconditioned		420	3.5
Side Seam Coating	Spray	660	5.5
End Seal Compound	Any	60	0.5

Table C-8 VOC Content Limits for Coil Coating Operations

Coil Coating Operations		
Coating Type	**g/l**	**lb/gal**
Prime and topcoat or single coat operation	200	1.7

Table C-9 VOC Content Limits for Organic Solvents

Organic Solvent Limits	
Solvent Preparation, Cleanup, Repair and Maintenance Cleaning, and Cleaning of Coating Application Equipment	25 g/l
Sheet Coater for Three-Piece Can	250 g/l

How does District Rule 4604 compare with federal and state rules and regulations?

Federal Regulations

There are no Alternative Control Techniques applicable to this source category.

A. Control Techniques Guidelines (CTG)

District staff conducted a comprehensive evaluation of EPA CTG requirements. EPA has not adopted updates to the following CTG since EPA found that Rule 4604 met RACT requirements through EPA's approval of the *2014 RACT SIP*. Therefore, further evaluation is not necessary at this time.

- *Control of Volatile Organic Emissions from Existing Stationary Sources – Volume II: Surface Coating of Cans, Coils, Paper, Fabrics, Automobiles, and Light-Duty Trucks (EPA-450/2-77-008 1977/05)*

B. New Source Performance Standards (NSPS)

District staff conducted a comprehensive evaluation of EPA NSPS requirements. EPA has not adopted updates to the following NSPS since EPA found that Rule 4604 met RACT requirements through EPA's approval of the *2014 RACT SIP*. Therefore, further evaluation is not necessary at this time.

- *40 CFR 60 Subpart TT - Standards of Performance for Metal Coil Surface Coating (2000/10)*
- *40 CFR 60 Subpart WW - Standards of Performance for Beverage Can Surface Coating Industry (2000/10)*

State Regulations

There are no state regulations applicable to this source category.

How does District Rule 4604 compare to rules in other air districts?

District staff compared emission limits, optional control requirements, and work practice standards in District Rule 4604 to comparable requirements in rules from the following California nonattainment areas:

- Bay Area AQMD Regulation 8, Rule 11 (Amended November 19, 1997)[159]

[159] BAAQMD. *Regulation 8, Rule 11 (Metal Container, Closure and Coil Coating).* (Amended November 19, 1997). Retrieved from: https://www.baaqmd.gov/~/media/dotgov/files/rules/reg-8-rule-11-metal-container-closure-and-coil-coating/documents/rg0811.pdf?la=en&rev=405be2308fdd49218df25c74254cc469.

- Sacramento Metropolitan AQMD Rule 452 (Amended September 25, 2008)[160]
- South Coast AQMD Rule 1125 (Amended March 7, 2008)[161]

Ventura County APCD does not have any analogous rules for this source category. The District reviewed the rule requirements implemented prior to EPA's approval of the *2014 RACT SIP*, and found that Rule 4604 continues to implement RACT levels of control.

Potential Emission Reduction Opportunities

As demonstrated above, Rule 4604 currently has in place the most stringent measures feasible to implement in the Valley. No additional emission reduction opportunities have been identified at this time.

Contingency Measure Evaluation

As discussed in Chapter 6, contingency measures are immediately implemented ONLY if triggered by an unanticipated milestone or attainment failure. The District reviewed this control measure for a potential contingency component. The District concludes that this control measure is not an appropriate contingency measure because the most stringent feasible controls are already in place, and a contingency trigger is incompatible with the technologies involved in reducing emissions from this category.

Evaluation Findings

Rule 4604 meets or exceeds federal RACT requirements for this source category based upon evaluation of applicable federal regulations, state standards, and other air districts' rules. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

[160] SMAQMD. *Rule 452 (Can Coating).* (Amended September 25, 2008). Retrieved from: http://www.airquality.org/ProgramCoordination/Documents/rule452.pdf.
[161] SCAQMD. *Rule 1125 (Metal Container, Closure, and Coil Coating Operations).* (Amended March 7, 2008). Retrieved from: http://www.aqmd.gov/docs/default-source/rule-book/reg-xi/rule-1125.pdf?sfvrsn=4.

C.30 RULE 4605 AEROSPACE ASSEMBLY AND COMPONENT COATING OPERATIONS

Emissions Inventory (Summer Average – Tons per day)

	2017	2023	2026	2029	2032	2035	2037
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VOC	0.01	0.01	0.01	0.01	0.01	0.01	0.01

District Rule 4605 Description

District Rule 4605, amended on June 16, 2011, limits VOC emissions from aerospace coatings and adhesives, the organic solvent cleaning, and the storage and disposal of solvents and waste solvent materials associated with the use of aerospace coatings and adhesives and provides the administrative requirements for recording and measuring the emissions. This rule shall apply to the manufacturing, assembling, coating, masking, bonding, paint stripping, surface cleaning, service, and maintenance of aerospace components, the cleanup of equipment, and the storage and disposal of solvents and waste solvent materials associated with these operations.

How does District Rule 4605 compare with federal and state rules and regulations?

Federal Regulations

There are no Alternative Control Techniques or New Source Performance Standards applicable to this source category.

A. Control Techniques Guidelines (CTG)

District staff conducted a comprehensive evaluation of EPA CTG requirements. EPA has not adopted updates to the following CTG since EPA found that Rule 4605 met RACT requirements through EPA's approval of the *2014 RACT SIP*. Therefore, further evaluation is not necessary at this time.

- *Control of Volatile Organic Compound Emissions from Coating Operations at Aerospace Manufacturing and Rework Operations (EPA-453/R-97-004 1997/12)*

State Regulations

There are no state regulations applicable to this source category.

How does District Rule 4605 compare to rules in other air districts?

District staff compared emission limits, optional control requirements, and work practice standards in District Rule 4605 to comparable requirements in rules from the following California nonattainment areas:

- Bay Area AQMD Regulation 8, Rule 29 (Amended December 20, 1995)[162]
- Sacramento Metropolitan AQMD Rule 456 (Amended October 23, 2009)[163]
- South Coast AQMD Rule 1124 (Amended September 21, 2001)[164]
- Ventura County APCD Rule 74.13 (Amended September 11, 2012)[165]

The District reviewed the rule requirements implemented prior to EPA's approval of the *2014 RACT SIP*, and found that Rule 4605 continues to implement RACT levels of control.

Potential Emission Reduction Opportunities

As demonstrated above, Rule 4605 currently has in place the most stringent measures feasible to implement in the Valley. No additional emission reduction opportunities have been identified at this time.

Contingency Measure Evaluation

As discussed in Chapter 6, contingency measures are immediately implemented ONLY if triggered by an unanticipated milestone or attainment failure. The District reviewed this control measure for a potential contingency component. The District concludes that this control measure is not an appropriate contingency measure because the most stringent feasible controls are already in place, and a contingency trigger is incompatible with the technologies involved in reducing emissions from this category.

Evaluation Findings

Rule 4605 meets or exceeds federal RACT requirements for this source category based upon evaluation of applicable federal regulations, state standards, and other air districts' rules. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

---

[162] BAAQMD. *Regulation 8, Rule 29 (Aerospace Assembly and Component Coating Operations).* (Amended December 20, 1995). Retrieved from: https://www.baaqmd.gov/~/media/dotgov/files/rules/reg-8-rule-29-aerospace-assembly-and-component-coating-operations/documents/rg0829.pdf?la=en&rev=361efa14654b4a8ca1c067d6446eabe1.

[163] SMAQMD. *Rule 456 (Aerospace Assemble and Component Coating Operations).* (Amended October 23, 2008). Retrieved from: http://www.airquality.org/ProgramCoordination/Documents/rule456.pdf.

[164] SCAQMD. *Rule 1124 (Aerospace Assembly and Component Manufacturing Operations).* (Amended September 21, 2001). Retrieved from: http://www.aqmd.gov/docs/default-source/rule-book/reg-xi/rule-1124.pdf?sfvrsn=4.

[165] VCAPCD. *Rule 74.13 (Aerospace Assemble and Component Manufacturing Operations).* (Amended September 11, 2012). Retrieved from: http://www.vcapcd.org/Rulebook/Reg4/RULE%2074.13.pdf.

C.31 RULE 4606 WOOD PRODUCTS AND FLAT WOOD PANELING PRODUCTS COATING OPERATIONS

Emissions Inventory (Summer Average – Tons per day)

	2017	2023	2026	2029	2032	2035	2037
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VOC	1.89	2.17	2.27	2.35	2.51	2.75	2.97

District Rule 4606 Description

District Rule 4606, amended on October 16, 2008, controls VOC emissions from wood products coating operations and flat wood paneling products coating operations, and from the organic solvent cleaning, storage and disposal of solvents, and waste solvent materials associated with such coating operations. District Rule 4606 specifies the VOC content limits of coatings used on wood products, which range from 120 grams/liter to 750 grams/liter (excluding water and exempt compounds, as applied), depending on the type of coating. For flat wood paneling products, the VOC content limit is 250 grams/liter (excluding water and exempt compounds, as applied). The VOC content limit for solvents used in cleaning operations is 25 grams/liter of material. In lieu of complying with the specified VOC content limits of coatings and solvents, operators may use a VOC emission control system with specified capture and control efficiency of at least 85 percent for wood coating operations, and at least 90 percent for flat wood paneling products coating operations.

How does District Rule 4606 compare with federal and state rules and regulations?

Federal Regulations

There are no Alternative Control Techniques or New Source Performance Standards applicable to this source category.

A. Control Techniques Guidelines (CTG)

District staff conducted a comprehensive evaluation of EPA CTG requirements. EPA has not adopted updates to the following CTGs since EPA found that Rule 4606 met RACT requirements through EPA's approval of the *2014 RACT SIP*. Therefore, further evaluation is not necessary at this time.

- *Control Techniques Guidelines for Wood Furniture Manufacturing Operations (EPA-453/R-96-007 1994/04)*
- *Control Techniques Guidelines for Flat Wood Paneling Coatings (EPA-453-06-004 2006/09)*

State Regulations

There are no state regulations applicable to this source category.

How does District Rule 4606 compare to rules in other air districts?

District staff compared VOC limits, optional control requirements, and work practice standards in District Rule 4606 to comparable requirements in rules from the following California nonattainment areas:

- BAAQMD Regulation 8, Rule 23 (Amended December 20, 1995)[166]
- BAAQMD Regulation 8, Rule 32 (Amended August 5, 2009)[167]
- Sacramento Metropolitan AQMD Rule 463 (Amended September 25, 2008)[168]
- South Coast AQMD Rule 1136 (Amended June 14, 1996)[169]
- South Coast AQMD Rule 1104 (Amended August 13, 1999)[170]
- Ventura County APCD Rule 74.30 (Amended June 27, 2006)[171]

The District reviewed the rule requirements implemented prior to EPA's approval of the *2014 RACT SIP*, and found that Rule 4604 continues to implement RACT levels of control and no further evaluation is needed.

Potential Emission Reduction Opportunities

As demonstrated above, Rule 4606 currently has in place the most stringent measures feasible to implement in the Valley. Therefore, the District did not identify any additional emission reduction opportunities at this time.

Contingency Measure Evaluation

As discussed in Chapter 6, contingency measures are immediately implemented ONLY if triggered by an unanticipated milestone or attainment failure. The District reviewed this control measure for a potential contingency component. The District concludes that this control measure is not an appropriate contingency measure because the most

---

[166] BAAQMD. *Regulation 8 Rule 23 (Coating of Flat Wood Paneling and Wood Flat Stock).* (Amended December 20, 1995). Retrieved from: https://www.baaqmd.gov/~/media/dotgov/files/rules/reg-8-rule-23-coating-of-flat-wood-paneling-and-wood-flat-stock/documents/rg0823.pdf?la=en&rev=f6166d266fc0406eaa3f201f9e317ef2

[167] BAAQMD. *Regulation 8 Rule 32 (Wood Products Coatings).* (Amended August 5, 2009). Retrieved from: https://www.baaqmd.gov/~/media/dotgov/files/rules/reg-8-rule-32-wood-products-coatings/documents/rg0832.pdf?la=en&rev=d9e2834ea6954eb694bef97b64bd6d94

[168] SMAQMD. *Rule 463 (Wood Products Coatings).* (Amended September 25, 2008). Retrieved from: http://www.airquality.org/ProgramCoordination/Documents/rule463.pdf

[169] SCAQMD. *Rule 1136 (Wood Products Coatings).* (Amended June 14, 1996). Retrieved from: https://www.aqmd.gov/docs/default-source/rule-book/reg-xi/rule-1136.pdf?sfvrsn=4

[170] SCAQMD. *Rule 1104 (Wood Flat Stock Coating Operations).* (Amended August 13, 1999). Retrieved from: https://www.aqmd.gov/docs/default-source/rule-book/reg-xi/rule-1104-wood-flat-stock-coating-operations.pdf?sfvrsn=4

[171] VCAPCD. *Rule 74.30 (Wood Products Coatings).* (Amended June 27, 2006). Retrieved from: http://www.vcapcd.org/Rulebook/Reg4/RULE%2074.30.pdf

stringent feasible controls are already in place, and a contingency trigger is incompatible with the technologies involved in reducing emissions from this category.

Evaluation Findings

Rule 4606 meets or exceeds federal RACT requirements for this source category based upon evaluation of applicable federal regulations, state standards, and other air districts' rules. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

C.32 RULE 4607 GRAPHIC ARTS AND PAPER FILM, FOIL, AND FABRIC COATINGS

Emissions Inventory (Summer Average – Tons per day)

	2017	2023	2026	2029	2032	2035	2037
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VOC	5.91	5.53	5.63	5.64	5.72	5.84	5.95

District Rule 4607 Description

This source category includes any graphic arts printing operation, to any paper, fabric film, or foil coating operation, to the organic solvent cleaning, and to the storage and disposal of solvents and waste solvent materials associated with these operations.

How does District Rule 4607 compare with federal and state rules and regulations?

Federal Regulations

A. Control Techniques Guidelines (CTG)

District staff conducted a comprehensive evaluation of EPA CTG requirements. EPA has not adopted updates to the following CTGs since EPA found that Rule 4607 met RACT requirements through EPA's approval of the *2014 RACT SIP*. Therefore, further evaluation is not necessary at this time.

- *Control Techniques Guidelines for Control of VOCs from Existing Stationary Sources – Volume II: Surface Coating of Cans, Coils, Paper, Fabrics, Automobiles, and Light-Duty Trucks (EPA-450/2-77-008 1977/05)*
- *Control Techniques Guidelines for Control of VOCs from Existing Stationary Sources – Volume VIII: Graphic Arts - Rotogravure and Flexography (EPA-450/2-78-033 1978/12)*
- *Control Techniques Guidelines for Offset Lithographic Printing and Letterpress Printing (EPA-453/R-06-002 2006/09)*
- *Control Techniques Guidelines for Flexible Package Printing (EPA-453/R-06-003 2006/09)*
- *Control Techniques Guidelines for Paper, Film, and Foil Coatings (EPA 453/R-07-003 2007/09)*

B. Alternative Control Techniques (ACT)

District staff conducted a comprehensive evaluation of EPA ACT requirements. EPA has not adopted updates to the following ACT since EPA found that Rule 4607 met

RACT requirements through EPA's approval of the *2014 RACT SIP*. Therefore, further evaluation is not necessary at this time.

- *Alternative Control Techniques Document - Control of Volatile Organic Compound Emissions from Offset Lithographic Printing (EPA-453-R-95-001 1993/09)*

C. New Source Performance Standards (NSPS)

District staff conducted a comprehensive evaluation of EPA NSPS requirements. EPA has not adopted updates to the following NSPS since EPA found that Rule 4607 met RACT requirements through EPA's approval of the *2014 RACT SIP*. Therefore, further evaluation is not necessary at this time.

- *40 CFR 60 Subpart QQ - Standards of Performance for the Graphic Arts Industry: Publication Rotogravure Printing (2000/10)*
- *40 CFR 60 Subpart RR - Standards of Performance for Pressure Sensitive Tape and Label Surface Coating Operations (2000/10)*
- *40 CFR 60 Subpart FFF - Standards of Performance for Flexible Vinyl and Urethane Coating and Printing (2000/10)*
- *40 CFR 60 Subpart SSS – Standards of Performance for Magnetic Tape Coating Facilities (1988/12)*

State Regulations

There are no state regulations applicable to this source category.

How does District Rule 4607 compare to rules in other air districts?

District staff compared VOC content limits, optional control requirements, and work practice standards in District Rule 4607 to comparable requirements in rules from the following California nonattainment areas:

- Bay Area AQMD Regulation 8, Rule 4 (Amended October 16, 2002)[172]
- Bay Area AQMD Regulation 8, Rule 12 (Amended December 20, 1995)[173]
- Bay Area AQMD Regulation 8, Rule 20 (Amended November 19, 2008)[174]
- Sacramento Metropolitan AQMD Rule 450 (Amended October 23, 2008)[175]

[172] BAAQMD. *Regulation 8 Rule 4 (General Solvent and Surface Coating Operations).* (Amended October 2002). Retrieved from: https://www.baaqmd.gov/~/media/dotgov/files/rules/reg-8-rule-4-general-solvent-and-surface-coating-operations/documents/rg0804.pdf?la=en&rev=ac49766b34a34a969cee55dfcfb1d779

[173] BAAQMD. *Regulation 8 Rule 12 (Paper, Fabric and Film Coating).* (Amended December 1995). Retrieved from: https://www.baaqmd.gov/~/media/dotgov/files/rules/reg-8-rule-12-paper-fabric-and-film-coating/documents/rg0812.pdf?la=en&rev=384923f72f4b4850bb184f2e458ce83e

[174] BAAQMD. *Regulation 8 Rule 20 (Graphic Arts Printing and Coating Operations).* (Amended November 2008). Retrieved from: https://www.baaqmd.gov/~/media/dotgov/files/rules/reg-8-rule-20-graphic-arts-printing-and-coating-operations/documents/rg0820.pdf?la=en&rev=2149e8ddfdce45d4ab9c6a3dcbbd0a73

[175] SMAQMD. *Rule 450 (Graphic Arts Operation).* (Amended October 2008). Retrieved from: http://www.airquality.org/ProgramCoordination/Documents/rule450.pdf

- South Coast AQMD Rule 1128 (Amended March 8, 1996)[176]
- South Coast AQMD Rule 1130 (Amended May 2, 2014)[177]
- South Coast AQMD Rule 1130.1 (Amended December 13, 1996)[178]
- South Coast AQMD Rule 1171 (Amended May 1, 2009)[179]
- Ventura County APCD Rule 74.3 (Amended December 10, 1991)[180]
- Ventura County APCD Rule 74.19 (Amended June 14, 2011)[181]
- Ventura County APCD Rule 74.19.1 (Amended November 11, 2003)[182]

The District reviewed the rule requirements implemented prior to EPA's approval of the *2014 RACT SIP*, and found that Rule 4607 continues to implement RACT levels of control. The below comparison table demonstrates that, for more recently amended rules, District Rule 4607 continues to meet RACT.

South Coast AQMD

- SCAQMD Rule 1130 (Graphic Arts)

	SJVAPCD Rule 4607	SCAQMD Rule 1130
Applicability	Any graphic arts printing operation, to digital printing operations, and to any paper, film, foil, or fabric coating operation and to the organic solvent cleaning materials and processes associated with such operations.	Any person performing graphic arts operations or who supplies, sells, offers for sale, markets, manufactures, blends, repackages, stores at a worksite, distributes, applies or solicits the application of graphic arts materials for use in the District.
Exemptions	• Requirements, except for recordkeeping, do not apply to: ○ Blanket repair materials used in containers of 4 fluid ounces or less. ○ Graphic arts printing operations emitting less than 400 lbs of VOC per calendar month. ○ Any graphic arts printing operation that emits less than 200 lbs of VOC per 12 rolling consecutive calendar months. ○ Digital printers and digital printing operations.	• Blanket repair materials used in containers of 4 fluid ounces or less. • Graphic arts materials with VOC content of no more than 10 g/L. • Fountain solutions used on proof presses. • Coating operations subject to other rules of Regulation XI. • Aerosol coating products. • Solar-control window film. • Heat-applied transfer decals. • Graphic arts on ceramic materials. • Circuitry printing. • Sterilization indicating inks.

[176] SCAQMD. *Rule 1128 (Paper, Fabric, and Film Coating Operations).* (Amended March 1996). Retrieved from: http://www.aqmd.gov/docs/default-source/rule-book/reg-xi/rule-1128.pdf?sfvrsn=4
[177] SCAQMD. *Rule 1130 (Graphic Arts).* (Amended May 2014). Retrieved from: http://www.aqmd.gov/docs/default-source/rule-book/reg-xi/rule-1130.pdf?sfvrsn=4
[178] SCAQMD. *Rule 1130.1 (Screen Printing Operations).* (Amended December 1996). Retrieved from: http://www.aqmd.gov/docs/default-source/rule-book/reg-xi/rule-1130-1.pdf?sfvrsn=4
[179] SCAQMD. *Rule 1171 (Solvent Cleaning Operations).* (Amended May 2009). Retrieved from: http://www.aqmd.gov/docs/default-source/rule-book/reg-xi/rule-1171.pdf?sfvrsn=4
[180] VCAPCD. *Rule 74.3 (Paper, Fabric and Film Coating Operations).* (Amended December 1991). Retrieved from: http://www.vcapcd.org/Rulebook/Reg4/RULE%2074.3.pdf
[181] VCAPCD. *Rule 74.19 (Graphic Arts).* (Amended June 2011). Retrieved from: http://www.vcapcd.org/Rulebook/Reg4/RULE%2074.19.pdf
[182] VCAPCD. *Rule 74.19.1 (Screen Printing Operations).* (Amended November 2003). Retrieved from: http://www.vcapcd.org/Rulebook/Reg4/RULE%2074.19.1.pdf

	SJVAPCD Rule 4607	SCAQMD Rule 1130
	○ These exemptions do not apply to paper, film, foil, or fabric coating operations. • Proof presses. • Aerosol adhesives. • Application of coatings and use of cleaning solvents in creating fine arts paintings. • Stripping of cured coatings, cured adhesives, and cured inks, except the stripping of such materials from spray application equipment. • Cleaning operations in printing pre-press or graphic arts pre-press areas, including the cleaning of film processors, color scanners, plate processors, film cleaning, and plate cleaning. • Paper, film, foil, or fabric coating requirements do not apply to application of coatings via aerosol products. • VOC content limits for solvent cleaning do not apply to cleaning in laboratory tests and analyses, or bench scale or research and development projects.	• Specific prohibition of sales and use requirements shall not apply to persons offering graphic arts materials for sale to, selling graphic arts materials to, distributing graphic arts materials to, or requiring the use of graphic arts materials from, persons who are operating an approved emission control system pursuant to the Rule. • Prohibition of sales and use requirements shall not apply to graphic arts materials which will be used solely outside of the District. • VOC content requirements for graphic arts materials shall not apply to metallic and matte finish inks provided they meet specifications outlined by the rule. • Facilities operating under the exemptions for metallic and matte finish inks whose actual emissions exceed 10 tons in any calendar year shall be subject to VOC content requirements for graphic arts materials and retain records. • Prohibition of storage provisions shall not apply to a worksite that stores graphic arts materials provided they meet certain requirements. • VOC content of graphic arts materials requirements shall not apply to postal cancellation inks provided the VOC emissions from these inks, at a facility, do not exceed 60 pounds per calendar month. • VOC contents for fountain solutions shall not apply to sheet-fed offset presses that have a sheet size no larger than 11 inches by 17 inches, or any offset press if the total solution reservoir capacity is one gallon or less, provided the VOC content of the fountain solution used contains no more than 80 g/L of material, as applied, or if using a refrigerated chiller, no more than 100 g/L.
Requirements	VOC Limits: Flexographic Ink Porous Substrates	
	225 g/L	225 g/L

	SJVAPCD Rule 4607	SCAQMD Rule 1130
	VOC Limits: Flexographic Ink on Non-Porous Substrates	
	300 g/L	300 g/L
	VOC Limits: Coatings and Inks	
	300 g/L	300 g/L
	VOC Limits: Adhesives and Web Splicing Adhesives	
	150 g/L	150 g/L
	VOC Limits: Fountain Solution	
	Range from 1.6% - 8%	Range from 8% - 10%
	Overall Capture and Control Efficiency	
	90%	85% for publication gravure and 75% for all other graphic arts operations.
	Other Requirements	
	Cleaning activities that use solvents with VOC content greater than 25 g/L of material shall be performed by one or more of the approved methods.	Matte finish and metallic ink VOC content limits only apply at facilities with potential to emit and actual emissions not more than 10 tpy of VOCs. Operator has a limit on the total quantity of matte finish and metallic coating used each day and each year. If a source does not meet the daily/annual coatings usage or total facility emission requirements for matte finish and metallic coatings, the general coating VOC content limit of 300 g/L (less water and exempt compounds) applies.

District Rule 4607 and SCAQMD Rule 1130 contain equivalent VOC content limits for the majority of categories. District Rule 4607 requires more stringent control efficiencies at 90%, whereas SCAQMD Rule 1130 requires 75% – 85%. Overall, District Rule 4607 is at least as stringent as or more stringent than SCAQMD Rule 1130.

Potential Emission Reduction Opportunities

As demonstrated above, Rule 4607 currently has in place the most stringent measures feasible to implement in the Valley. Therefore, the District did not identify any additional emission reduction opportunities at this time.

Contingency Measure Evaluation

As discussed in Chapter 6, contingency measures are immediately implemented ONLY if triggered by an unanticipated milestone or attainment failure. The District reviewed this control measure for a potential contingency component. The District concludes that this control measure is not an appropriate contingency measure because the most stringent feasible controls are already in place, and a contingency trigger is incompatible with the technologies involved in reducing emissions from this category.

Evaluation Findings

Rule 4607 meets or exceeds federal RACT requirements for this source category based upon evaluation of applicable federal regulations, state standards, and other air districts' rules. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

C.33 RULE 4610 GLASS COATING OPERATIONS

Emissions Inventory (Summer Average – Tons per day)

	2017	2023	2026	2029	2032	2035	2037
NOx	n/a	n/a	n/a	n/a	n/a	n/a	n/a
VOC	n/a	n/a	n/a	n/a	n/a	n/a	n/a

The emissions from this rule are accounted for in the discussion for Rule 4354 (Glass Melting Furnaces).

District Rule 4610 Description

The requirements of this rule apply to any major source that coats glass products with VOC-containing materials. The purpose of this rule is to limit the emissions of VOCs from the coating of glass products.

How does District Rule 4610 compare with federal and state rules and regulations?

Federal Regulations

There are no Control Techniques Guidelines, Alternative Control Techniques, or New Source Performance Standards applicable to this source category.

State Regulations

How does District Rule 4610 compare to rules in other air districts?

District staff compared emission limits, optional control requirements, and work practice standards in District Rule 4610 to comparable requirements in rules from the following California nonattainment areas:

- Bay Area AQMD Regulation 8, Rule 4 (Amended October 16, 2002)[183]
- South Coast AQMD Rule 1145 (Amended December 4, 2009)[184]

Sacramento Metropolitan AQMD and Ventura County APCD do not have analogous rules applicable to this source category.

The District reviewed the rule requirements implemented prior to EPA's approval of the *2014 RACT SIP*, and found that Rule 4610 continues to implement RACT levels of control.

[183] BAAQMD. *Regulation 8, Rule 4 (General Solvent and Surface Coating Operations).* (Amended October 16, 2002). Retrieved from: https://www.baaqmd.gov/~/media/dotgov/files/rules/reg-8-rule-4-general-solvent-and-surface-coating-operations/documents/rg0804.pdf?la=en&rev=ac49766b34a34a969cee55dfcfb1d779.
[184] SCAQMD. *Rule 1145 (Plastic, Rubber, Leather and Glass Coatings).* (Amended December 4, 2009). Retrieved from: http://www.aqmd.gov/docs/default-source/rule-book/reg-xi/rule-1145.pdf?sfvrsn=4.

Potential Emission Reduction Opportunities

As demonstrated above, Rule 4610 currently has in place the most stringent measures feasible to implement in the Valley. Therefore, the District did not identify any additional emission reduction opportunities at this time.

Contingency Measure Evaluation

As discussed in Chapter 6, contingency measures are immediately implemented ONLY if triggered by an unanticipated milestone or attainment failure. The District reviewed this control measure for a potential contingency component. The District concludes that this control measure is not an appropriate contingency measure because the most stringent feasible controls are already in place, and a contingency trigger is incompatible with the technologies involved in reducing emissions from this category.

Evaluation Findings

Rule 4610 meets or exceeds federal RACT requirements for this source category based upon evaluation of applicable federal regulations, state standards, and other air districts' rules. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

C.34 RULE 4612 MOTOR VEHICLE AND MOBILE EQUIPMENT COATING OPERATIONS

Emissions Inventory (Summer Average – Tons per day)

	2017	2023	2026	2029	2032	2035	2037
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VOC	1.67	1.79	1.90	2.01	2.12	2.23	2.30

District Rule 4612 Description

This rule applies to any person who supplies, sells, offers for sale, manufactures, or distributes any automotive coating for use within the District, as well as any person who uses, applies, or solicits the use or application of any automotive coating within the District. The purpose of this rule is to limit VOC emissions from coatings of motor vehicles, mobile equipment, and associated parts and components, and associated organic solvent cleaning, storage, and disposal.

How does District Rule 4612 compare with federal and state rules and regulations?

Federal Regulations

A. Control Techniques Guidelines (CTG)

District staff conducted a comprehensive evaluation of EPA CTG requirements. EPA has not adopted updates to the following CTGs since EPA found that Rule 4612 met RACT requirements through EPA's approval of the *2014 RACT SIP*. Therefore, further evaluation is not necessary at this time.

- *Control of Volatile Organic Emissions from Existing Stationary Sources - Volume II: Surface Coating of Cans, Coils, Paper, Fabrics, Automobiles, and Light-Duty Trucks (EPA-450/2-77-008 1977/05)*
- *Control Techniques Guidelines for Automobile and Light-Duty Truck Assembly Coatings (EPA-453/R-08-006 2008/09)*

B. Alternative Control Techniques (ACT)

District staff conducted a comprehensive evaluation of EPA ACT requirements. EPA has not adopted updates to the following ACT since EPA found that Rule 4612 met RACT requirements through EPA's approval of the *2014 RACT SIP*. Therefore, further evaluation is not necessary at this time.

- *Alternative Control Techniques Document - Surface Coating of Automotive/Transportation and Business Machine Plastic Parts (EPA-453/R-94-017 1994/02)*

C. New Source Performance Standards (NSPS)

District staff conducted a comprehensive evaluation of EPA NSPS requirements. EPA has not adopted updates to the following NSPS since EPA found that Rule 4612 met RACT requirements through EPA's approval of the *2014 RACT SIP*. Therefore, further evaluation is not necessary at this time.

- *40 CFR 60 Subpart MM - Standards of Performance for Automobile and Light Dusty Truck Surface Coating Operations (1994/10)*

State Regulations

- *Title 17, Section 93112 – Airborne Toxic Control Measure (ATCM) for Emissions of Hexavalent Chromium and Cadmium from Motor Vehicle and Mobile Equipment Coatings (2002/08)*

This regulation prohibits the sale and supply of motor vehicle and/or mobile equipment coatings manufactured on or after January 1, 2003 that contain hexavalent chromium or cadmium. These compounds are not VOCs. Therefore, this regulation does not contain requirements to reduce VOC emissions and no further discussion is required as a part of this analysis.

How does District Rule 4612 compare to rules in other air districts?

District staff compared emission limits, optional control requirements, and work practice standards in District Rule 4612 to comparable requirements in rules from the following California nonattainment areas:

- Bay Area AQMD Regulation 8, Rule 45 (Amended December 3, 2008)[185]
- Sacramento Metropolitan AQMD Rule 459 (Amended February 29, 2012)[186]
- South Coast AQMD Rule 1151 (Amended September 5, 2014)[187]
- Ventura County APCD Rule 74.18 (Amended November 11, 2008)[188]

[185] BAAQMD. *Regulation 8, Rule 45 (Motor Vehicle and Mobile Equipment Coating Operations).* (Amended December 3, 2008). Retrieved from: https://www.baaqmd.gov/~/media/dotgov/files/rules/reg-8-rule-45-motor-vehicle-and-mobile-equipment-coating-operations/documents/rg0845.pdf?la=en&rev=6875392dea2847569a1cefd2e7f25500.
[186] SMAQMD. *Rule 459 (Automotive, Mobile Equipment, and Associated Parts and Components).* (Amended February 29, 2012). Retrieved from: http://www.airquality.org/ProgramCoordination/Documents/rule459.pdf.
[187] SCAQMD. *Rule 1151 (Motor Vehicle and Mobile Equipment Non-Assembly Line Coating Operations).* (Amended September 5, 2014). Retrieved from: http://www.aqmd.gov/docs/default-source/rule-book/reg-xi/rule-1151.pdf?sfvrsn=4.
[188] VCAPCD. *Rule 74.18 (Motor Vehicle and Mobile Equipment Coating Operations).* (Amended November 11, 2008). Retrieved from: http://www.vcapcd.org/Rulebook/Reg4/RULE%2074.18.pdf.

The District reviewed the rule requirements implemented prior to EPA's approval of the *2014 RACT SIP*, and found that Rule 4612 continues to implement RACT levels of control. The below comparison tables demonstrate that, for more recently amended rules, District Rule 4612 continues to meet RACT.

South Coast AQMD

- SCAQMD Rule 1151 (Motor Vehicle and Mobile Equipment Non-Assembly Line Coating Operations)

	SJVAPCD Rule 4612	SCAQMD Rule 1151
Applicability	Any person who supplies, sells, offers for sale, manufacturers, or distributes any automotive coating for use within the District, as well as any person who uses, applies, or solicits the use or application of any automotive coating within the District.	Any person who supplies, sells, offers for sale, markets, manufactures, blends, packages, repackages, possesses or distributes any automotive coating or associated solvent for use within the District, as well as any person who uses, applies, or solicits the use or application of any automotive coating or associated solvent within the District.
Exemptions	• Automotive coatings that are offered for sale, sold, or manufactured for use outside the SJVAPCD or for shipment to other manufacturers for reformulation or repackaging. • Aerosol coating products • Automotive coatings that are sold, supplied, or offered for sale in 0.5 fluid ounce or smaller containers intended to be used by the general public to repair tiny surface imperfections. • Any coating applied to new motor vehicles or mobile equipment, or their associated parts and components, during manufacture on an assembly line pursuant to Rule 4602.	• Any automotive coating that is expressly sold or manufactured for use outside of the District or that is for shipment to other manufacturers for reformulation or repackaging. • Any aerosol coating product. • Any automotive coating that is supplied, sold, marketed, manufactured, blended, packaged for use in the District in 0.5 fluid ounces or smaller containers. • Any automotive coating applied to motor vehicles or mobile equipment, or their associated parts and components, during manufacture on an assembly line that is subject to Rule 1115. • VOC content limits shall not apply to automotive coatings applied for educational purposes at automotive coating training centers, provided that the VOC emissions emitted at an automotive coating training center from automotive coatings not complying with paragraph (d)(1) do not exceed twelve pounds per day. • VOC content limits shall not apply to automotive coatings supplied by an assembly-line motor vehicle manufacturer for use by a prototype motor vehicle manufacturing facility in the finishing of a prototype motor vehicle, provided that the VOC

	SJVAPCD Rule 4612	SCAQMD Rule 1151
		emissions at the facility from such topcoats do not exceed 21 lbs in a single day and 930 lbs in a calendar year. • Application requirements shall not apply to automotive graphic arts operations, truck bed liner coatings, or underbody coatings.
Requirements		
Category	**SJVAPCD (g/L)**	**SCAQMD (g/L)**
Underbody Coating	430	540
Adhesion Promoter	540	540
Clear Coating	250	250
Color Coating	420	420
Multi-Color Coating	680	680
Pretreatment Coating	660	660
Primer	250	250
Single-Stage Coating	340	340
Temporary Protective Coating	60	60
Truck Bed Liner Coating	310	310
Uniform Finish Coating	540	540
Any Other Coating Type	250	250
Most Restrictive VOC Limits	If anywhere on the container of any automotive coating, or in any sales, advertising, or technical literature indicates that the coating meets the definition of or is recommended for use for more than one of the coating categories listed in Coating Limits table, then the lowest applicable VOC content limit shall apply.	If any information on the container of any automotive coating, or any label or sticker affixed to the container, or in any sales, advertising, or technical literature that indicates that the automotive coating meets the definition of more than one of the automotive coating categories listed in VOC Content Limit table, then the lowest VOC content shall apply.
Application Methods	Except for underbody coatings, graphic arts operations, truck bed liner coatings, or any coating use of less than 1.0 fluid ounce (29.6 milliliters), no person shall apply any coating to any motor vehicle, mobile equipment, or associated parts and components unless one of the following application methods is used: • Brush, dip, or roller • Electrostatic spray • HVLP spray equipment	A person shall not apply any coating to any motor vehicles or mobile equipment or their parts and components with spray application equipment unless one of the following methods is used: • Electrostatic application equipment • HVLP spray equipment, • Any alternative coating application method that achieves a transfer efficiency equivalent to, or higher than, the application methods listed above.

	SJVAPCD Rule 4612	SCAQMD Rule 1151
	• Use of a spray gun not permanently marked HVLP. • If a spray gun is used, the operator must demonstrate that the gun meets the HVLP definition in Section 3.21 in design and use. • Any other coating application method that is capable of achieving at least 65 percent transfer efficiency, as determined per Section 6.8.8.	
Organic Solvent Requirements	• For solvent cleaning operations other than for bug and tar removal, a person shall not use solvents that have more than 25g VOC/liter. • For bug and tar removal, a person shall not use any material other than bug and tar remover regulated under Consumer Products. • Fresh or spent solvents, waste solvent cleaning materials shall be stored or disposed in closed, non-absorbent and non-leaking containers. The containers shall remain closed at all times except when depositing or removing the contents of the containers or the container is empty.	Solvent cleaning, storage and disposal of VOC-containing materials solvent cleaning of application equipment, parts, products, tools, machinery, equipment, general work areas, and the storage and disposal of VOC-containing materials used in cleaning operations shall be carried out pursuant to SCAQMD Rule 1171.

As demonstrated above, the requirements of Rule 4612 are as stringent as or more stringent than SCAQMD Rule 1151.

Potential Emission Reduction Opportunities

As demonstrated above, Rule 4612 currently has in place the most stringent measures feasible to implement in the Valley. The District did not identify any additional emission reduction opportunities at this time.

Contingency Measure Evaluation

As discussed in Chapter 6, contingency measures are immediately implemented ONLY if triggered by an unanticipated milestone or attainment failure. The District reviewed this control measure for a potential contingency component. The District concludes that this control measure is not an appropriate contingency measure because the most stringent feasible controls are already in place, and a contingency trigger is incompatible with the technologies involved in reducing emissions from this category.

Evaluation Findings

Rule 4612 meets or exceeds federal RACT requirements for this source category based upon evaluation of applicable federal regulations, state standards, and other air districts' rules. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

C.35 RULE 4621 GASOLINE TRANSFER INTO STATIONARY STORAGE CONTAINERS, DELIVERY VESSELS, AND BULK PLANTS

Emissions Inventory (Summer Average – Tons per day)

	2017	2023	2026	2029	2032	2035	2037
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VOC	1.69	1.53	1.44	1.38	1.34	1.33	1.33

District Rule 4621 Description

This rule applies to gasoline transfer and storage operations associated with the gasoline stationary storage containers, delivery vessels, and bulk plants. The purpose of this rule is to limit VOC emissions from these operations and to provide administrative requirements for determining compliance with this rule. The rule requirements include CARB certified vapor recovery systems maintained in leak-free condition for VOC emissions control. The rule also contains monitoring, testing, and recordkeeping provisions to ensure vapor control systems are maintained in good operating conditions. The District last adopted amendments to Rule 4621 on December 19, 2013.

How does District Rule 4621 compare with federal and state rules and regulations?

Federal Regulations

There are no Alternative Control Techniques or New Source Performance Standards applicable to this source category.

A. Control Techniques Guidelines (CTG)

District staff conducted a comprehensive evaluation of EPA CTG requirements. EPA has not adopted updates to the following CTGs since EPA found that Rule 4621 met RACT requirements through EPA's approval of the *2014 RACT SIP*. Therefore, further evaluation is not necessary at this time.

- *Design Criteria for Stage I Vapor Control Systems - Gasoline Service Stations (EPA-450/R-75-102 1975/11)*
- *Guideline for Control of Hydrocarbons from Tank Truck Gasoline Loading Terminals (EPA-450/2-77-026 1977/10)*
- *Guideline for Control of Volatile Organic Emissions from Bulk Gasoline Plants (EPA-450/2-77-035 1977/12)*
- *Guideline for Control of Volatile Organic Compound Leaks from Gasoline Tank Trucks and Vapor Collection Systems (EPA-450/2-78-051 1978/12)*

State Regulations

- *CARB – Certification Procedures (CPs) for Vapor Recovery Systems*

District Rule 4621 includes requirements to install and maintain CARB certified vapor recovery systems for VOC emissions control. All CARB certified vapor recovery systems contain certification according to the following CARB certification procedures for various source categories, pursuant to CH&SC provisions:

Table C-10 Applicability of CARB Certification Procedures

Certification Procedure	Applicable Source Category
CP-201	Certification Procedure for Vapor Recovery Systems at Dispensing Facilities
CP-202	Certification Procedure for Vapor Recovery Systems of Bulk Plants
CP-203	Certification Procedure for Vapor Recovery Systems of Terminals
CP-204	Certification Procedure for Vapor Recovery Systems of Cargo Tanks
CP-205	Certification Procedure for Vapor Recovery Systems of Novel Facilities
CP-206	Certification Procedure for Vapor Recovery Systems at Gasoline Dispensing Facilities Using Aboveground Storage Tanks
CP-207	Certification Procedure for Enhanced Conventional (ECO) Nozzles and Low Permeation Conventional Hoses for Use at Gasoline Dispensing Facilities

Since District Rule 4621 requires CARB certified vapor recovery systems, which contain certification according to the certification procedures listed above, District Rule 4621 is as stringent as the state certification procedures requirements.

How does District Rule 4621 compare to rules in other air districts?

District staff compared emission limits, optional control requirements, and work practice standards in District Rule 4621 to comparable requirements in rules from the following California nonattainment areas:

- Bay Area AQMD Regulation 8, Rule 7 (Amended November 3, 2021)[189]
- Bay Area AQMD Regulation 8, Rule 39 (Amended November 3, 2021)[190]
- Sacramento Metropolitan AQMD Rule 447 (Amended April 2, 1998)[191]

[189] BAAQMD. *Regulation 8 Rule 7 (Gasoline Dispensing Facilities).* (Amended November 3, 2021). Retrieved from: https://www.baaqmd.gov/~/media/dotgov/files/rules/refinery-rules-definitions/rg0807_20211103-pdf.pdf?la=en&rev=5659ecc1e45c40038529a8a98cf64d06

[190] BAAQMD. *Regulation 8 Rule 39 (Gasoline Bulk Plants and Gasoline Cargo Tanks).* (Amended November 3, 2021). Retrieved from: https://www.baaqmd.gov/~/media/dotgov/files/rules/reg-8-rule-39-gasoline-bulk-plants-and-gasoline-delivery-vehicles/documents/rg0839.pdf?la=en#:~:text=8%2D39%2D306%20Operating%20Practices%3A%20An%20owner%20or%20operator,its%20evaporation%20to%20the%20atmosphere.

[191] SMAQMD. *Rule 447 (Organic Liquid Loading).* (Amended April 2, 1998). Retrieved from: http://www.airquality.org/ProgramCoordination/Documents/rule447.pdf

- Sacramento Metropolitan AQMD Rule 448 (Amended February 26, 2009)[192]
- South Coast AQMD Rule 461 (Amended April 6, 2012)[193]
- South Coast AQMD Rule 462 (Amended May 14, 1999)[194]
- Ventura County APCD Rule 70 (Amended March 10, 2009)[195]

The District reviewed the rule requirements implemented prior to EPA's approval of the *2014 RACT SIP*, and found that Rule 4621 continues to implement RACT levels of control. The below comparison tables demonstrate that, for more recently amended rules, District Rule 4621 continues to meet RACT.

Bay Area AQMD

- BAAQMD Regulation 8, Rule 7 (Gasoline Dispensing Facilities)

Bay Area AQMD Regulation 8, Rule 7 applies to both Phase I and Phase II of gasoline transfer. Since District Rule 4621 only applies to the Phase I side of gasoline transferring, the District will only be comparing District Rule 4621 to the Phase I requirements of BAAQMD Regulation 8, Rule 7.

	SJVAPCD Rule 4621	BAAQMD Reg 8, Rule 7
Applicability	Gasoline storage containers located at bulk plants (which include loading racks and associated unloading racks) with capacities greater than 250 gallons and less than 19,800 gallons; along with other categories.	Limits emissions of organic compounds from gasoline dispensing facilities.
Exemptions	• The transfer of gasoline into any stationary storage container with a capacity of 550 gallons or less used primarily for the fueling of implements of husbandry, if such container is equipped with a permanent submerged fill pipe. • The transfer of gasoline into any stationary storage container having a capacity of 2,000 gallons or less which was installed prior to July 1, 1975, if such container is equipped with a permanent submerged fill pipe, and provided no major modification is made on the container. • The transfer of gasoline into any stationary storage container in	• Storage tanks with capacities less than 250 gallons • Storage tanks with capacities less than 550 gallons that are used primarily for the fueling of implements of husbandry and that have a submerged fill pipe • Storage tanks installed before January 1, 1999 where the APCO determines that Phase I vapor recovery is not feasible. • Cargo tanks may be opened for gauging or inspection provided the tanks is not pressurized or being loaded

[192] SMAQMD. *Rule 448 (Gasoline Transfer into Stationary Storage Containers).* (Amended February 26, 2009). Retrieved from: http://www.airquality.org/ProgramCoordination/Documents/rule448.pdf
[193] SCAQMD. *Rule 461 (Gasoline Transfer and Dispensing).* (Amended April 6, 2012). Retrieved from: http://www.aqmd.gov/docs/default-source/rule-book/rule-iv/rule-461.pdf
[194] SCAQMD. *Rule 462 (Organic Liquid Loading).* (Amended May 14, 1999). Retrieved from: http://www.aqmd.gov/docs/default-source/rule-book/rule-iv/rule-462.pdf
[195] VCAPCD. *Rule 70 (Storage and Transfer of Gasoline).* (Amended March 10, 2009). Retrieved from: http://www.vcapcd.org/Rulebook/Reg4/RULE%2070.pdf

	SJVAPCD Rule 4621	BAAQMD Reg 8, Rule 7
	existence prior to July 1, 1975, which is equipped with an offset fill pipe if such container is equipped with a permanent submerged fill pipe, and provided no major modification is made on the container. • Mobile fuelers used exclusively for fueling emergency motor vehicles while on location at an emergency.	
Requirements	• CARB certified vapor recovery system with six month leak inspection and maintain entire system in leak free conditions. • Rule also requires CARB certified vapor recovery system for switch loading.	• Gasoline storage tanks to be equipped with a CARB certified Phase I vapor recovery system. • Vapor recovery system is required to be maintained and operated according to the manufacturer's specifications and the applicable CARB Executive Order. • No person shall install or modify a Phase I vapor recovery system unless the system vapor recovery rate is 98% or the highest vapor recovery rate specified by CARB if the highest rate is less than 98%.

BAAQMD Regulation 8, Rule 7 and District Rule 4621 have the same monitoring and testing requirements, however BAAQMD Regulation 8, Rule 7 only requires the facility to maintain records for 2 years, whereas District Rule 4621 requires that facilities keep records for 5 years.

Therefore, District Rule 4621 is at least as stringent as BAAQMD Regulation 8, Rule 7.

Bay Area AQMD

- BAAQMD Regulation 8, Rule 39 (Gasoline Bulk Plants and Gasoline Cargo Tanks)

	SJVAPCD Rule 4621	BAAQMD Reg 8, Rule 39
Applicability	Gasoline storage containers located at bulk plants (which include loading racks and associated unloading racks) with capacities greater than 250 gallons and less than 19,800 gallons; along with other categories.	Gasoline transfer operations at gasoline bulk plants and organic compounds from gasoline cargo tanks.
Exemptions	• The transfer of gasoline into any stationary storage container with a capacity of 550 gallons or less used primarily for the fueling of implements of husbandry, if such container is equipped with a permanent submerged fill pipe. • The transfer of gasoline into any stationary storage container having	• Cargo tanks requirements for tanks with a capacity less than 250 gallons • Cargo tanks requirements for tanks with a capacity less than 550 gallons used primarily for the refueling of implements of husbandry

	SJVAPCD Rule 4621	BAAQMD Reg 8, Rule 39
	a capacity of 2,000 gallons or less which was installed prior to July 1, 1975, if such container is equipped with a permanent submerged fill pipe, and provided no major modification is made on the container. • The transfer of gasoline into any stationary storage container in existence prior to July 1, 1975, which is equipped with an offset fill pipe if such container is equipped with a permanent submerged fill pipe, and provided no major modification is made on the container. • Mobile fuelers used exclusively for fueling emergency motor vehicles while on location at an emergency.	• Storage tanks where the APCO determines that gasoline vapor recovery requirements are not feasible • Cargo tanks may be opened for gauging or inspection provided the tanks is not pressurized or being loaded • Requirements during maintenance or repair operations • Vapor recovery systems where the operator demonstrates that CARB has determined that the system are not required to be CARB certified.
Requirements	• CARB certified vapor recovery system with six month leak inspection and maintain entire system in leak free conditions. • Rule also requires CARB certified vapor recovery system for switch loading.	• Requires the delivery vessels to have valid State of California decals, as required by Section 41962 of the Health and Safety Code which attest to the vapor integrity of the tank, are displayed. • Any gasoline delivery vehicle loading at a facility subject to the requirements of Section 8-33-302 shall be equipped with and use a vapor recovery system. • Prohibits the purge of gasoline vapors from the tank of a delivery vehicle to the atmosphere.

District Rule 4621 contains similar vapor recovery requirements for bulk plants and delivery vessels. Overall, District Rule 4621 is as stringent as BAAQMD Regulation 8, Rule 39.

Potential Emission Reduction Opportunities

As demonstrated above, Rule 4621 currently has in place the most stringent measures feasible to implement in the Valley. No additional emission reduction opportunities have been identified at this time.

Contingency Measure Evaluation

As discussed in Chapter 6, contingency measures are immediately implemented ONLY if triggered by an unanticipated milestone or attainment failure. The District reviewed this control measure for a potential contingency component. The District concludes that this control measure is not an appropriate contingency measure because the most

stringent feasible controls are already in place, and a contingency trigger is incompatible with the technologies involved in reducing emissions from this category.

Evaluation Findings

Rule 4621 meets or exceeds federal RACT requirements for this source category based upon evaluation of applicable federal regulations, state standards, and other air districts' rules. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

C.36 RULE 4622 GASOLINE TRANSFER INTO MOTOR VEHICLE FUEL TANKS

Emissions Inventory (Summer Average – Tons per day)

	2017	2023	2026	2029	2032	2035	2037
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VOC	1.95	1.34	1.16	1.05	0.98	0.94	0.93

District Rule 4622 Description

The purpose of this rule is to limit emissions of gasoline vapors (VOC emissions) from the transfer of gasoline into motor vehicle fuel tanks. This rule applies to any gasoline storage and dispensing operation or mobile fueler, in which facilities transfer gasoline into motor vehicle fuel tanks, except for the exemptions stated in the rule.

How does District Rule 4622 compare with federal and state rules and regulations?

Federal Regulations

There are no Control Techniques Guidelines, Alternative Control Techniques, or New Source Performance Standards applicable to this source category.

State Regulations

- *CARB - CPs for Vapor Recovery Systems*

District Rule 4622 includes requirements to install and maintain CARB certified vapor recovery systems for VOC emissions control. All CARB certified vapor recovery systems contain certification according to the following CARB certification procedures for various source categories, pursuant to CH&SC provisions:

Table C-11 Applicability of CARB Certification Procedures

Certification Procedure	Applicable Source Category
CP-201	Certification Procedure for Vapor Recovery Systems at Dispensing Facilities
CP-202	Certification Procedure for Vapor Recovery Systems of Bulk Plants
CP-203	Certification Procedure for Vapor Recovery Systems of Terminals
CP-204	Certification Procedure for Vapor Recovery Systems of Cargo Tanks
CP-205	Certification Procedure for Vapor Recovery Systems of Novel Facilities

Certification Procedure	Applicable Source Category
CP-206	Certification Procedure for Vapor Recovery Systems at Gasoline Dispensing Facilities Using Aboveground Storage Tanks
CP-207	Certification Procedure for Enhanced Conventional (ECO) Nozzles and Low Permeation Conventional Hoses for Use at Gasoline Dispensing Facilities

District Rule 4622 requires CARB certified vapor recovery systems, which contain certification according to the procedures listed above. Therefore, District Rule 4622 is as stringent as the state certification procedures requirements.

How does District Rule 4622 compare to rules in other air districts?

District staff compared emission limits, optional control requirements, and work practice standards in District Rule 4622 to comparable requirements in rules from the following California nonattainment areas:

- Bay Area AQMD Regulation 8, Rule 7 (Amended November 3, 2021)[196]
- Sacramento Metropolitan AQMD Rule 449 (Amended February 26, 2009)[197]
- San Diego County APCD Rule 61.4 (Amended March 26, 2008)[198]
- San Diego County APCD Rule 61.4.1 (Amended March 26, 2008)[199]
- South Coast AQMD Rule 461 (Amended April 6, 2012)[200]
- Ventura County APCD Rule 70 (Amended March 10, 2009)[201]

The District reviewed the rule requirements implemented prior to EPA's approval of the *2014 RACT SIP*, and found that Rule 4622 continues to implement RACT levels of control. The below comparison tables demonstrate that, for more recently amended rules, District Rule 4622 continues to meet RACT.

Bay Area AQMD

- BAAQMD Regulation 8, Rule 7 (Gasoline Dispensing Facilities)

Bay Area AQMD Regulation 8, Rule 7 applies to both Phase I and Phase II of gasoline transfer. Since District Rule 4622 only applies to the Phase II side of gasoline

[196] BAAQMD. *Regulation 8, Rule 7 (Gasoline Dispensing Facilities).* (Amended November 3, 2021). Retrieved from: https://www.baaqmd.gov/~/media/dotgov/files/rules/refinery-rules-definitions/rg0807_20211103-pdf.pdf?la=en&rev=5659ecc1e45c40038529a8a98cf64d06.
[197] SMAQMD. *Rule 449 (Transfer of Gasoline into Vehicle Fuel Tanks).* (Amended February 26, 2009). Retrieved from: http://www.airquality.org/ProgramCoordination/Documents/rule449.pdf.
[198] SDAPCD. *Rule 61.4 (Transfer of Volatile Organic Compounds into Vehicle Fuel Tanks).* (Amended March 26, 2008). Retrieved from: https://www.sdapcd.org/content/dam/sdapcd/documents/rules/current-rules/Rule-61.4.pdf
[199] SDAPCD. *Rule 61.4.1 (Transfer of Gasoline from Stationary Underground Storage Tanks into Vehicle Fuel Tanks).* (Amended March 26, 2008). Retrieved from: https://www.sdapcd.org/content/dam/sdapcd/documents/rules/current-rules/Rule-61.4.1.pdf
[200] SCAQMD. *Rule 461 (Gasoline Transfer and Dispensing).* (Amended January 7, 2022). Retrieved from: http://www.aqmd.gov/docs/default-source/rule-book/rule-iv/rule-461.pdf?sfvrsn=4.
[201] VCAPCD. *Rule 70 (Storage and Transfer of Gasoline).* (Amended March 10, 2009). Retrieved from: http://www.vcapcd.org/Rulebook/Reg4/RULE%2070.pdf.

transferring, the District will only be comparing District Rule 4622 to the Phase II requirements of BAAQMD Regulation 8, Rule 7.

	SJVAPCD Rule 4622	BAAQMD Reg 8, Rule 7
Applicability	Rule applies to Phase II only	Rule applies to both Phase I and II

Exemptions	• Existing tanks (on or before 5/21/92) exempt with low throughput of:
	  ○ ≤ 24,000 gal/yr, &
	  ○ ≤ 10,000 gal/30-day
	• Tanks exempt from Phase I requirements pursuant to Rule 4621 are also exempt from Phase II
	• Vehicle fleets with 100% Onboard Refueling Vapor Recovery (ORVR) & operator owns dispensing operation.
	• Mobile fuelers exclusively fueling aircrafts.
	• Marine vessels not subject to rule (non motor vehicle)
	• E85 fuel dispensing operations
		• Tanks installed prior to 3/4/1987 at facilities with throughput < 60,000 gal/yr where Phase II not installed prior to 7/1/1983.
		• Facilities exempt from Phase I requirements are also exempt from Phase II
		• Facilities with 90% vehicles with ORVR refueled at the facility owned by a common operator.
		• Facilities exclusively refueling aircraft or marine vessels.
		• Nozzles primarily refueling marine vessels or aircraft.
		• Mobile and vehicle to vehicle refueling.
		• Vehicles with fill-neck configuration, location or design feature making this rule infeasible.
		• Facilities where the APCO determines in writing Phase II not feasible.
		• Tanks installed prior to 3/4/1987 exclusively refuel motor vehicle tanks ≤ 5 gal

	SJVAPCD Rule 4622	BAAQMD Reg 8, Rule 7
	Requirements	
Phase II Requirements	• CARB certified Phase II vapor recovery system for transfer of gasoline from stationary tanks (or mobile fueler >120 gal) to motor vehicle fuel tanks (>5 gal) • CARB certified Phase II maintained according to CARB certifications & manufacturer specs • Phase II & dispensing equipment maintained without leaks • Vapor path of coaxial hoses associated with bellows equipped nozzles shall not contain more than 100 ml of liquid, or as required by the applicable CARB Executive Order	• CARB certified Phase II vapor recovery system for transfer of gasoline from stationary tanks into motor vehicle fuel tanks • Phase II maintained per most recent CARB certifications & manufacturer's specs • Phase II maintained leak-free & vapor tight, except for components with allowable leak rate or at nozzle/fill-pipe interface. • Emission of 0.42 lb/1000 gal for certified Phase II • Riser & dispenser cabinet connection of galvanized piping or flex tubing per CARB Executive Order. • Vacuum assist Phase II installed after 6/1/2000 CARB certified ORVR compatible • Bellows-equipped nozzles shall be equipped with insertion interlock. • Balance systems nozzles shall be equipped with a built-in vapor check valve. • Nozzles shall be equipped with a coaxial hose. • Nozzles on balance systems shall be equipped with a vapor check valve.
Installation	• Phase II in compliance with rule at time of installation • Backfilling inspection of all underground tanks & piping • ICC certified installation & maintenance contractors • CARB certified Phase II not to be removed, except 100% ORVR vehicle fleet exemption	None.
Inspections	• Maintenance inspections by operator to verify system components in good working condition (nozzles, hoses, etc.). • Includes verification of nozzle insertion interlock, coaxial hoses, & check valves.	None.
Maintenance and Repair	• No operation until Major Defect is repaired, replaced, or adjusted as necessary, and District notified. All major defects, after repair, are duly entered into O&M manual.	• Phase II maintained free of defects as defined in Section 41960.2(c) of the California Health and Safety Code and California Code of Regulations, title 17, section 94006 (Major Defect).

	SJVAPCD Rule 4622	BAAQMD Reg 8, Rule 7
	• Major defect tag out requirements, until repaired, replaced, or adjusted, reinspected, as necessary. • Breakaway valves, hoses, & nozzles ARB certified. • Retail outlets to post operating instructions, warning signs of topping off, & display e District's or ARBs toll-free telephone number for complaints. • No person shall top off a motor vehicle fuel tank. • Retail outlets must have hold-open latches on all nozzles. • No tampering of system to impair operation or effectiveness. • Liquid removal devices to achieve min liquid removal rate of 5 ml/gal. • Mobile fuelers to be registered per Rule 2250 (Permit-Exempt Equipment Registration), unless exempt from the rule. • Liquid condensate traps operation & maintenance requirements • In-Station Diagnostics (ISD) System operation & maintenance requirements. Testing every 12-months	• Facilities with Phase II to post operating instruction, warning signs of topping off, & District/CARB toll free number for complaints. • No topping off fuel tanks or other vessels. • No operation of a nozzle without an operating hold open latch. • Liquid removal devices shall achieve minimum liquid removal rate of at least 5 ml/gal. • Tanks with ISD to test once in 24-month rather than 12-month period.
Recordkeeping	• Existing exempt tanks with low throughput to maintain records • If exemption limits exceeded, operator to notify District within 30 days. • Operator with 100% ORVR vehicle fleet exempt from rule to keep records of make, model, model year, & vehicle identification number, & retain for at least 5 years. • Operators to maintain records of test results, repairs, maintenance, & periodic inspections for five years. • Operations & Maintenance (O&M) manual requirements for proper operation, inspection, maintenance, repair, & testing	• Burden of proof for exemption from any section of this rule is on the applicant. Persons seeking such an exemption shall maintain adequate records and furnish them to the APCO upon request. • Facilities to maintain records of gasoline dispensed, maintenance activities, & test results for last 12 month and retained for 24 months.
Testing Requirements	• Phase II performance tests required as required by applicable CARB executive order. • Person conducting tests to use calibrated equipment & in compliance with Rule 1177 (Gasoline Dispensing Facility Tester Certification).	• Applicable periodic testing required as required by applicable CARB executive order. • District to be notified at least 48 hours prior to testing & results submitted no later than 30 days after test.

	SJVAPCD Rule 4622	BAAQMD Reg 8, Rule 7
	• Operator to notify District at least 7 days prior to any performance testing. • Each ARB certified Phase II system to be tested within 60 days of completion of installation or modification.	
Test Methods	• Tests conducted in accordance with latest version of specified ARB and EPA approved test methods, or equivalents as approved by EPA and APCO.	• All tests conducted in accordance with District's approved procedures as prescribed in the Manual of Procedures or as prescribed by CARB Test Procedures.

As detailed above, Rule 4622 and BAAQMD Regulation 9, Rule 7 contain similar Phase II requirements. Rule 4622 includes more stringent operator periodic inspection requirements, annual testing, and recordkeeping requirements. Rule 4622 also requires operators to notify the District at least 7 days prior to any performance testing, whereas BAAQMD requires the operator to notify at least 48 hours prior to testing. Additionally, Rule 4622 includes stringent installation and inspection provisions, which are not included in BAAQMD Regulation 9, Rule 7.

Overall, the requirements in Rule 4622 are as stringent as or more stringent than those in Regulation 8, Rule 7.

Potential Emission Reduction Opportunities

As demonstrated above, Rule 4622 currently has in place the most stringent measures feasible for implementation in the Valley. The District did not identify any additional emission reduction opportunities at this time.

Contingency Measure Evaluation

As discussed in Chapter 6, contingency measures are immediately implemented ONLY if triggered by an unanticipated milestone or attainment failure. The District reviewed this control measure for a potential contingency component. The District concludes that this control measure is not an appropriate contingency measure because the most stringent feasible controls are already in place, and a contingency trigger is incompatible with the technologies involved in reducing emissions from this category.

Evaluation Findings

Rule 4622 meets or exceeds federal RACT requirements for this source category based upon evaluation of applicable federal regulations, state standards, and other air districts' rules. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

C.37 RULE 4623 STORAGE OF ORGANIC LIQUIDS

Emissions Inventory (Average – Tons per day)

	2017	2023	2026	2029	2032	2035	2037
NOx	0.01	0.01	0.01	0.01	0.01	0.01	0.01
VOC	2.84	2.46	2.29	2.14	2.00	1.88	1.81

District Rule 4623 Description

District Rule 4623, last amended on May 19, 2005, requires that storage of organic liquids in tanks be equipped with one of the following VOC control systems: pressure-vacuum relief valves; internal floating roof; external floating roof; a fixed roof tank with vapor recovery system of at least 95% control efficiency, or pressure vessel. Specific control requirements vary depending on the tank capacity and TVP of the stored liquid.

How does District Rule 4623 compare with federal and state rules and regulations?

Federal Regulations

A. Control Techniques Guidelines (CTG)

District staff conducted a comprehensive evaluation of EPA CTG requirements. EPA has not adopted updates to the following CTGs since EPA found that Rule 4623 met RACT requirements through EPA's approval of the *2014 RACT SIP*. Therefore, further evaluation is not necessary at this time.

- *Control of Volatile Organic Emissions from Storage of Petroleum Liquids in Fixed-Roof Tanks (EPA-450/2-77-036 1977/12)*
- *Control of Volatile Organic Emissions from Petroleum Liquid Storage in External Floating Roof Tanks (EPA-450/2-78-047 1978/12)*

For the following more recently amended CTG, District staff is providing an evaluation.

- *Control Techniques Guidelines for the Oil and Natural Gas Industry (EPA-453/B-16-001 2016/10)*

This CTG applies to equipment used in the oil and gas industry, including equipment subject to Rule 4623.

On September 30, 2022, EPA took final action in the Federal Register[202] to provide limited approval and limited disapproval of COGR as well as several District Rules. As part of this action, EPA published a Technical Support Document[203] (TSD), which references EPA's *Control Techniques Guidelines for the Oil and Natural Gas Industry* (2016 CTG)[204] as containing EPA's RACT recommendations for reducing VOC emissions from special equipment and processes used in the oil and natural gas industry. As part of this action, EPA identified deficiencies in COGR and Rule 4623, along with other air district rules, stating that it is not clear whether these rules capture all storage vessels at oil and gas facilities that meet or exceed the CTG Potential to Emit (PTE) threshold because Rule 4623 applicability is based on a tank's volumetric capacity and the CTG applicability is based on a PTE threshold.

The District is currently amending Rule 4623 to address these deficiencies. Rule amendments will include PTE calculations for storage vessels, lower leak thresholds, more frequent Leak Detection and Repair (LDAR) inspections, and the use of new technology as instruments for leak detection, among evaluating other potential changes. The District will incorporate the CTG recommendations as necessary to address EPA's final September 30, 2022, action.

B. Alternative Control Techniques (ACT)

District staff conducted a comprehensive evaluation of EPA ACT requirements. EPA has not updated the following applicable ACT since EPA stated that Rule 4623 met RACT requirements through EPA's approval of the *2014 RACT SIP*. EPA's approval determined that Rule 4623 met or exceeded RACT and therefore, further evaluation is not necessary at this time.

- *Alternative Control Techniques Document - Control Techniques for Volatile Organic Compound Emissions from Stationary Sources (EPA-453/R-92-018 1992/12)*

C. New Source Performance Standards (NSPS)

District staff conducted a comprehensive evaluation of EPA NSPS requirements. EPA has not updated the following NSPS since EPA found that Rule 4623 met RACT requirements through EPA's approval of the *2014 RACT SIP*. Therefore, further evaluation is not necessary at this time.

- *40 CFR 60 Subpart K - Standards of Performance for Storage Vessels for Petroleum Liquids for Which Construction, Reconstruction, or Modification Commenced after June 11, 1973, and Prior to May 19, 1978 (2012/09)*

[202] EPA. *Limited Approval, Limited Disapproval of California Air Plan Revisions; California Air Resources Board; Final Rule.* 87 Fed. Reg. 189, pp. 59314-59320. (September 30, 2022). Retrieved from: https://www.govinfo.gov/content/pkg/FR-2022-09-30/pdf/2022-20870.pdf
[203] EPA. *Technical Support Document*. (April 2022). Retrieved from: https://www.regulations.gov/document/EPA-R09-OAR-2022-0416-0002
[204] Control Technique Guidelines for the Oil and Natural Gas Industry, EPA-453/B-16-001 https://www3.epa.gov/airquality/ctg_act/2016-ctg-oil-and-gas.pdf

- *40 CFR 60 Subpart Ka - Standards of Performance for Storage Vessels for Petroleum Liquids for Which Construction, Reconstruction, or Modification Commenced after May 18, 1978, and Prior to July 23, 1984 (2000/12)*
- *40 CFR 60 Subpart Kb - Standards of Performance for Volatile Organic Liquid Storage Vessels (Including Petroleum Liquids Storage Vessels) for Which Construction, Reconstruction, or Modification Commenced after July 23, 1984 (2000/12)*

For the following, more recently amended NSPS, District staff is providing an evaluation.

- *40 CFR 60 Subpart OOOO, Standards of Performance for Crude Oil and Natural Gas Facilities (2020/09)*

This NSPS is applicable to oil and gas facilities for which construction, modification, or reconstruction commenced between August 23, 2011, and September 18, 2015. The NSPS imposes equipment standards on several different types of new/modified/reconstructed equipment and includes leak detection and repair requirements such equipment. Notably, NSPS subpart OOOO does not include retrofit requirements for existing, unmodified equipment.

Subpart OOOO includes design standards for some component types, e.g. pumps and compressors, and leak detection and repair requirements.

The District is currently amending Rule 4623 to include lower leak thresholds, more frequent LDAR inspections, and the use of new technology as instruments for leak detection, among evaluating other potential changes. The District will consider and incorporate Subpart OOOO to the extent feasible.

- *40 CFR 60 Subpart OOOOa - Standards of Performance for Crude Oil and Natural Gas Facilities for which Construction, Modification or Reconstruction Commenced After September 18, 2015 (2016/06)*

This NSPS is applicable to oil and gas facilities for which construction, modification, or reconstruction commenced between August 23, 2011, and September 18, 2015, and after September 18, 2015, respectively. The NSPS imposes equipment standards on several different types of new/modified/reconstructed equipment and imposes leak detection and repair requirements for such equipment.

The District is currently amending Rule 4623 to include lower leak thresholds, more frequent LDAR inspections, and the use of new technology as instruments for leak detection, among evaluating other potential changes. The District will consider and incorporate Subpart OOOOa to the extent feasible.

State Regulations

- *California Code of Regulations, Title 17, Division 3, Chapter 1, Subchapter 10 Climate Change, Article 4 (Subarticle 13: Greenhouse Gas Emission Standards for Crude Oil and Natural Gas Facilities) (2018)*

On January 1, 2018, COGR took effect to establish standards for crude oil and natural gas facilities located in the State of California and California Waters. COGR is designed to encompass components not subject to current local air district rules in California that have the potential to release greenhouse gas emissions identified in COGR. This regulation adds required flash analysis testing on all crude oil and natural gas tank systems that are not controlled by vapor recovery systems. Leak thresholds range from 1,000 ppmv to 50,000 ppmv, and have designated repair time periods depending on the leak size. COGR also establishes a number of allowable leaks within a specified range, and incorporates requirements for quarterly inspections, conducted in accordance with EPA Reference Method 21.

On September 30, 2022, EPA took final action in the Federal Register[205] to provide limited approval and limited disapproval of COGR. The District will evaluate and consider EPA's action on COGR through the development of amendments to Rule 4623.

How does District Rule 4623 compare to rules in other air districts?

District staff compared emission limits, optional control requirements, and work practice standards in District Rule 4623 to comparable requirements in rules from the following California nonattainment areas:

- Bay Area AQMD Regulation 8, Rule 5 (Amended November 2, 2021)[206]
- Sacramento Metropolitan AQMD Rule 446 (Amended November 16, 1993)[207]
- South Coast AQMD Rule 463 (Amended November 4, 2011)[208]
- Ventura County APCD Rule 71.2 (Amended September 26, 1989)[209]
- Ventura County APCD Rule 74.10 (Amended March 10, 1998)[210]

[205] EPA. *Limited Approval, Limited Disapproval of California Air Plan Revisions; California Air Resources Board; Final Rule*. 87 Fed. Reg. 189, pp. 59314-59320. (September 30, 2022). Retrieved from: https://www.govinfo.gov/content/pkg/FR-2022-09-30/pdf/2022-20870.pdf
[206] BAAQMD. *Regulation 8, Rule 5 (Storage of Organic Liquids)*. (Amended November 2, 2021). Retrieved from: https://www.baaqmd.gov/~/media/dotgov/files/rules/refinery-rules-definitions/rg0805_20211103-pdf.pdf
[207] SMAQMD. *Rule 446 (Storage of Petroleum Products)*. (Amended November 16, 1993). Retrieved from: http://www.airquality.org/ProgramCoordination/Documents/rule446.pdf
[208] SCAQMD. *Rule 463 (Organic Liquid Storage)*. (Amended November 4, 2011). Retrieved from: http://www.aqmd.gov/docs/default-source/rule-book/rule-iv/rule-463.pdf
[209] VCAPCD. *Rule 71.2 (Storage of Reactive Organic Compound Liquids)*. (Amended September 26, 1989). Retrieved from: http://www.vcapcd.org/Rulebook/Reg4/RULE%2071.2.pdf
[210] VCAPCD. *Rule 74.10 (Components at Crude Oil and Natural Gas Production and Processing Facilities)*. (Amended March 10, 1998). Retrieved from: http://www.vcapcd.org/Rulebook/Reg4/RULE%2074.10.pdf

As part of EPA's September 2022 disapproval of COGR, EPA identified deficiencies in Rule 4623. As stated earlier, the District is currently amending Rule 4623, and proposed amendments will meet or exceed federal RACT requirements for this source category, and will be as stringent as or more stringent than analogous rules.

Bay Area AQMD

- BAAQMD Regulation 8, Rule 5 (Storage of Organic Liquids)

	SJVAPCD Rule 4623	BAAQMD Reg 8, Rule 5
Applicability	Any tank with a capacity ≥ 1,100 gal in which any organic liquid is placed, held, or stored.	Any container, reservoir, or tank used for the storage of organic liquids, excluding tanks that are permanently affixed to mobile vehicles.

Exemptions	• Pressure vessels.
	• Gasoline storage tanks with a capacity < 19,800 gal that are subject to requirements of Rule 4621 (Gasoline Transfer Into Stationary Storage Containers, Delivery Vessels, and Bulk Plants).
	• Tanks used for storage/processing of clean produced water, or other water that meets the VOC standard specified in Rule 1020 (Definitions).
	• Except for recordkeeping and compliance requirements:
	  ○ Emergency standby tanks, in existence prior to May 1, 1979, which exclusively store petroleum distillates or crude oil.
	  ○ Temporary tanks, with capacities ≤ 21,000 gal (500 barrels), left on site for six months or less.
	  ○ A small producer's tank with a throughput ≤ 50 barrels of crude oil per day.
	• Tanks exclusively receiving and/or storing an organic liquid with a TVP < 0.5 psia (must comply with testing, recordkeeping, test methods, and compliance schedules as detailed in the Rule).
		• Storage tanks with a capacity < 264 gal.
		• Any storage tank installed prior to January 4, 1967, which is not used for storage of gasoline to be dispensed to internal combustion engine fuel tanks, and is either of a capacity < 2,008 gal, or an underground tank with an offset fill line.
		• Any above ground gasoline tank with a capacity ≤ 2,008 gal installed and in service prior to January 9, 1976, and equipped with a submerged fill pipe.
		• Limited exemptions for:
		  ○ Tanks during removal from and return to service
		  ○ Tanks during preventative maintenance and inspection of tanks in operation
		  ○ Tanks storing organic liquids with a TVP ≤ 25.8 mm Hg (0.5 psia)
		  ○ Tanks at facilities subject to the requirements of Reg 8, Rule 18 (Equipment Leaks)
		  ○ During repair period for an operator who has implemented an Enhanced Monitoring Program pursuant to the rule, provided certain conditions are met

Requirements	**Storage Tanks Control:**
	• Must be equipped with one of the following VOC control systems:
	  ○ Pressure-vacuum relief valves;
	  ○ Internal floating roof;
	  ○ External floating roof;
		Storage Tanks Control:
		• Must be equipped with a vapor loss control device that is specified for the tank capacity, or for a higher capacity, and for the TVP of the tank organic liquid contents, or for a higher TVP.

	SJVAPCD Rule 4623	BAAQMD Reg 8, Rule 5
	○ Fixed roof tank with vapor recovery system of at least 95% control efficiency; or ○ Pressure vessel. Specific control requirements vary depending on the tank capacity and TVP of the stored liquid. • All storage tanks shall be maintained in a leak-free condition, except for following: ○ Pressure-vacuum relief valve; ○ Primary and secondary seals; ○ Floating roof deck fittings; and ○ Floating roof automatic bleeder vents. **Leaks:** • Allowed up to 10,000 ppm **Pressure-Vacuum Relief Valves:** • The PVRV is to be set within 10% of the maximum allowable working pressure of the tank. The PVRV shall be permanently labeled with the operating pressure setting. **External Floating Roof Tanks:** • Must be equipped with a floating roof consisting of a pan type that is installed before 12/20/01, pontoon-type, or double-deck type cover, that rests on the surface of the liquid contents. • Must be equipped with a closure device between the tank shell and roof edge consisting of two seals, one above the other; the one below shall be referred to as the primary seal, and the one above shall be referred to as the secondary seal. Seal designs are specified in the rule. **Internal Floating Roof Tanks:** • Must be equipped with seals that meet EFR requirements, except for metallic-shoe type seals, which shall be installed so that one end of the shoe extends into the stored liquid and the other end extends a minimum vertical distance of 18	**Leaks:** • Allowed between 100 ppm and 500 ppm, depending on component **Submerged Fill Pipes:** • A submerged fill pipe must meet either of the following: ○ Where the tank is filled from the top, the end of the discharge pipe or nozzle must be totally submerged when the liquid level is 15 cm (6 in.) from the bottom of the tank. ○ Where the tank is filled from the side, the discharge pipe or nozzle must be totally submerged when the liquid level is 46 cm (18 in.) from the bottom of the tank. **Pressure-Vacuum Valve:** • Must be set to either at least 90% of the tank's maximum allowable working pressure, or at least 25.8 mm Hg (0.5 psig), and in good operating condition. • Sealing mechanism must remain in a gas tight condition except when operating pressure exceeds the valve set pressure, or except when the sealing mechanism is vented to a vapor recovery or disposal system that has an overall abatement efficiency of at least 95% by weight. **External Floating Roof Tanks:** • Floating roof fittings must meet rule requirements • Floating roof must be equipped with a primary and secondary seal that meets rule requirements • Floating roof must rest on the surface of the liquid tank contents and must be in good operating condition. There shall be no liquid tank contents on top of either the primary or secondary seal, or on top of the floating roof (this requirement does not apply to liquid that clings to the inside tank walls as the tank is drained, or to liquid that drips from the tank walls onto the seals).

	SJVAPCD Rule 4623	BAAQMD Reg 8, Rule 5

	inches above the stored liquid surface.
	
	Vapor Recovery Systems:
	• Fixed roof tanks shall be fully enclosed and maintained in a leak-free condition, without gas leak (greater than 10,000 ppmv, as methane) or liquid leak (dripping of organic liquid more than three drops per minute).
	• VRS shall consist of a closed system that collects all VOCs from the storage tank, and a VOC control device. The VRS shall be maintained in a leak-free condition. The VOC control device shall be one of the following:
	  ○ A condensation or vapor return system that connects to one of the following: a gas processing plant; a field gas pipeline; a pipeline distributing public utility commission quality gas for sale; an injection well for disposal of vapors as approved by the California Department of Conservation; or
	  ○ A control device that reduces the inlet VOC emissions by at least 95% by weight.
	• Any tank gauging or sampling device on a tank vented to the VRS shall be equipped with a leak-free cover, which shall be closed at all times except during gauging or sampling. All piping, valves, and fittings connected with the VRS shall be constructed and maintained in a leak-free condition.
	
	Pressure Vessel:
	• Shall be a tank, reservoir, or container that is capable of maintaining working pressures sufficient to prevent organic liquid loss or VOC loss to the atmosphere at all times
	
	Inspections:
	• Required on tank shell, hatches, seals, seams, cable seals, valves, flanges, connectors, any other
		• Tank shell must be in good operating condition with no liquid leakage through the shell.
		• Tank shall not be operated with organic liquid tank contents in any tank pontoon unless:
		  ○ Within 48 hours of discovery of organic liquid in a pontoon, all lids or other openings on the affected pontoon shall be sealed and maintained in a gas tight condition; and
		  ○ The next time the tank is removed from service, repairs shall be made on all pontoon leaks on that tank.
		
		Internal Floating Roof Tanks:
		• For a tank with seals installed on or before February 1, 1993, the tank must be equipped with one of the following:
		  ○ A liquid mounted primary seal, mounted in full contact with the liquid in the annular space between the tank shell and floating roof; or
		  ○ A metallic shoe primary seal; or
		  ○ A vapor mounted primary and a secondary seal.
		• For a tank with seals installed after February 1, 1993, the tank must be equipped with a liquid mounted or metallic shoe primary seal and a secondary seal that meets rule requirements
		• Tanks that are placed into service or de-gassed after February 1, 1993 shall be equipped with at least 3 viewports in the fixed roof of the tank. This requirement shall not apply to EFR tanks retrofitted with domes or other fixed roofs after February 1, 1993, as long as the dome consists of translucent panels through which sufficient light passes to allow inspection of the floating roof seal.
		• Floating roof fittings must meet rule requirements.
		• Floating roof must rest on the surface of the liquid tank contents and must be in good operating

	SJVAPCD Rule 4623	BAAQMD Reg 8, Rule 5
	piping components directly affixed to the tank and within 5 feet of the tank for liquid leaks, and with a portable analyzer for gas leaks, at least once per year. • EFR tanks require annual inspection of the primary seal envelope. • IFR tanks require visual inspection, through the manholes, roof hatches, or other openings on the fixed roof, the internal floating roof and its appurtenant parts, fittings, etc., and the primary seal and/or secondary seal at least once every 12 months after the tank is initially filled. • Requires the actual gap measurements of the primary seal and/or secondary seal at least once every 5 years. All defects of the primary seal, secondary seal, internal floating roof of its appurtenant parts, components, fittings, etc., must be repaired prior to filling the tank.	condition. There shall be no liquid tank contents on top of either the primary or secondary seal, or on top of the floating roof (this requirement does not apply to liquid that clings to the inside tank walls as the tank is drained, or to liquid that drips from the tank walls onto the seals). • Tank shell must be in good operating condition with no liquid leakage through the shell.

The majority of requirements between District Rule 4623 and BAAQMD Regulation 8 Rule 5 are similar. BAAQMD Regulation 8 Rule 5 includes more stringent LDAR requirements which go beyond RACT levels. As discussed above, the District is currently undergoing a rule amendment to include lower leak thresholds, more frequent LDAR inspections, and the use of new technology as instruments for leak detection, among evaluating other potential changes.

Potential Emission Reduction Opportunities

The District is currently amending Rule 4623 to include lower leak thresholds, more frequent LDAR inspections, and the use of new technology as instruments for leak detection, among evaluating other potential changes.

Contingency Measure Evaluation

As discussed in Chapter 6, contingency measures are immediately implemented ONLY if triggered by an unanticipated milestone or attainment failure. The District reviewed this control measure for a potential contingency component. The District concludes that this control measure is not an appropriate contingency measure because the contingency trigger is incompatible with the technologies involved in reducing emissions from this category.

Evaluation Findings

The District commits to amend Rule 4623 no later than 2024 to include lower leak thresholds, more frequent LDAR inspections, and the use of new technology as instruments for leak detection, among evaluating other potential changes. Once amended, District Rule 4623 will continue to meet or exceed federal RACT requirements for this source category.

C.38 RULE 4624 TRANSFER OF ORGANIC LIQUID

Emissions Inventory (Summer Average – Tons per day)

	2017	2023	2026	2029	2032	2035	2037
NOx	0.05	0.05	0.04	0.04	0.04	0.04	0.04
VOC	1.15	1.17	1.16	1.16	1.17	1.17	1.18

District Rule 4624 Description

The purpose of this rule is to limit VOC emissions from the transfer of organic liquids, which are liquids that contain VOCs and have a True Vapor Pressure (TVP) of 1.5 psia or greater at the storage container's maximum organic liquid storage temperature.

Facilities transferring 20,000 gallons or more per day of organic liquid must comply with a VOC emission limit of 0.08 lb per 1,000 gallons, use bottom loading, and route VOC vapors to a vapor collection and control system, a fixed roof container, a floating roof container, a pressure vessel, or other closed VOC emission control system. Facilities transferring less than 20,000 gallons per day of organic liquid must capture at least 95% of VOC vapors displaced during loading, use bottom loading, and route VOC vapors to a vapor collection and control system, a fixed roof container, a floating roof container, a pressure vessel, or other closed VOC emission control system.

Facilities must maintain pressure loaded in the delivery tank within the range of 18 inches water column pressure and 6 inches water column vacuum. Facilities must only fill delivery tanks that previously contained organic liquids at transfer facilities that are compliant with the vapor capture requirements. Transfer racks and vapor collection equipment shall have no leaks and no excess organic liquid drainage at disconnections. The rule prohibits new top loading facilities or the expansion of any existing top loading facilities.

How does District Rule 4624 compare with federal and state rules and regulations?

Federal Regulations

A. Control Techniques Guidelines (CTG)

District staff conducted a comprehensive evaluation of EPA CTG requirements. EPA has not adopted updates to the following CTGs since EPA found that Rule 4624 met RACT requirements through EPA's approval of the *2014 RACT SIP*. Therefore, further evaluation is not necessary at this time.

- *Control of Hydrocarbons from Tank Truck Gasoline Loading Terminals (EPA-450/2-77-026 1977/10)*

B. Alternative Control Techniques (ACT)

- *Alternative Control Techniques Document - Control Techniques for Volatile Organic Compound Emissions from Stationary Sources (EPA-453/R-92-018 1992/12)*

District staff have conducted a comprehensive evaluation of EPA ACT requirements. EPA has not updated the applicable ACT above since EPA stated that Rule 4624 met RACT requirements through EPA's approval of the *2014 RACT SIP*. EPA's approval determined that Rule 4624 met or exceeded RACT and therefore, further evaluation is not necessary at this time.

C. New Source Performance Standards (NSPS)

District staff conducted a comprehensive evaluation of EPA NSPS requirements. EPA has not updated the following NSPS since EPA found that Rule 4624 met RACT requirements through EPA's approval of the *2014 RACT SIP*. Therefore, further evaluation is not necessary at this time.

- *40 CFR 60 Subpart XX – Standards of Performance for Bulk Gasoline Terminals (2003/12)*

State Regulations

District staff conducted a comprehensive evaluation of California regulatory requirements. The State has not adopted updates to the following state regulations since EPA approved Rule 4624 as meeting RACT requirements through EPA's approval of the *2014 RACT SIP*. Therefore, further evaluation is not necessary at this time.

- *CARB Executive Order G-70-124M for Vapor Recovery Systems Installed on Gasoline Bulk Plants (1999/10)*
- *CARB Executive Order G-70-126M for Vapor Recovery Systems Installed on Gasoline Bulk Terminals (1996/12)*

The following state regulation was recently established.

- *California Code of Regulations, Title 17, Division 3, Chapter 1, Subchapter 10 Climate Change, Article 4 (Subarticle 13: Greenhouse Gas Emission Standards for Crude Oil and Natural Gas Facilities) (January 1, 2018)*

On January 1, 2018, COGR took effect to establish standards for crude oil and natural gas facilities located in the State of California and California Waters. COGR is designed to encompass components not subject to current local air district rules in California that have the potential to release greenhouse gas emissions identified in COGR. This regulation adds required flash analysis testing on all crude oil and natural gas tank systems that are not controlled by vapor recovery systems. Leak thresholds range from

1,000 ppmv to 50,000 ppmv, and have designated repair time periods depending on the leak size. COGR also establishes a number of allowable leaks within a specified range, and incorporates requirements for quarterly inspections, conducted in accordance with EPA Reference Method 21.

On September 30, 2022, EPA took final action in the Federal Register[211] to provide limited approval and limited disapproval of COGR. The District will evaluate and consider EPA's action on COGR through the development of amendments to Rule 4624.

How does District Rule 4624 compare to rules in other air districts?

In 2020, the District performed a review of the other air district rules for this source category. Based on the review of rule requirements, District staff found that Rule 4624 was not analogous when compared to the following rules:

- Bay Area AQMD Regulation 8, Rule 33 (Amended November 3, 2021)[212]
- Bay Area AQMD Regulation 8, Rule 39 (Amended November 3, 2021)[213]
- Sacramento Metropolitan AQMD Rule 447 (Amended April 2, 1998)[214]
- South Coast AQMD Rule 462 (Amended May 14, 1999)[215]
- South Coast AQMD Rule 1142 (Amended July 19, 1991)[216]
- Ventura County APCD Rule 70 (Amended March 10, 2009)[217]

[211] EPA. *Limited Approval, Limited Disapproval of California Air Plan Revisions; California Air Resources Board; Final Rule.* 87 Fed. Reg. 189, pp. 59314-59320. (September 30, 2022). Retrieved from: https://www.govinfo.gov/content/pkg/FR-2022-09-30/pdf/2022-20870.pdf
[212] BAAQMD. *Regulation 8, Rule 33 (Gasoline Bulk Terminals and Gasoline Cargo Tanks)*. (Amended November 3, 2021). Retrieved from: https://www.baaqmd.gov/~/media/dotgov/files/rules/reg-8-rule-33-gasoline-bulk-terminals-and-gasoline-delivery-vehicles/documents/rg0833.pdf?la=en
[213] BAAQMD. *Regulation 8, Rule 39 (Gasoline Bulk Plants and Gasoline Cargo Tanks)*. (Amended November 3, 2021). Retrieved from: https://www.baaqmd.gov/~/media/dotgov/files/rules/reg-8-rule-39-gasoline-bulk-plants-and-gasoline-delivery-vehicles/documents/rg0839.pdf?la=en
[214] SMAQMD. *Rule 447 (Organic Liquid Loading)*. (Amended April 2, 1998). Retrieved from: http://www.airquality.org/ProgramCoordination/Documents/rule447.pdf
[215] SCAQMD. *Rule 462 (Organic Liquid Loading)*. (Amended May 14, 1999). Retrieved from: http://www.aqmd.gov/docs/default-source/rule-book/rule-iv/rule-462.pdf
[216] SCAQMD. *Rule 1142 (Marine Tank Vessel Operations)*. (Adopted July 19, 1991). Retrieved from: http://www.aqmd.gov/docs/default-source/rule-book/reg-xi/rule-1142.pdf
[217] VCAPCD. *Rule 70 (Storage and Transfer of Gasoline)*. (Amended March 10, 2009). Retrieved from: http://www.vcapcd.org/Rulebook/Reg4/RULE%2070.pdf

District staff compared emission limits, optional control requirements, and work practice standards in District Rule 4624 to comparable requirements in rules from the following California nonattainment areas:

- Bay Area AQMD Regulation 8, Rule 6 (Amended November 3, 2021)[218]
- Santa Barbara County APCD Rule 346 (Amended January 18, 2001)[219]
- Ventura County APCD Rule 71.3 (Amended May 11, 2021)[220]
- Ventura County APCD Rule 74.10 (Amended March 10, 1998)[221]

For the remaining above-listed rules, the District reviewed the rule requirements implemented prior to EPA's approval of the *2014 RACT SIP*, and found that Rule 4624 continues to implement RACT levels of control.

Bay Area AQMD

- BAAQMD Regulation 8, Rule 6 (Organic Liquid Bulk Terminals and Bulk Plants)

	SJVAPCD Rule 4624	BAAQMD Reg 8, Rule 6
Applicability	Organic liquid transfer facilities.	Transfer operations at non-gasoline organic liquid bulk terminals and bulk plants.
Exemptions	• Facilities which transfer < 4,000 gal of organic liquids in any one day. • Transfer operations subject to the requirements of Rule 4621 or Rule 4622. • Transfer of organic liquids with TVP < 1.5 psia at the storage container's maximum organic liquid storage temperature. • Equipment or components subject to District Rules 4409, 4455, or 4623 .	• Spills resulting from maintenance or repair operations. • Gasoline bulk terminals and bulk plants. • Loading organic liquids into any transportable container with capacity < 30 gal. • Transfer operations involving liquefied organic gases such as liquefied petroleum gas (LPG) and halogenated gases.
Requirements	**Leaks:** • 3 drops/min **Operations:** • Locations transferring ≥ 4,000 gal but < 20,000 gal on any one day of organic liquids with TVP ≥ 1.5 psia shall prevent the release to the atmosphere of at least 95% by weight of the VOC displaced during organic liquid transfers.	**Leaks:** • 3 drops/min **Operations:** • Shall not transfer or allow the transfer of organic liquids unless a vapor loss control system is properly connected and used. • Shall not transfer or allow the transfer of any organic liquid with a TVP of ≥ 1.5 psia into any bulk terminal or bulk

[218] BAAQMD. *Regulation 8, Rule 6 (Organic Liquid Bulk Terminals and Bulk Plants)*. (Amended November 3, 2021). Retrieved from: https://www.baaqmd.gov/~/media/dotgov/files/rules/refinery-rules-definitions/rg0806_20211103-pdf.pdf
[219] SBAPCD. *Rule 346 (Loading of Organic Liquid Cargo Vessels)*. (Amended January 18, 2001). Retrieved from: https://www.ourair.org/wp-content/uploads/rule346.pdf
[220] VCAPCD. *Rule 71.3 (Transfer of Reactive Organic Compound Liquids)*. (Amended May 11, 2021). Retrieved from: http://www.vcapcd.org/Rulebook/Reg4/RULE%2071.3.pdf
[221] VCAPCD. *Rule 74.10 (Components at Crude Oil and Natural Gas Production and Processing Facilities)*. (Amended March 10, 1998). Retrieved from: http://www.vcapcd.org/Rulebook/Reg4/RULE%2074.10.pdf

	SJVAPCD Rule 4624	BAAQMD Reg 8, Rule 6

	• For locations transferring ≥ 20,000 gal on any one day of organic liquids with TVP ≥ 1.5 psia, VOC emission from the transfer operation shall not exceed 0.08 lbs/1,000 gal of organic liquid transferred.
	• A transfer operation shall use one of the following:
	  ○ An organic liquid loading operation shall be bottom loaded. (For locations transferring < 20,000 gal: equipped with a vapor collection and control system and the vapors from loading the tank truck, trailer, or railroad tank car shall be routed to the vapor collection and control system); or
	  ○ The VOC from the transfer operation shall be routed to a fixed roof container, a floating roof container, a pressure vessel, or a VOC control system that meets the control requirements specified in Rule 4623;
	• All delivery tanks which previously contained organic liquids with a TVP ≥ 1.5 psia at the storage container's maximum organic liquid storage temperature shall be filled only at transfer facilities satisfying rule requirements.
	• The transfer rack and vapor collection equipment shall be designed, installed, maintained and operated such that there are no leaks and no excess organic liquid drainage at disconnections.
	
	Inspection:
	• Vapor collection system, vapor disposal system, and each transfer rack handling organic liquids for leaks during transfer should be inspected at least once every calendar quarter using a portable hydrocarbon detection instrument in accordance with EPA established method.
	• A floating roof container that meets the applicable control requirements of Rule 4623 shall be considered not
		plant storage tank having a capacity between 2,008 - 39,630 gal inclusive, unless a vapor balance system or vapor loss control system has been properly installed on the storage tank and is properly connected during delivery.
		• Organic compound emissions from the transfer operation shall not exceed 0.17 lbs/1,000 gal of organic liquid loaded.
		• Shall not allow the loading of any organic liquid from bulk plant loading equipment unless the following requirements are satisfied:
		  ○ Vapor Recovery Requirement: Any emissions displaced while transferring an organic liquid with a TVP ≥ 1.5 psia into a delivery vehicle shall be controlled by a vapor balance system or a vapor loss control system, which is properly connected and used during loading. Organic compound emissions shall not exceed 0.35 lbs/1,000 gal of organic liquid loaded.
		• Operations shall be maintained to be vapor tight, leak free and in good working order.

	SJVAPCD Rule 4624	BAAQMD Reg 8, Rule 6
	leaking for the purposes of the inspection requirements of this rule. • All equipment found leaking shall be repaired or replaced within 72 hours, or else shall be taken out of service until repaired or replaced. It shall be re-inspected the first time the equipment is in operation after the repair or replacement. • An operator may apply for APCO approval to change the inspection frequency from quarterly to annually provided no leaks were found during 5 consecutive quarterly inspections. Upon identification of any leak during an annual inspection the frequency would revert back to quarterly and the operator shall contact the APCO in writing within 14 days.	

As demonstrated above, District Rule 4624 and BAAQMD Regulation 8, Rule 6 contain similar rule requirements. Therefore, District Rule 4624 is as stringent as BAAQMD Regulation 8, Rule 6.

Ventura County APCD

- VCAPCD Rule 71.3 (Transfer of Reactive Organic Compound Liquids)

	SJVAPCD Rule 4624	VCAPCD Rule 71.3
Applicability	Organic liquid transfer facilities.	Equipment used to transfer reactive organic compound (ROC) liquids with a Modified Reid Vapor Pressure (MRVP) ≥ 0.5 psia, not including the transfer of gasoline or ROC liquids via pipeline.
Exemptions	• Facilities which transfer < 4,000 gal of organic liquids in any one day, except applicable recordkeeping requirements. • Transfer operations subject to the requirements of Rule 4621 or Rule 4622. • Transfer of organic liquids with TVP < 1.5 psia at the storage container's maximum organic liquid storage temperature, except applicable recordkeeping requirements. • Equipment or components subject to District Rules 4409, 4455, or 4623 are exempt from leak inspection requirements of Rule 4624.	• Equipment that transfers an ROC liquid with a MRVP < 0.5 psia, except applicable recordkeeping requirements. • Loading facility requirements shall not apply to any loading equipment that transfers crude oil from storage tanks that are exempt from the vapor recovery requirements of Rule 71.1 (Crude Oil Production and Separation). • Loading facility requirements shall not apply to a loading facility constructed prior to July 1, 1990, that transfers crude oil into any ROC delivery vessel from shipping tanks located > 1200 ft. from the loading facility.

	SJVAPCD Rule 4624	VCAPCD Rule 71.3
		• During the calibration of the marker inside a cargo tank when done by the Ventura County Department of Weights and Measures in accordance with their procedures.

Requirements	**Leaks:**
	• 1,000 ppmv
	• 3 drops/min
	
	Operations:
	• Locations transferring ≥ 4,000 gal but < 20,000 gal on any one day of organic liquids with TVP ≥ 1.5 psia shall prevent the release to the atmosphere of at least 95% by weight of the VOC displaced during organic liquid transfers.
	• For locations transferring ≥ 20,000 gal on any one day of organic liquids with TVP ≥ 1.5 psia, VOC emission from the transfer operation shall not exceed 0.08 lbs/1,000 gal of organic liquid transferred.
	• A transfer operation shall use one of the following:
	  ○ An organic liquid loading operation shall be bottom loaded. (For locations transferring < 20,000 gal: equipped with a vapor collection and control system and the vapors from loading the tank truck, trailer, or railroad tank car shall be routed to the vapor collection and control system); or
	  ○ The VOC from the transfer operation shall be routed to a fixed roof container, a floating roof container, a pressure vessel, or a VOC control system that meets the control requirements specified in Rule 4623;
	• All delivery tanks which previously contained organic liquids with a TVP ≥ 1.5 psia at the storage container's maximum organic liquid storage temperature shall be filled only at transfer facilities satisfying rule requirements.
	• The transfer rack and vapor collection equipment shall be
		Leaks:
		• 10,000 ppmv
		• 3 drops/min
		
		Operations:
		• Persons transferring > 4,000 gal but < 20,000 gal on any one day with MRVP ≥ 1.5 psia or 150,000 gal/year of ROC liquid with a MRVP ≥ 0.5 psia must use:
		  ○ A bottom-loaded vapor recovery system that prevents the displaced vapors during loading from being released into the atmosphere.
		  ○ A vapor disposal system with a vapor destruction or removal efficiency of at least 95% by weight.
		• Persons transferring > 20,000 gal on any one day with MRVP ≥ 1.5 psia must use:
		  ○ A bottom-loaded vapor recovery system
		  ○ A vapor return or condensation system that connects to a gas pipeline recovery and distribution system,
		• Any loading operation equipment, vapor recovery system, or other equipment required by this rule shall not leak.
		• The vapor recovery system shall be operated and maintained so that it does not cause the pressure in any delivery vessel to exceed 18 in. water gauge or the vacuum to exceed 6 in. water gauge.

	SJVAPCD Rule 4624	VCAPCD Rule 71.3
	designed, installed, maintained and operated such that there are no leaks and no excess organic liquid drainage at disconnections. **Inspection:** • Vapor collection system, vapor disposal system, and each transfer rack handling organic liquids for leaks during transfer should be inspected at least once every calendar quarter using a portable hydrocarbon detection instrument in accordance with EPA established method. • A floating roof container that meets the applicable control requirements of Rule 4623 shall be considered not leaking for the purposes of the inspection requirements of this rule. • All equipment found leaking shall be repaired or replaced within 72 hours, or else shall be taken out of service until repaired or replaced. It shall be re-inspected the first time the equipment is in operation after the repair or replacement. • An operator may apply for APCO approval to change the inspection frequency from quarterly to annually provided no leaks were found during 5 consecutive quarterly inspections. Upon identification of any leak during an annual inspection the frequency would revert back to quarterly and the operator shall contact the APCO in writing within 14 days	

As shown above, District Rule 4624 contains similar requirements as VCAPCD Rule 71.3. However, District Rule 4624 contains a lower leak limit of 1,000 ppmv, compared to VCAPCD Rule 71.3's leak limit of 10,000 ppmv.[222] Therefore, District Rule 4624 is as stringent as or more stringent than VCAPCD Rule 71.3.

[222] Pursuant to VCAPCD Rule 71.2; on or after January 1, 2023, the definition of a leak changes to major gas leak, minor gas leak, major liquid leak, or minor liquid leak, which has concentration limits ranging from 1,000 ppmv to 10,000 ppmv.

Potential Emission Reduction Opportunities

The District is currently amending Rule 4624 to include lower leak thresholds, more frequent LDAR inspections, and the use of new technology as instruments for leak detection among evaluating other potential changes.

Contingency Measure Evaluation

As discussed in Chapter 6, contingency measures are immediately implemented ONLY if triggered by an unanticipated milestone or attainment failure. The District reviewed this control measure for a potential contingency component. The District concludes that this control measure is not an appropriate contingency measure because the contingency trigger is incompatible with the technologies involved in reducing emissions from this category.

Evaluation Findings

The District commits to amend Rule 4624 no later than 2024 to include lower leak thresholds, more frequent LDAR inspections, and the use of new technology as instruments for leak detection, among evaluating other potential changes. Once amended, District Rule 4624 will continue to meet or exceed federal RACT requirements for this source category.

C.39 RULE 4625 WASTEWATER SEPARATORS

Emissions Inventory (Summer Average – Tons per day)

	2017	2023	2026	2029	2032	2035	2037
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VOC	0.07	0.07	0.07	0.07	0.07	0.07	0.07

District Rule 4625 Description

District Rule 4625, amended on December 15, 2011, applies to wastewater separators including air flotation units. The rule only applies to the separation of crude oil and water after custody transfer. The rule prohibits the use of any compartment of any vessel or device operated for the recovery of oil or tar from effluent water, from equipment which processes, refines, stores, or handles petroleum or coal tar products unless such compartments are equipped with one of the following: (1) a solid cover with all openings sealed and totally enclosing the liquid contents of the compartment; (2) a floating pontoon or double deck type cover with closure seals that meet specific requirements of the rule; or (3) a vapor recovery system with a combined collection and control efficiency of at least 90%. Control devices must be under District permit. Any gauging and sampling device in the compartment cover must be equipped with a cover or lid. Facilities must close covers and lids at all times, except when the device is in actual use.

How does District Rule 4625 compare with federal and state rules and regulations?

Federal Regulations

There are no Alternative Control Techniques applicable to this source category.

A. Control Techniques Guidelines (CTG)

District staff conducted a comprehensive evaluation of EPA CTG requirements. EPA has not adopted updates to the following CTGs since EPA found that Rule 4625 met RACT requirements through EPA's approval of the *2014 RACT SIP*. Therefore, further evaluation is not necessary at this time.

- *Control of Refinery Vacuum Producing Systems, Water Separators and Process Unit Turnarounds (EPA-450/2-77-025 1997/10)*
- *Control of Volatile Organic Compound Emissions from Industrial Wastewater (EPA-453/D-93-056 1992/09)*

B. New Source Performance Standards (NSPS)

District staff conducted a comprehensive evaluation of EPA NSPS requirements. EPA has not adopted updates to the following NSPS since EPA found that Rule 4625 met RACT requirements through EPA's approval of the *2014 RACT SIP*. Therefore, further evaluation is not necessary at this time.

- *40 CFR 60 Subpart QQQ - Standards of Performance for VOC Emissions from Petroleum Refinery Wastewater Systems (1995/08)*

State Regulations

There are no state regulations applicable to this source category.

How does District Rule 4625 compare to rules in other air districts?

District staff compared emission limits, optional control requirements, and work practice standards in District Rule 4625 to comparable requirements in rules from the following California nonattainment areas:

- Bay Area AQMD Regulation 8, Rule 8 (Amended September 15, 2004)[223]
- South Coast AQMD Rule 1176 (Amended September 13, 1996)[224]
- Ventura County APCD Rule 74.8 (Amended July 5, 1983)[225]

Sacramento Metropolitan AQMD does not have an analogous rule for this source category. For the remaining above-listed rules, the District reviewed the rule requirements implemented prior to EPA's approval of the *2014 RACT SIP* and found that Rule 4625 continues to implement RACT levels of control.

Potential Emission Reduction Opportunities

As demonstrated above, District Rule 4625 currently has in place the most stringent measures feasible to implement in the Valley. The District did not identify additional emission reduction opportunities at this time.

Contingency Measure Evaluation

As discussed in Chapter 6, contingency measures are immediately implemented ONLY if triggered by an unanticipated milestone or attainment failure. The District reviewed this control measure for a potential contingency component. The District concludes that

[223] BAAQMD. *Regulation 8 Rule 8 (Wastewater Collection and Separation Systems).* (Amended September 15, 2004). Retrieved from: https://www.baaqmd.gov/~/media/dotgov/files/rules/refinery-rules-definitions/rg0808_20211103-pdf.pdf?la=en&rev=c03cc2b2bc8c44c7aac63200f4114c58

[224] SCAQMD. *Rule 1176 (VOC Emissions from Wastewater Systems).* (Amended September 13, 1996). Retrieved from: http://www.aqmd.gov/docs/default-source/rule-book/reg-xi/rule-1176.pdf?sfvrsn=4

[225] VCAPCD. *Rule 74.8 (Refinery Vacuum Producing Systems, Wastewater Separators and Process Turnarounds).* (Amended July 5, 1983). Retrieved from: http://www.vcapcd.org/Rulebook/Reg4/RULE%2074.8.pdf

this control measure is not an appropriate contingency measure because the most stringent feasible controls are already in place, and a contingency trigger is incompatible with the technologies involved in reducing emissions from this category.

Evaluation Findings

Rule 4625 meets or exceeds federal RACT requirements for this source category based upon evaluation of applicable federal regulations, state standards, and other air districts' rules. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

C.40 RULE 4641 CUTBACK, SLOW CURE, AND EMULSIFIED ASPHALT, PAVING, AND MAINTENANCE OPERATIONS

Emissions Inventory (Summer Average – Tons per day)

	2017	2023	2026	2029	2032	2035	2037
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VOC	0.95	1.11	1.16	1.19	1.23	1.27	1.30

District Rule 4641 Description

This rule applies to the manufacture and use of cutback asphalt, slow cure asphalt, and emulsified asphalt for paving and maintenance operations. The purpose of this rule is to limit VOC emissions by restricting the application and manufacturing of certain types of asphalt for paving and maintenance operations.

How does District Rule 4641 compare with federal and state rules and regulations?

Federal Regulations

There are no Alternative Control Techniques or New Source Performance Standards applicable to this source category.

A. Control Techniques Guidelines (CTG)

District staff conducted a comprehensive evaluation of EPA CTG requirements. EPA has not adopted updates to the following CTG since EPA found that Rule 4641 met RACT requirements through EPA's approval of the *2014 RACT SIP*. Therefore, further evaluation is not necessary at this time.

- *Control of Volatile Organic Emissions from Use of Cutback Asphalt (EPA-450/2-77-037 1977/12)*

State Regulations

There are no state regulations applicable to this source category.

How does District Rule 4641 compare to rules in other air districts?

District staff compared emission limits, optional control requirements, and work practice standards in District Rule 4641 to comparable requirements in rules from the following California nonattainment areas:

- Bay Area AQMD Regulation 8, Rule 15 (Amended June 1, 1994)[226]
- Sacramento Metropolitan AQMD Rule 453 (Amended October 27, 2011)[227]
- South Coast AQMD Rule 1108 (Amended February 1, 1985)[228]
- South Coast AQMD Rule 1108.1 (Amended November 4, 1983)[229]
- Ventura County APCD Rule 74.4 (Amended July 5, 1983)[230]

The District reviewed the rule requirements implemented prior to EPA's approval of the *2014 RACT SIP* and found that Rule 4641 continues to implement RACT levels of control.

Potential Emission Reduction Opportunities

As part of the District's recent BARCT analysis as required by AB 617, the District determined that there are actually no permitted emissions units that are subject to District Rule 4641 requirements that have emission control technologies more effective than those required under Rule 4641.[231] In addition, there are no federal, state, or other air district rules that are more stringent than what is already contained within District Rule 4641. Overall, the District found that Rule 4641 satisfies BARCT requirements.

Further, as demonstrated above, Rule 4641 currently has in place the most stringent measures feasible to implement in the Valley. The District did not identify additional emission reduction opportunities at this time.

Contingency Measure Evaluation

As discussed in Chapter 6, contingency measures are immediately implemented ONLY if triggered by an unanticipated milestone or attainment failure. The District reviewed this control measure for a potential contingency component. The District concludes that this control measure is not an appropriate contingency measure because the most

---

[226] BAAQMD. *Regulation 8, Rule 15 (Emulsified and Liquid Asphalts).* (Amended June 1, 1994). Retrieved from: https://www.baaqmd.gov/~/media/dotgov/files/rules/reg-8-rule-15-emulsified-and-liquid-asphalts/documents/rg0815.pdf?la=en&rev=c62ba1ccb8224f60a213d9ce1e6f1d1d.

[227] SMAQMD. *Rule 453 (Cutback and Emulsified Asphalt Paving Materials).* (Amended August 31, 1982). Retrieved from: http://www.airquality.org/ProgramCoordination/Documents/rule453.pdf.

[228] SCAQMD. *Rule 1108 (Cutback Asphalt).* (Amended February 1, 1985). Retrieved from: http://www.aqmd.gov/docs/default-source/rule-book/reg-xi/rule-1108-cutback-asphalt.pdf?sfvrsn=4.

[229] SCAQMD. *Rule 1108.1 (Emulsified Asphalt).* (Amended November 4, 1983). Retrieved from: http://www.aqmd.gov/docs/default-source/rule-book/reg-xi/rule-1108-1-emulsified-asphalt.pdf?sfvrsn=4.

[230] VCAPCD. *Rule 74.4 (Cutback Asphalt).* (Amended July 5, 1983). Retrieved from: http://www.vcapcd.org/Rulebook/Reg4/RULE%2074.4.pdf.

[231] SJVAPCD. *AB 617 Best Available Retrofit Control Technology (BARCT) Analysis*. Pp. 36-50. December 26, 2019. Retrieved from: https://community.valleyair.org/media/1790/final-barct-rule-analysis-july-30-2020.pdf

stringent feasible controls are already in place, and a contingency trigger is incompatible with the technologies involved in reducing emissions from this category.

Evaluation Findings

Rule 4641 meets or exceeds federal RACT requirements for this source category based upon evaluation of applicable federal regulations, state standards, and other air districts' rules. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

C.41 RULE 4642 SOLID WASTE DISPOSAL SITES

Emissions Inventory (Summer Average – Tons per day)

	2017	2023	2026	2029	2032	2035	2037
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VOC	1.42	1.50	1.54	1.59	1.63	1.67	1.70

District Rule 4642 Description

The purpose of this rule is to impose performance requirements for landfill gas collection and control systems that are in place at solid waste disposal sites. Rule 4642 does not require the installation of a gas collection or control system at any solid waste disposal site.

The rule exempts landfill gas collection and control systems at landfills which are subject to the requirements of 40 CFR 60 Subpart WWW (Standards of Performance for Municipal Solid Waste Landfills), or Subpart Cc (Emission Guidelines and Compliance Times for Municipal Solid Waste Landfills), and hazardous waste disposal sites.

The rule requires the operation of landfill gas collection systems in such a manner that landfill surface VOC concentrations shall not exceed 1,000 ppmv at any point. Landfills shall be treated with a control device that achieves a VOC destruction efficiency of at least 98 percent by weight, or reduces the VOC concentration to 20 ppmv or less (measured as Methane) corrected to 3 percent oxygen. For facilities which received Authorities to Construct prior to the rule adoption date (July 20, 1995), the rule requires the control device to achieve a VOC destruction efficiency of at least 90 percent, or reduce the VOC concentration to 30 ppmv.

How does District Rule 4642 compare with federal and state rules and regulations?

Federal Regulations

There are no Control Techniques Guidelines or Alternative Control Techniques applicable to this source category.

A. New Source Performance Standards (NSPS)

- *40 CFR 60 Subpart Cc - Emission Guidelines and Compliance Times for Municipal Solid Waste Landfills (2016/08)*

This NSPS applies to existing landfills that commenced construction, reconstruction or modification prior to May 30, 1991. Landfills meeting the applicability criteria are required to install a landfill gas collection and control system meeting the specifications

of 40 CFR 60.752(b)(2)(ii). The landfill gas collection and control system specifications of 40 CFR 60.752(b)(2)(ii) are consistent with the requirements of Rule 4642. For landfills that have a gas collection and control system, the requirements of Rule 4642 are as stringent as the requirements of 40 CFR Subpart Cc.

- *40 CFR 60 Subpart Cf - Standards of Performance for Municipal Solid Waste Landfills that Commenced Construction, Reconstruction, or Modification After July 17, 2014 (2020/03)*

This NSPS applies to landfills that commenced construction, reconstruction or modification before July 17, 2014. Landfills meeting the applicability criteria are required to install a landfill gas collection and control system meeting the specifications of 60.33f(c)(2) are consistent with the requirement of Rule 4642. For landfills that have a gas collection and control system, the requirements of Rule 4642 are as stringent as the requirements of 40 CFR Subpart Cf.

- *40 CFR 60 Subpart WWW - Standards of Performance for Municipal Solid Waste Landfills That Commenced Construction, Reconstruction, or Modification on or After May 30, 1991, but Before July 18, 2014 (2020/03)*

This NSPS applies to landfills that commenced construction, reconstruction, or modification after May 30, 1991, but before July 18, 2014. Landfills meeting the applicability criteria are required to install a landfill gas collection and control system meeting the specifications of 40 CFR 60.752(b)(2)(ii).

The landfill gas collection and control system specifications of 40 CFR 60.752(b)(2)(ii) are consistent with the requirements of Rule 4642.

- *40 CFR 60 Subpart XXX - Standards of Performance for Municipal Solid Waste Landfills That Commenced Construction, Reconstruction, or Modification on or After July 17, 2014 (2022/02)*

This NSPS applies to landfills that commenced construction, reconstruction, or modification after July 17, 2014. Landfills meeting the applicability criteria are required to install a landfill gas collection and control system meeting the specifications of 40 CFR 60.762(b)(2)(iii). The landfill gas collection and control system specifications of 40 CFR 60.762(b)(2)(iii) are consistent with the requirements of Rule 4642.

State Regulations

There are no state regulations applicable to this source category.

How does District Rule 4642 compare to rules in other air districts?

District staff compared emission limits, optional control requirements, and work practice standards in District Rule 4642 to comparable requirements in rules from the following California nonattainment areas:

- Bay Area AQMD Regulation 8, Rule 34 (Amended June 15, 2005)[232]
- Sacramento Metropolitan AQMD Rule 485 (Amended July 23, 1998)[233]
- Ventura County APCD Rule 74.17.1 (Amended February 9, 1999)[234]
- South Coast AQMD Rule 1150.1 (Amended April 1, 2011)[235]

The District reviewed the rule requirements implemented prior to EPA's approval of the *2014 RACT SIP* and found that Rule 4642 continues to implement RACT levels of control.

Potential Emission Reduction Opportunities

As demonstrated above, Rule 4642 currently has in place the most stringent measures feasible to implement in the Valley. No additional emission reduction opportunities have been identified at this time.

Contingency Measure Evaluation

As discussed in Chapter 6, contingency measures are immediately implemented ONLY if triggered by an unanticipated milestone or attainment failure. The District reviewed this control measure for a potential contingency component. The District concludes that this control measure is not an appropriate contingency measure because the most stringent feasible controls are already in place, and a contingency trigger is incompatible with the technologies involved in reducing emissions from this category.

Evaluation Findings

District Rule 4642 meets or exceeds federal RACT requirements for this source category based upon evaluation of applicable federal regulations, state standards, and other air districts' rules.

---

[232] BAAQMD. *Regulation 8 Rule 34 (Solid Waste Disposal Sites).* (Amended June 15, 2005). Retrieved from: https://www.baaqmd.gov/~/media/dotgov/files/rules/reg-8-rule-34-solid-waste-disposal-sites/documents/rg0834.pdf?la=en&rev=41e786097ed348e99bf53c14f101e055

[233] SMAQMD. *Rule 485 (Municipal Landfill Gas).* (Amended July 23, 1998). Retrieved from: http://www.airquality.org/ProgramCoordination/Documents/rule485.pdf

[234] VCAPCD. *Rule 74.17.1 (Municipal Solid Waste Landfills).* (Amended February 9, 1999). Retrieved from: http://www.vcapcd.org/Rulebook/Reg4/RULE%2074.17.1.pdf

[235] SCAQMD. *Rule 1150.1 (Control of Gaseous Emissions from Municipal Solid Waste Landfills).* (Amended April 1, 2011). Retrieved from: https://www.aqmd.gov/docs/default-source/rule-book/reg-xi/rule-1150-1.pdf?sfvrsn=4

C.42 RULE 4651 SOIL DECONTAMINATION OPERATIONS

Emissions Inventory (Summer Average – Tons per day)

	2017	2023	2026	2029	2032	2035	2037
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VOC	0.09	0.09	0.09	0.10	0.10	0.10	0.10

District Rule 4651 Description

The purpose of this rule is to reduce VOC emissions from soil contaminated with a VOC-containing liquid. This source category includes all activities involving the remediation of contaminated soils. Soil contamination from organic material occurs due to leaking storage and handling systems, operating losses, and accidental spills.

How does District Rule 4651 compare with federal and state rules and regulations?

Federal Regulations

There are no Control Techniques Guidelines, Alternative Control Techniques, or New Source Performance Standards.

State Regulations

There are no state regulations applicable to this source category.

How does District Rule 4651 compare to rules in other air districts?

District staff compared emission limits, optional control requirements, and work practice standards in District Rule 4651 to comparable requirements in rules from the following California nonattainment areas:

- Bay Area AQMD Regulation 8, Rule 40 (Amended June 15, 2005)[236]
- South Coast AQMD Rule 1166 (Amended May 11, 2001)[237]
- Ventura County APCD Rule 74.29 (Amended April 8, 2008)[238]

[236] BAAQMD. *Regulation 8, Rule 40 (Aeration of Contaminated Soil and Removal of Underground Storage Tanks).* (Amended June 15, 2005). Retrieved from: https://www.baaqmd.gov/~/media/dotgov/files/rules/reg-8-rule-40-aeration-of-contaminated-soil-and-removal-of-underground-storage-tanks/documents/rg0840.pdf?la=en&rev=a9e8f30796f84cdb8e087abc704b520d.
[237] SCAQMD. *Rule 1166 (Volatile Organic Compound Emissions from Decontamination of Soil).* (Amended May 11, 2001). Retrieved from: http://www.aqmd.gov/docs/default-source/rule-book/reg-xi/rule-1166.pdf?sfvrsn=4.
[238] VCAPCD. *Rule 74.29 (Soil Decontamination Operations).* (Amended April 8, 2008). Retrieved from: http://www.vcapcd.org/Rulebook/Reg4/RULE%2074.29.pdf.

Sacramento Metropolitan AQMD does not have an analogous rule for this source category. For the remaining above-listed rules, the District reviewed the rule requirements implemented prior to EPA's approval of the *2014 RACT SIP* and found that Rule 4651 continues to implement RACT levels of control.

Potential Emission Reduction Opportunities

As demonstrated above, Rule 4651 currently has in place the most stringent measures feasible to implement in the Valley. No additional emission reduction opportunities have been identified at this time.

Contingency Measure Evaluation

As discussed in Chapter 6, contingency measures are immediately implemented ONLY if triggered by an unanticipated milestone or attainment failure. The District reviewed this control measure for a potential contingency component. The District concludes that this control measure is not an appropriate contingency measure because the most stringent feasible controls are already in place, and a contingency trigger is incompatible with the technologies involved in reducing emissions from this category.

Evaluation Findings

Rule 4651 meets or exceeds federal RACT requirements for this source category based upon evaluation of applicable federal regulations, state standards, and other air districts' rules. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

C.43 RULE 4652 COATINGS AND INK MANUFACTURING

Emissions Inventory (Summer Average – Tons per day)

	2017	2023	2026	2029	2032	2035	2037
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VOC	0.00	0.00	0.00	0.00	0.00	0.00	0.00

District Rule 4652 Description

District Rule 4652, last amended on December 17, 1992, limits VOC emissions from coating and ink manufacturing operations.

District Rule 4652 specifies equipment design and operational procedures for processes associated with the manufacture of coatings or inks. The rule requires that portable mixing vats be covered, and includes lid configuration requirements. Stationary mixing vats are to be covered and grinding mills must have fully enclosed screens. For cleaning portable and stationary vats, as well as for cleaning high-speed dispersion mills, grinding mills, and roller mills, APCO-approved cleaning methods are required.

How does District Rule 4652 compare with federal and state rules and regulations?

Federal Regulations

There are no Control Techniques Guidelines, Alternative Control Techniques, or New Source Performance Standards applicable to this source category.

State Regulations

There are no state regulations applicable to this source category.

How does District Rule 4652 compare to rules in other air districts?

District staff compared emission limits, optional control requirements, and work practice standards in District Rule 4652 to comparable requirements in rules from the following California nonattainment areas:

- Bay Area AQMD Regulation 8, Rule 35 (Amended June 15, 1994)[239]
- South Coast AQMD Rule 1141.1 (Amended November 17, 2000)[240]

[239] BAAQMD. *Regulation 8, Rule 35 (Coating, Ink and Adhesive Manufacturing).* (Amended June 15, 1994). Retrieved from: https://www.baaqmd.gov/~/media/dotgov/files/rules/reg-8-rule-35-coating-ink-and-adhesive-manufacturing/documents/rg0835.pdf?la=en&rev=9b93ed69811d49aab0beb9ca5f85d1b9.
[240] SCAQMD. *Rule 1141.1 (Coatings and Ink Manufacturing).* (Amended November 17, 2000). Retrieved from: http://www.aqmd.gov/docs/default-source/rule-book/reg-xi/rule-1141-1.pdf?sfvrsn=4.

Ventura County APCD does not have an analogous rule for this source category. For the above-mentioned rules, the District reviewed the rule requirements implemented prior to EPA's approval of the *2014 RACT SIP* and found that Rule 4652 continues to implement RACT levels of control.

Potential Emission Reduction Opportunities

As demonstrated above, Rule 4652 currently has in place the most stringent measures feasible to implement in the Valley. No additional emission reduction opportunities have been identified at this time.

Contingency Measure Evaluation

As discussed in Chapter 6, contingency measures are immediately implemented ONLY if triggered by an unanticipated milestone or attainment failure. The District reviewed this control measure for a potential contingency component. The District concludes that this control measure is not an appropriate contingency measure because the most stringent feasible controls are already in place, and a contingency trigger is incompatible with the technologies involved in reducing emissions from this category.

Evaluation Findings

Rule 4652 meets or exceeds federal RACT requirements for this source category based upon evaluation of applicable federal regulations, state standards, and other air districts' rules. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

C.44 RULE 4653 ADHESIVES AND SEALANTS

Emissions Inventory (Summer Average – Tons per day)

	2017	2023	2026	2029	2032	2035	2037
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VOC	0.62	0.63	0.63	0.63	0.63	0.64	0.64

District Rule 4653 Description

District Rule 4653 sets VOC content limits for adhesive products, sealant products, and associated solvent cleaning operations. This rule is applicable to any person who supplies, sells, offers for sale, or applies any adhesive product, sealant product, or associated solvent, used within the District. The District amended Rule 4653 on September 16, 2010, to incorporate more stringent VOC limits for adhesives enforced in several other air districts, and add sealant products to rule requirements.

How does District Rule 4653 compare with federal and state rules and regulations?

Federal Regulations

There are no Alternative Control Techniques or New Source Performance Standards applicable to this source category.

A. Control Techniques Guidelines (CTG)

District staff conducted a comprehensive evaluation of EPA CTG requirements. EPA has not adopted updates to the following CTG since EPA found that Rule 4653 met RACT requirements through EPA's approval of the *2014 RACT SIP*. Therefore, further evaluation is not necessary at this time.

- *Control Techniques Guidelines for Miscellaneous Industrial Adhesives (EPA-453/R-08-005 2008/09)*

State Regulations

There are no state regulations applicable to this source category.

How does District Rule 4653 compare to rules in other air districts?

District staff compared emission limits, optional control requirements, and work practice standards in District Rule 4653 to comparable requirements in rules from the following California nonattainment areas:

- Bay Area AQMD Regulation 8, Rule 51 (Amended July 17, 2002)[241]
- Sacramento Metropolitan AQMD Rule 460 (Amended November 30, 2000)[242]
- South Coast AQMD Rule 1168 (Amended October 6, 2017)[243]
- Ventura County APCD Rule 74.20 (Amended October 9, 2018)[244]

EPA approved the most recent amendments to Rule 4653 in 2012[245], and determined that it met RACT levels of emission controls. The below comparison tables demonstrate that, for other district rules that have been amended since EPA's approval of 4653, District Rule 4653 continues to meet RACT.

South Coast AQMD

- SCAQMD Rule 1168 (Adhesive and Sealant Applications)

	SJVAPCD Rule 4653	SCAQMD Rule 1168
Applicability	Any person who supplies, sells, offers for sale, or applies any adhesive product, sealant product, or associated solvent.	Any person who uses, sells, stores, supplies, distributes, offers for sale, or manufactures for sale any adhesives, adhesive primers, sealants, or sealant primers, unless otherwise specifically exempted by this rule.
Exemptions	• Stationary sources that use 20 gallons or less of adhesive products. • Adhesive/sealant products containing less than 20 grams of VOC per liter. • Testing and evaluation of adhesives in research laboratories, analytical laboratories, or quality assurance laboratories. • The use of adhesives in tire repair provided the label states "for tire repair use only." • The use of adhesives sold or supplied with 8 fluid oz. or less of adhesive in non-reusable containers. • Aerosol spray adhesive products	• Adhesive tape • Adhesives, adhesive primers, sealants, or sealant primers, and associated application processes. • Regulated products shipped, supplied, or sold to persons for use outside the District, or distribution centers that do not ship regulated products into or within the District. • Aerosol adhesives and primers dispensed from non-refillable aerosol spray systems. • Regulated products sold in quantities of one fluid ounce or less. • Adhesives used to glue flowers to parade floats.

[241] BAAQMD. *Regulation 8, Rule 51 (Adhesive and Sealant Products).* (Amended July 17, 2002). Retrieved from: https://www.baaqmd.gov/~/media/dotgov/files/rules/reg-8-rule-51-adhesive-and-sealant-products/documents/rg0851.pdf?la=en&rev=7cf8dc673a4f41629984727defad9b55

[242] SMAQMD. *Rule 460 (Adhesives and Sealants).* (Amended November 30, 2000). Retrieved from: http://www.airquality.org/ProgramCoordination/Documents/rule460.pdf

[243] SCAQMD. *Rule 1168 (Adhesives and Sealants).* (Amended October 6, 2017). Retrieved from: http://www.aqmd.gov/docs/default-source/rule-book/reg-xi/rule-1168.pdf?sfvrsn=4

[244] VCAPCD. *Rule 74.20 (Adhesives and Sealants).* (Amended October 9, 2018). Retrieved from: http://www.vcapcd.org/Rulebook/Reg4/RULE%2074.20.pdf

[245] EPA. *Revisions to the California State Implementation Plan, Joaquin Valley Unified Air Pollution Control District.* 77 Fed. Reg. 29, pp. 7536 – 7537 (February 13, 2012). Retrieved from: https://www.govinfo.gov/content/pkg/FR-2012-02-13/pdf/2012-3172.pdf

	SJVAPCD Rule 4653	SCAQMD Rule 1168
	• Household adhesives • Adhesive products subject to the VOC limit requirements of Rule 4605, (Aerospace Assembly and Component Coating Operations), Rule 4607 (Graphic Arts), and Rule 4681 (Rubber Tire Manufacturing). • Contact adhesives that are subject to the Consumer Product Safety Commission regulations in 16 CFR, Part 1302, that have a flash point greater than 20°F as determined pursuant to those regulations, and that are sold in packages that contain 128 fluid ounces or less. • Stripping of cured adhesives, except the stripping of such materials from spray application equipment. • A stationary source that uses 20 gallons or less of sealant products in a calendar year. • Testing and evaluation of sealant products in research laboratories, analytical laboratories, or quality assurance laboratories. • The use of aerosol adhesive or aerosol adhesive primer products. • Adhesive products used in assembly, repair, or manufacture of undersea-based weapon systems. • Adhesive products used in medical equipment manufacturing operations. • Cyanoacrylate adhesive application processes. • Processes using polyester bonding putties to assemble fiberglass parts at fiberglass boat manufacturing facilities and at other reinforced plastic composite manufacturing facilities. • Adhesive products and sealant products shipped, supplied, or sold exclusively to persons outside the District for use outside the District.	• Adhesives used to fabricate orthotics and prosthetics under a medical doctor's prescription. • Shoe repair, luggage, and handbag adhesives. • Research and development programs and quality assurance labs. • Solvent welding operations used in the manufacturing of medical devices. • Adhesives used in tire repair • A facility that demonstrates that the total volume of noncompliant products is less than 55 gallons per facility per calendar year. • Adhesives used in architectural applications, contact adhesives, special purpose contact adhesives, and adhesives used on porous substrates. • Regulated products used in the field installation and repair of potable water linings and covers at water treatment, storage, or water distribution facilities. • Regulated products with a viscosity of 200 centipoise or greater. • Thermoplastic hot melt adhesives or to regulated products offered for sale as a dry mix, containing no polymer, which are ready for use or only mixed with water prior to use, and include, but are not limited to, grouts, cements, and mortars • Products with a VOC content no more than 20 grams per liter, less water and less exempt compounds, or no more than 20 grams per liter material for low-solids regulated products. • Solvent welding formulations containing methylene chloride used to bond hard acrylic, polycarbonate, and polyethylene terephthalate glycol plastic fabrications, provided that the concentration of methylene chloride in any solvent welding formulation does not exceed 60 percent by weight; and the purchase of all solvent welding

<table>
<tr><th></th><th colspan="3">SJVAPCD Rule 4653</th><th>SCAQMD Rule 1168</th></tr>
<tr><td></td><td colspan="3">• Adhesive products and sealant products sold to any person who complies with the VOC emission control system requirements.
• Cleaning of solar cells, laser hardware, scientific instruments, or high precision optics.
• Cleaning in laboratory tests and analyses, or bench scale or research and development projects.
• Cleaning of clutch assemblies where rubber bonds to metal by means of an adhesive.
• Cleaning of paper-based gaskets.</td><td>products does not exceed 20 gallons per calendar year at a single facility.
• Regulated products weighing one pound or less, or consist of 16 fluid ounces or less and have VOC content limits, unless used exclusively in the manufacture or construction of the goods or commodities or used in pollution-generating activities that take place at stationary sources, excluding maintenance and repair.
• Manufacturer or supplier of regulated products provided the product sells to an independent distributor, informed in writing, including electronic formats, by the manufacturer or supplier, the regulated product is not be used in SCAQMD.</td></tr>
<tr><td rowspan="12">Requirements
Categories not shown indicates the rules have the same requirement.</td><td>Category</td><td>SJVAPCD Rule 4653 (limit in g/l)</td><td>SCAQMD Rule 1168 (limit in g/l)</td></tr>
<tr><td>All Other Roof Adhesives</td><td>300</td><td>250 until 12-31-2022
then 200</td></tr>
<tr><td>All Other Indoor Floor Covering Adhesives</td><td>660 for Perimeter Bonded Sheet Flooring Installation

150 for Floor Covering Installation</td><td>50</td></tr>
<tr><td>ABS to PVC Transition Cement</td><td>250</td><td>510 until 12-31-2022
then 425</td></tr>
<tr><td>CPVC Welding Cement</td><td>490</td><td>490 until 12-31-2022
then 400</td></tr>
<tr><td>PVC Welding Cement</td><td>510</td><td>510 until 12-31-2022
then 425</td></tr>
<tr><td>All Other Plastic Welding Cements</td><td>250</td><td>100</td></tr>
<tr><td>Rubber Vulcanization Adhesive</td><td>850</td><td>850 until 12-31-2022
then 250</td></tr>
<tr><td>Top and Trim Adhesive</td><td>540</td><td>540 until 12-31-2022
then 250</td></tr>
<tr><td>Architectural – Foam Insulation
Foam Sealant</td><td>250</td><td>250 until 12-31-2022
then 50</td></tr>
<tr><td>Architectural – Grout</td><td>250</td><td>65</td></tr>
</table>

	SJVAPCD Rule 4653		SCAQMD Rule 1168
	Architectural – Non-Staining Plumbing Putty	250	150 until 12-31-2022 then 50
	Architectural – Potable Water Sealant	250	100
	Single Ply Roof Membrane Sealant	450	450 until 12-31-2022 then 250
	All Other Architectural Sealants	250	50
	All Other Sealants	420	420 until 12-31-2022 then 250
	Adhesive Primers - Plastic	650	550
	Adhesive Primers – Pressure Sensitive	250	785
	Solvents		
	Medical Devices & Pharmaceuticals – Tools, Equipment, & Machinery	Exempt	800
	Medical Devices & Pharmaceuticals – General Work Surfaces	Exempt	600
	Electrical Apparatus Components & Electronic Components	25	100

Comparison of these rules revealed that the NOx limits in recently amended SCAQMD Rule 1168 are potentially more stringent for several unit categories in District Rule 4653, while in other categories, District Rule 4653 is more stringent. Rule 4653's low usage and small container exemptions (40 gal/year adhesives & sealants; and adhesives that are sold or supplied in ≤ 8 oz. non-reusable containers) are more stringent than South Coast's (55 gal/yr, with some exceptions; and regulated products, which weigh ≤ 1 lb, or consist of ≤ 16 fluid oz.). South Coast also has the following exemptions, which do not correspond to any equivalent exemptions in District Rule 4653:

1. Regulated products used in the field installation and repair of potable water linings and covers at water treatment, storage, or water distribution facilities.
2. Adhesive tape.
3. Regulated products sold in quantities of ≤ 1 fluid oz.
4. Adhesives used to glue flowers to parade floats.
5. Shoe repair, luggage, and handbag adhesives.

RACT is intended as the minimum level of control that all ozone nonattainment areas must achieve for existing sources. RACT is not intended as the only level of control needed for all nonattainment areas to attain the ozone standard. RACT is also not intended to be the most stringent level of control in an area's attainment strategy. Given

the District's existing stringent limits, the cost-effectiveness associated with the installation of additional controls will be far in excess of RACT cost-effectiveness levels.

Ventura County APCD

- VCAPCD Rule 74.20 (Adhesives and Sealants)

	SJVAPCD Rule 4653	VCAQMD Rule 74.20
Applicability	Any person who supplies, sells, offers for sale, or applies any adhesive product, sealant product, or associated solvent.	Any person who supplies, sells, offers for sale, manufactures, solicits the application of, or uses adhesives, sealants, sealant primers or adhesive primers in Ventura County.
Exemptions	• Stationary sources that use 20 gallons or less of adhesive products. • Adhesive/sealant products containing less than 20 grams of VOC per liter. • Testing and evaluation of adhesives in research laboratories, analytical laboratories, or quality assurance laboratories. • The use of adhesives in tire repair provided the label states "for tire repair use only." • The use of adhesives sold or supplied with 8 fluid oz. or less of adhesive in non-reusable containers. • Aerosol spray adhesive products • Household adhesives • Adhesive products subject to the VOC limit requirements of Rule 4605, (Aerospace Assembly and Component Coating Operations), Rule 4607 (Graphic Arts), and Rule 4681 (Rubber Tire Manufacturing). • Contact adhesives that are subject to the Consumer Product Safety Commission regulations in 16 CFR, Part 1302, that have a flash point greater than 20°F as determined pursuant to those regulations, and that are sold in packages that contain 128 fluid ounces or less. • Stripping of cured adhesives, except the stripping of such materials from spray application equipment.	• Any stationary source that emits less than 200 pounds of ROC in every rolling period of 12 consecutive calendar months from adhesive and sealant operations. • Assembling, manufacturing and repairing of aerospace components. • Graphic arts operations • Screen printing operations • Assembling and manufacturing of undersea-based weapon systems. • Testing and evaluation of adhesive or sealant products in any research and development or analytical laboratories. • Plastic welding operations used in the manufacturing of medical devices. • Tire repair operations, provided the label on the adhesive used states "For Tire Repair Only". • Field installation or repair of potable water linings and covers at potable water treatment, potable water storage, or potable water distribution facilities. • Manufacturing operations of the following products: diving suits, rubber fuel bladders, inflatable boats, life preservers or other stand-alone elastomeric type products designed for immersion in liquids. • Inkjet printer head assembly operations where the ROC content of the adhesive used for laminating is less than 100 grams per liter of material.

	SJVAPCD Rule 4653	VCAQMD Rule 74.20
	• A stationary source that uses 20 gallons or less of sealant products in a calendar year. • Testing and evaluation of sealant products in research laboratories, analytical laboratories, or quality assurance laboratories. • The use of aerosol adhesive or aerosol adhesive primer products. • Adhesive products used in assembly, repair, or manufacture of undersea-based weapon systems. • Adhesive products used in medical equipment manufacturing operations. • Cyanoacrylate adhesive application processes. • Processes using polyester bonding putties to assemble fiberglass parts at fiberglass boat manufacturing facilities and at other reinforced plastic composite manufacturing facilities. • Adhesive products and sealant products shipped, supplied, or sold exclusively to persons outside the District for use outside the District. • Adhesive products and sealant products sold to any person who complies with the VOC emission control system requirements. • Cleaning of solar cells, laser hardware, scientific instruments, or high precision optics. • Cleaning in laboratory tests and analyses, or bench scale or research and development projects. • Cleaning of clutch assemblies where rubber bonds to metal by means of an adhesive. • Cleaning of paper-based gaskets.	• Thin film laminating operations of magnetic or electronic components excluding inkjet printer head assembly operations. • Glass bonding and priming processes in automotive convertible top manufacturing operations. • Any adhesive, primer, or sealant that contains less than 20 grams of ROC per liter of material. • Any aerosol adhesive • Any cyanoacrylate or methyacrylate-based adhesive • Any adhesive tape • Any low pressure (less than 250 psi) or high pressure (1,000 to 1,300 psi) two-component spray polyurethane foam system that uses exempt organic compounds as the blowing agent and that uses ancillary spray equipment and hoses to apply the foam • Any one-component spray polyurethane foam system in a cylinder (containing not less than 10 pounds and not more than 23 pounds of prepolymerized mixtures) that uses exempt organic compounds as the blowing agent and that uses ancillary spray equipment or hoses to apply the foam. • Any person who uses less than 10 gallons per rolling period (consisting of 12 consecutive calendar months) per stationary source of an adhesive, a sealant, or primer in a separate formulation provided the total volume of noncomplying adhesives, sealants, or primers at a stationary source does not exceed 55 gallons per rolling period (consisting of 12 consecutive calendar months).

	Category	SJVAPCD Rule 4653 (limit in g/l)	VCAPCD Rule 74.20 (limit in g/l)
	Other Plastic Welding	250	500
	Plastic Welding Primer	400	550
	Pressure Sensitive Adhesive Primer	250	785

	SJVAPCD Rule 4653		VCAQMD Rule 74.20
Requirements	Non-Staining Plumbing Putty	250	150 until 12-31-2022 then 50
	Potable Water Sealant	250	100
	All Other Roof Sealants	250	300
	All Other Architectural Sealants	250	50
Categories not shown indicates the rules have the same requirement.	All Other Sealants	420	420 until 12-31-2022 Then 250
	Modified Bituminous Sealant Primer	500	250

As shown in the table above, out of the nine adhesives/primers/sealants categories compared, Rule 4653 requires lower VOC content limits in four categories and Ventura County requires lower VOC content limits in five categories. In addition, District Rule 4653's low usage exemption (40 gal/year adhesives & sealants) is much more stringent than Ventura County's (stationary sources emitting < 200 lb-ROC/yr adhesive and sealant operations). Ventura's County's exemption is equivalent to 107 gal/yr of adhesives & sealants when converted using the highest VOC content limit (850 g/l) in Rule 4653. Ventura County also has the following exemptions, which do not correspond to any equivalent exemptions in District Rule 4653:

1. Substrate-specific limits (i.e. fiberglass, flexible vinyl, metal, plastic foam, porous material, wood) shall not apply to the use of < 10 gal/yr of an adhesive, a sealant, or primer in a separate formulation provided the total volume of noncomplying adhesives, sealants, or primers at a stationary source does not exceed 55 gal/yr .
2. Manufacturing operations of the following products: diving suits, rubber fuel bladders, inflatable boats, life preservers or other stand-alone elastomeric type products designed for immersion in liquids.
3. Glass bonding and priming processes in automotive convertible top manufacturing operations.
4. Any adhesive tape is exempt from all provisions of this rule

Overall, District Rule 4653 is at least as stringent or more stringent as Ventura County APCD Rule 74.20.

Potential Emission Reduction Opportunities

As demonstrated above, Rule 4653 currently has in place the most stringent measures feasible to implement in the Valley. Therefore, no additional emission reduction opportunities have been identified at this time.

Contingency Measure Evaluation

As discussed in Chapter 6, contingency measures are immediately implemented ONLY if triggered by an unanticipated milestone or attainment failure. The District reviewed

this control measure for a potential contingency component. The District concludes that this control measure is not an appropriate contingency measure because the most stringent feasible controls are already in place, and a contingency trigger is incompatible with the technologies involved in reducing emissions from this category.

Evaluation Findings

Rule 4653 meets or exceeds federal RACT requirements for this source category based upon evaluation of applicable federal regulations, state standards, and other air districts' rules. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

C.45 RULE 4661 ORGANIC SOLVENTS

Emissions Inventory (Summer Average – Tons per day)

	2017	2023	2026	2029	2032	2035	2037
NOx	n/a	n/a	n/a	n/a	n/a	n/a	n/a
VOC	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Rule 4661 establishes limits for the use of organic solvents, however their emissions are represented in the rules that regulate their use: Rule 4662 (Organic Solvent Degreasing Operations), and Rule 4663 Organic Solvent Cleaning, Storage, and Disposal).

District Rule 4661 Description

District Rule 4661 applies to any source operation that uses organic solvents, with the exception of operations exempted under Section 4.0 of the rule (generally, the manufacture or transport of organic solvents or any source operation that is subject to or exempted by another District rule). The purpose of this rule is to limit VOC emissions from the use of organic solvents. This rule also specifies the reduction, monitoring, reporting, and disposal requirements.

How does District Rule 4661 compare with federal and state rules and regulations?

Federal Regulations

There are no New Source Performance Standards applicable to this source category.

A. Control Techniques Guidelines (CTG)

District staff conducted a comprehensive evaluation of EPA CTG requirements. EPA has not adopted updates to the following CTGs since EPA found that Rule 4661 met RACT requirements through EPA's approval of the *2014 RACT SIP*. Therefore, further evaluation is not necessary at this time.

- *Control of Volatile Organic Emissions from Solvent Metal Cleaning (EPA-450/2-77-022 1977/11)*
- *Control Techniques Guidelines for Industrial Cleaning Solvents (EPA-453/R-06-001 2006/09)*

B. Alternative Control Techniques (ACT)

District staff conducted a comprehensive evaluation of EPA ACT requirements. EPA has not adopted updates to the following ACTs since EPA found that Rule 4661 met RACT requirements through EPA's approval of the *2014 RACT SIP*. Therefore, further evaluation is not necessary at this time.

- *Alternative Control Technology Document – Halogenated Solvent Cleaners (EPA-450/3-89-030 1989/08)*
- *Alternative Control Techniques Document – Industrial Cleaning Solvents (EPA-453/R-94-015 1994/02)*

State Regulations

There are no state regulations applicable to this source category.

How does District Rule 4661 compare to rules in other air districts?

District staff compared emission limits, optional control requirements, and work practice standards in District Rule 4661 to comparable requirements in rules from the following California nonattainment areas:

- Bay Area AQMD Regulation 8, Rule 16 (Amended October 16, 2002)[246]
- Sacramento Metropolitan AQMD Rule 441 (Amended December 6, 1978)[247]
- South Coast AQMD Rules 1171 (Amended May 1, 2009)[248]

Ventura County APCD does not have an analogous rule for this source category. For the remaining above-listed rules, the District reviewed the rule requirements implemented prior to EPA's approval of the *2014 RACT SIP* and found that Rule 4661 continues to implement RACT levels of control.

Potential Emission Reduction Opportunities

As demonstrated above, Rule 4661 currently has in place the most stringent measures feasible to implement in the Valley. No additional emission reduction opportunities have been identified at this time.

Contingency Measure Evaluation

As discussed in Chapter 6, contingency measures are immediately implemented ONLY if triggered by an unanticipated milestone or attainment failure. The District reviewed this control measure for a potential contingency component. The District concludes that this control measure is not an appropriate contingency measure because the most stringent feasible controls are already in place, and a contingency trigger is incompatible with the technologies involved in reducing emissions from this category.

[246] BAAQMD. *Regulation 8 Rule 16 (Solvent Cleaning Operations).* (Amended October 16, 2002). Retrieved from: https://www.baaqmd.gov/~/media/dotgov/files/rules/reg-8-rule-16-solvent-cleaning-operations/documents/rg0816.pdf?la=en&rev=1bc8308d9bba4794a6496adffa04841a
[247] SMAQMD. *Rule 441 (Organic Solvents).* (Amended December 6, 1978). Retrieved from: http://www.airquality.org/ProgramCoordination/Documents/rule441.pdf
[248] SCAQMD. *Rules 1171 (Solvent Cleaning Operations).* (Amended May 1, 2009). Retrieved from: http://www.aqmd.gov/docs/default-source/rule-book/reg-xi/rule-1171.pdf

Evaluation Findings

Rule 4661 meets or exceeds federal RACT requirements for this source category based upon evaluation of applicable federal regulations, state standards, and other air districts' rules. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

C.46 RULE 4662 ORGANIC SOLVENTS DEGREASING OPERATIONS

Emissions Inventory (Summer Average – Tons per day)

	2017	2023	2026	2029	2032	2035	2037
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VOC	1.23	1.26	1.34	1.39	1.45	1.53	1.60

District Rule 4662 Description

District Rule 4662, amended on September 20, 2007, controls VOC emissions from organic solvent degreasers (tanks, trays, drums, or other containers). This rule applies to all organic solvent degreasing operations. The purpose of this rule is to limit VOC emissions and hazardous air pollutant emissions from these operations.

How does District Rule 4662 compare with federal and state rules and regulations?

Federal Regulations

There are no Alternative Control Techniques or New Source Performance Standards applicable to this source category.

A. Control Techniques Guidelines (CTG)

District staff conducted a comprehensive evaluation of EPA CTG requirements. EPA has not adopted updates to the following CTGs since EPA found that Rule 4662 met RACT requirements through EPA's approval of the *2014 RACT SIP*. Therefore, further evaluation is not necessary at this time.

- *Control of Volatile Organic Emissions from Solvent Metal Cleaning (EPA-450/2-77-022* 1977/11)
- *Control Techniques Guidelines for Industrial Cleaning Solvents (EPA-453/R-06-001 2006/09)*

State Regulations

There are no state regulations applicable to this source category.

How does District Rule 4662 compare to rules in other air districts?

District staff compared emission limits, optional control requirements, and work practice standards in District Rule 4662 to comparable requirements in rules from the following California nonattainment areas:

- Sacramento Metropolitan AQMD Rule 454 (Amended September 25, 2008)[249]
- South Coast AQMD Rule 1122 (Amended May 1, 2009)[250]
- Ventura County APCD Rule 74.6 (Amended November 10, 2020)[251]

Bay Area AQMD does not have an analogous rule for this source category. For the remaining above-listed rules, the District reviewed the rule requirements implemented prior to EPA's approval of the *2014 RACT SIP* and found that Rule 4662 continues to implement RACT levels of control. The below comparison table demonstrates that, for the more recently amended rule, District Rule 4662 continues to meet RACT.

Ventura County APCD

- VCAPCD Rule 74.6 (Surface Cleaning and Degreasing)

	SJVAPCD Rule 4662	VCAPCD Rule 74.6
Applicability	All organic solvent degreasing operations.	Any person who performs solvent cleaning activities, and any person who manufactures or supplies solvents for use in solvent cleaning activities.

Exemptions	• Cleaning outside a degreaser
	• Any degreaser which:
	  ○ uses unheated non-halogenated solvent, and
	  ○ is covered except when parts are being added to, removed from, or handled in the solvent bath, and
	  ○ has an open top surface area of less than 1.0 square foot, or with a capacity of less than 2.0 gallons, and
	  ○ has a solvent usage, the difference between the amount of solvent at the end of the recordkeeping period and the total of the amount of solvent at the beginning of the recordkeeping period plus the amount of solvent added to the device during the
		• Cleaning activities using Clean Air Solvent, or a solvent with an ROC content no more than 25 grams per liter as applied.
		• The use of up to 160 fluid ounces of non-refillable aerosol cleaning products per day, per facility.
		• Janitorial cleaning including graffiti removal.
		• Cleaning carried out in vapor degreasers or motion picture film cleaning equipment.
		• Stripping of cured coating (e.g.; stripping), cured adhesive (e.g.; debonding, ungluing), cured ink, or cured resin.
		• The use of solvent for purposes other than solvent cleaning activities.

[249] SMAQMD. *Rule 454 (Degreasing Operations).* (Amended September 25, 2008). Retrieved from: http://www.airquality.org/ProgramCoordination/Documents/rule454.pdf
[250] SCAQMD. *Rule 1122 (Degreasing Operations).* (Amended May 1, 2009). Retrieved from: http://www.aqmd.gov/docs/default-source/rule-book/reg-xi/rule-1122-solvent-degreasers.pdf
[251] VCAPCD. *Rule 74.6 (Surface Cleaning and Degreasing).* (Amended November 10, 2020). Retrieved from: http://www.vcapcd.org/Rulebook/Reg4/RULE%2074.6.pdf

	SJVAPCD Rule 4662	VCAPCD Rule 74.6
	recordkeeping period, of less than five (5.0) gallons per calendar month, and ○ is used only for one or more of the following cleaning applications: electrical, high precision optics, electronic applications, aerospace and military applications for the cleaning of solar cells, laser hardware, fluid system, and space vehicle components, and components used solely in research and development programs and laboratory tests in quality assurance laboratories. • One degreaser per building, which uses unheated, non-halogenated solvent exclusively, and has an open top surface area of less than 1.0 square foot and a capacity of less than 2.0 gallons, provided the degreaser is covered except when parts are being added to, removed from, or handled in the solvent bath. • Degreaser exclusively using non-halogenated cleaning material having a VOC content of 25 grams VOC per liter solvent or less, as used.	• Cleaning of ultraviolet lamps used to cure ultraviolet inks coatings, adhesives or resins. • Cleaning of solar cells, laser hardware, scientific instruments, or high-precision optics. • Cleaning conducted in laboratory tests and analyses including quality assurance/quality control applications, or bench scale or short-term (less than 2 years) research and development programs. • Removal of elemental sodium from the inside of pipes and lines. • Cleaning of mold release compounds from molds. • Cleaning of tools used to cut or abrade cured magnetic oxide coatings. • Cleaning of aerospace assembly and subassembly surfaces that are exposed to strong oxidizers or reducers such as nitrogen tetroxiode, liquid oxygen or hydrazine. • Cleaning of paper gaskets. • Cleaning of clutch assemblies where rubber is bonded to metal by means of an adhesive. • Cleaning of hydraulic actuating fluid from filters and filter housings. • Removal of explosive materials and constituents from equipment associated with manufacturing, testing or developing explosives. • Facility wide use of less than 1 gallon per week of non-compliant solvent where compliant solvents are not available. • Aircraft engine gas path cleaning or stationary gas turbine gas path cleaning using solvent with an ROC content of 200 g/l or less, as applied.

	SJVAPCD Rule 4662	VCAPCD Rule 74.6
Requirements	District Rule 4662 has solvent VOC content requirements for cold cleaners (25 g-VOC/L), or an equivalent control system with no less than 85% overall control for cold cleaners, open-vapor, and conveyorized degreasers. The rule also contains work practice standards and design requirements for these categories of source.	VCPCD Rule 74.6 contains solvent VOC content requirements for cold cleaners (25 g-VOC/L), or an equivalent control system with no less than 85% overall control for cold cleaners, open-vapor, and conveyorized degreasers. The rule also contains equivalent work practice standards and design requirements for these categories of source compared to SJVAPCD Rule 4662.

District Rule 4662 and VCAPCD Rule 74.6 have similar requirements including identical (or equivalent) control efficiencies. Therefore, District Rule 4662 is at least as stringent as VCAPCD Rule 74.6.

Potential Emission Reduction Opportunities

As demonstrated above, Rule 4662 currently has in place the most stringent measures feasible to implement in the Valley. No additional emission reduction opportunities have been identified at this time.

Contingency Measure Evaluation

As discussed in Chapter 6, contingency measures are immediately implemented ONLY if triggered by an unanticipated milestone or attainment failure. The District reviewed this control measure for a potential contingency component. The District concludes that this control measure is not an appropriate contingency measure because the most stringent feasible controls are already in place, and a contingency trigger is incompatible with the technologies involved in reducing emissions from this category.

Evaluation Findings

Rule 4662 meets or exceeds federal RACT requirements for this source category based upon evaluation of applicable federal regulations, state standards, and other air districts' rules. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

C.47 RULE 4663 ORGANIC SOLVENT CLEANING, STORAGE, AND DISPOSAL

Emissions Inventory (Summer Average – Tons per day)

	2017	2023	2026	2029	2032	2035	2037
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VOC	0.80	0.82	0.86	0.88	0.92	0.96	0.99

District Rule 4663 Description

District Rule 4663, amended on September 20, 2007, controls VOC emissions from organic solvent cleaning outside a degreaser (tank, tray, drum, or other container) as well as storage and disposal of the solvents.

District Rule 4663 has solvent VOC content requirements for general product cleaning or surface preparation, repair and maintenance cleaning, and cleaning of coating/adhesive application equipment (all 25 g-VOC/L), as well as specific other categories (ranging from 100-800 g-VOC/L) or an equivalent control system with no less than 90% overall control for the emissions generated. The rule also requires containers for solvent storage and disposal.

How does District Rule 4663 compare with federal and state rules and regulations?

Federal Regulations

There are no New Source Performance Standards applicable to this source category.

A. Control Techniques Guidelines (CTG)

District staff conducted a comprehensive evaluation of EPA CTG requirements. EPA has not adopted updates to the following CTGs since EPA found that Rule 4663 met RACT requirements through EPA's approval of the *2014 RACT SIP*. Therefore, further evaluation is not necessary at this time.

- *Control of Volatile Organic Emissions from Solvent Metal Cleaning (EPA-450/2-77-022 1977/11)*
- *Control Techniques Guidelines for Industrial Cleaning Solvents (EPA-453/R-06-001 2006/09)*

B. Alternative Control Techniques (ACT)

District staff conducted a comprehensive evaluation of EPA ACT requirements. EPA has not adopted updates to the following ACTs since EPA found that Rule 4663 met RACT requirements through EPA's approval of the *2014 RACT SIP*. Therefore, further evaluation is not necessary at this time.

- *Alternative Control Techniques Document – Halogenated Solvent Cleaners (EPA-450/3-89-030 1989/08)*
- *Alternative Control Techniques Document – Industrial Cleaning Solvents (EPA-453/R-94-015 1994/02)*

State Regulations

There are no state regulations applicable to this source category.

How does District Rule 4663 compare to rules in other air districts?

District staff compared emission limits, optional control requirements, and work practice standards in District Rule 4663 to comparable requirements in rules from the following California nonattainment areas:

- Bay Area AQMD Regulation 8, Rule 16 (Amended October 16, 2002)[252]
- Sacramento Metropolitan AQMD Rule 441 (Amended December 6, 1978)[253]
- South Coast AQMD Rules 1171 (Amended May 1, 2009)[254]

Ventura County APCD does not have an analogous rule for this source category. For the remaining above-listed rules, the District reviewed the rule requirements implemented prior to EPA's approval of the *2014 RACT SIP* and found that Rule 4663 continues to implement RACT levels of control.

Potential Emission Reduction Opportunities

As demonstrated above, Rule 4663 currently has in place the most stringent measures feasible to implement in the Valley. No additional emission reduction opportunities have been identified at this time.

Contingency Measure Evaluation

As discussed in Chapter 6, contingency measures are immediately implemented ONLY if triggered by an unanticipated milestone or attainment failure. The District reviewed

[252] BAAQMD. *Regulation 8 Rule 16 (Solvent Cleaning Operations).* (Amended October 16, 2002). Retrieved from: https://www.baaqmd.gov/rules-and-compliance/rules/reg-8-rule-16-solvent-cleaning-operations
[253] SMAQMD. *Rule 441 (Organic Solvents).* (Amended December 6, 1978). Retrieved from: http://www.airquality.org/ProgramCoordination/Documents/rule441.pdf
[254] SCAQMD. *Rules 1171 (Solvent Cleaning Operations).* (Amended May 1, 2009). Retrieved from: http://www.aqmd.gov/docs/default-source/rule-book/reg-xi/rule-1171.pdf

this control measure for a potential contingency component. The District concludes that this control measure is not an appropriate contingency measure because the most stringent feasible controls are already in place, and a contingency trigger is incompatible with the technologies involved in reducing emissions from this category.

Evaluation Findings

Rule 4663 meets or exceeds federal RACT requirements for this source category based upon evaluation of applicable federal regulations, state standards, and other air districts' rules. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

C.48 RULE 4672 PETROLEUM SOLVENT DRY CLEANING OPERATIONS

Emissions Inventory (Summer Average – Tons per day)

	2017	2023	2026	2029	2032	2035	2037
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VOC	0.08	0.08	0.09	0.09	0.09	0.09	0.09

District Rule 4672 Description

This rule applies to petroleum solvent washers, dryers, solvent filters, settling tanks, vacuum stills, and other containers and conveyors of petroleum solvents used in petroleum solvent dry cleaning facilities. The purpose of this rule is to limit VOC emissions from petroleum solvent dry cleaning operations.

EPA finalized approval of the amendments to Rule 4672 on March 9, 2010, and deemed this rule as being at least as stringent as established RACT requirements.[255] Additionally, EPA approved this rule as being at least as stringent as established RACT requirements through approval of the *2014 RACT SIP*.

How does District Rule 4672 compare with federal and state rules and regulations?

Federal Regulations

There are no Control Techniques Guidelines or Alternative Control Techniques applicable to this source category.

A. New Source Performance Standards (NSPS)

District staff conducted a comprehensive evaluation of EPA NSPS requirements. EPA has not adopted updates to the following NSPS since EPA found that Rule 4672 met RACT requirements through EPA's approval of the *2014 RACT SIP*. Therefore, further evaluation is not necessary at this time.

- *40 CFR 60 Subpart JJJ - Standards of Performance for Petroleum Dry Cleaners (2000/10)*

[255] EPA. *Revisions to the California State Implementation Plan, San Joaquin Valley Air Pollution Control District; Final Rule.* 75 Fed. Reg. 45, pp. 10690 – 10692. (2010, March 9). Retrieved from http://www.gpo.gov/fdsys/pkg/FR-2010-03-09/pdf/2010-4967.pdf

State Regulations

There are no state regulations applicable to this source category.

How does District Rule 4672 compare to rules in other air districts?

District staff compared emission limits, optional control requirements, and work practice standards in District Rule 4672 to comparable requirements in rules from the following California nonattainment areas:

- Bay Area AQMD Regulation 8, Rule 17 (Amended March 4, 2009)[256]
- Sacramento Metropolitan AQMD Rule 444 (Amended August 13, 1981)[257]
- South Coast AQMD Rules 1102 (Amended November 17, 2000)[258]
- Ventura County APCD Rule 74.5.1 (Amended December 4, 1990)[259]

The District reviewed the rule requirements implemented prior to EPA's approval of the *2014 RACT SIP* and found that Rule 4672 continues to implement RACT levels of control.

Potential Emission Reduction Opportunities

As demonstrated above, Rule 4672 currently has in place the most stringent measures feasible to implement in the Valley. No additional emission reduction opportunities have been identified at this time.

Contingency Measure Evaluation

As discussed in Chapter 6, contingency measures are immediately implemented ONLY if triggered by an unanticipated milestone or attainment failure. The District reviewed this control measure for a potential contingency component. The District concludes that this control measure is not an appropriate contingency measure because the most stringent feasible controls are already in place, and a contingency trigger is incompatible with the technologies involved in reducing emissions from this category.

Evaluation Findings

Rule 4672 meets or exceeds federal RACT requirements for this source category based upon evaluation of applicable federal regulations, state standards, and other air districts'

[256] BAAQMD. *Regulation 8, Rule 17 (Non-Halogenated Solvent Cleaning Operations).* (Amended 3/4/2009). Retrieved from: https://www.baaqmd.gov/~/media/dotgov/files/rules/reg-8-rule-17-petroleum-dry-cleaning-operations/documents/rg0817.pdf?la=en&rev=be6a9c282c184888a86e402a60144af0

[257] SMAQMD. *Rule 444 (Petroleum Solvent Dry Cleaning).* (Amended 8/13/1981). Retrieved from: http://www.airquality.org/ProgramCoordination/Documents/rule444.pdf

[258] SCAQMD. *Rules 1102 (Dry Cleaners Using Solvent Other than Perchloroethylene).* (Amended 11/17/2000). Retrieved from: http://www.aqmd.gov/docs/default-source/rule-book/reg-xi/rule-1102-dry-cleaners-using-solvent-other-than-perchloroethylene.pdf

[259] VCAPCD. *Rule 74.5.1 (Petroleum Solvent Dry Cleaning).* (Amended 12/4/1990). Retrieved from: http://www.vcapcd.org/Rulebook/Reg4/RULE%2074.5.1.pdf

rules. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

C.49 RULE 4681 RUBBER TIRE MANUFACTURING

Emissions Inventory (Summer Average – Tons per day)

	2017	2023	2026	2029	2032	2035	2037
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VOC	0.00	0.00	0.00	0.00	0.00	0.00	0.00

District Rule 4681 Description

District Rule 4681 applies to rubber tire and recapping tread stock manufacturing facilities. The purpose of this rule is to limit emissions of VOC from these facilities.

EPA finalized approval of the 1993 amendments to Rule 4681 on August 17, 1998, and deemed this rule as being at least as stringent as then established RACT requirements.[260]

The District adopted a Negative Declaration on December 16, 2010 to satisfy CAA CTG RACT requirements for this source category. There are currently no rubber tire manufacturers operating in the Valley. Any rubber tire manufacturers beginning operation in the Valley in the future would be required to go beyond CTG RACT requirements and meet District BACT requirements, per District Rule 2201 (New and Modified Stationary Source Review Rule).

How does District Rule 4681 compare with federal and state rules and regulations?

Federal Regulations

There are no Alternative Control Techniques applicable to this source category.

A. Control Techniques Guidelines (CTG)

District staff conducted a comprehensive evaluation of EPA CTG requirements. EPA has not adopted updates to the following CTG since EPA found that Rule 4681 met RACT requirements through EPA's approval of the *2014 RACT SIP*. Therefore, further evaluation is not necessary at this time.

- *Control of Volatile Organic Emissions from Manufacture of Pneumatic Rubber Tires (EPA-450-2-78-030 1978/12)*

[260] EPA. *Approval and Promulgation of Implementation Plans; California State Implementation Plan Revision, Kern County Air Pollution Control District, San Joaquin Valley Unified Air Pollution Control District, South Coast Air Quality Management District; Direct Final Rule.* 63 FR 43881. Retrieved from http://www.gpo.gov/fdsys/pkg/FR-1998-08-17/pdf/98-21900.pdf

B. New Source Performance Standards (NSPS)

District staff conducted a comprehensive evaluation of EPA NSPS requirements. EPA has not adopted updates to the following NSPS since EPA found that Rule 4681 met RACT requirements through EPA's approval of the *2014 RACT SIP*. Therefore, further evaluation is not necessary at this time.

- *40 CFR 60 Subpart BBB - Standards of Performance for the Rubber Tire Manufacturing Industry (1989/09)*

State Regulations

There are no state regulations applicable to this source category.

How does District Rule 4681 compare to rules in other air districts?

District staff compared emission limits, optional control requirements, and work practice standards in District Rule 4681 to comparable requirements in rules from the following California nonattainment areas:

- Bay Area AQMD Regulation 8, Rule 21 (Amended March 17, 1982)[261]

Sacramento Metropolitan AQMD, South Coast AQMD, and Ventura County APCD did not have analogous rules for this source category. For the remaining above-listed rule, the District reviewed the rule requirements implemented prior to EPA's approval of the *2014 RACT SIP* and found that Rule 4681 continues to implement RACT levels of control.

Potential Emission Reduction Opportunities

The District does not have any facilities in the Valley currently subject to this rule. Therefore, the District did not identify any potential emission reduction opportunities at this time.

Contingency Measure Evaluation

As discussed in Chapter 6, contingency measures are immediately implemented ONLY if triggered by an unanticipated milestone or attainment failure. The District reviewed this control measure for a potential contingency component. The District concludes that this control measure is not an appropriate contingency measure because the most stringent feasible controls are already in place, and a contingency trigger is incompatible with the technologies involved in reducing emissions from this category.

[261] BAAQMD. *Regulation 8, Rule 21 (Rubber Tire Manufacturing Operations)*. (Amended March 17, 1982). Retrieved from: https://www.baaqmd.gov/~/media/dotgov/files/rules/reg-8-rule-21-rubber-tire-manufacturing-operations/documents/rg0821.pdf?la=en&rev=3392cf3692844ecf86bbc614c885006e

Evaluation Findings

Rule 4681 meets or exceeds federal RACT requirements for this source category based upon evaluation of applicable federal regulations, state standards, and other air districts' rules. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

C.50 RULE 4682 POLYSTYRENE, POLYETHYLENE, AND POLYPROPYLENE PRODUCTS MANUFACTURING

Emissions Inventory (Summer Average – Tons per day)

	2017	2023	2026	2029	2032	2035	2037
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VOC	0.21	0.20	0.21	0.21	0.22	0.24	0.25

District Rule 4682 Description

The purpose of this rule is to limit emissions of VOC and trichlorofluoromethane (CFC-11) and dichlorofluoromethane (CFC-12) from manufacturing and processing of products composed of polystyrene, polyethylene, or polypropylene and from the storage of VOC blowing agents. The provisions of this rule shall apply to any manufacturing, processing, and storage of products composed of polystyrene, polyethylene, or polypropylene.

District Rule 4682 requires polystyrene foam, polyethylene, or polypropylene manufacturing or processing operations to use one of the following VOC emission reduction methods:

- A blowing agent other than a VOC or trichlorofluoromethane (CFC-11) or dichlorodifluoromethane (CFC-12) is exclusively used; or
- A system designed to achieve at least 90 percent VOC capture efficiency, and a thermal oxidizer which abates captured VOC emissions by at least 95 percent by weight; or
- Methods controlling VOC emissions which achieves an emission equivalent reduction and which does not include the use of trichlorofluoromethane (CFC-11) or dichlorodifluoromethane (CFC-12), and approved by the APCO.

How does District Rule 4682 compare with federal and state rules and regulations?

Federal Regulations

A. Control Techniques Guidelines (CTG)

District staff conducted a comprehensive evaluation of EPA CTG requirements. EPA has not adopted updates to the following CTG since EPA found that Rule 4682 met RACT requirements through EPA's approval of the *2014 RACT SIP*. Therefore, further evaluation is not necessary at this time.

- *Control of Volatile Organic Compound Emissions from Manufacture of High-Density Polyethylene, Polypropylene, and Polystyrene Resins (EPA-450/3-83-008 1983/11)*

B. Alternative Control Techniques (ACT)

District staff conducted a comprehensive evaluation of EPA ACT requirements. EPA has not adopted updates to the following ACT since EPA found that Rule 4682 met RACT requirements through EPA's approval of the *2014 RACT SIP*. Therefore, further evaluation is not necessary at this time.

- *Alternative Control Techniques Document - Control of VOC Emissions From Polystyrene Foam Manufacturing (EPA-450/3-90-020 1990/09)*

C. New Source Performance Standards (NSPS)

District staff conducted a comprehensive evaluation of EPA NSPS requirements. EPA has not adopted updates to the following NSPS since EPA found that Rule 4682 met RACT requirements through EPA's approval of the *2014 RACT SIP*. Therefore, further evaluation is not necessary at this time.

- *40 CFR Part 60 Subpart DDD - Standards of Performance for Volatile Organic Compound (VOC) Emissions from the Polymer Manufacturing Industry (1990/12)*

State Regulations

There are no state regulations applicable to this source category.

How does District Rule 4682 compare to rules in other air districts?

District staff compared emission limits, optional control requirements, and work practice standards in District Rule 4682 to comparable requirements in rules from the following California nonattainment areas:

- Bay Area AQMD Regulation 8, Rule 52 (Adopted July 7, 1999)[262]
- South Coast AQMD Rule 1175 (Amended November 5, 2010)[263]

Sacramento Metropolitan AQMD and Ventura County APCD do not have analogous rules for this source category. For the remaining above-listed rules, the District reviewed the rule requirements implemented prior to EPA's approval of the *2014 RACT SIP* and found that Rule 4682 continues to implement RACT levels of control.

[262] BAAQMD. *Regulation 8, Rule 52 (Polystyrene, Polypropylene and Polyethylene Foam Product Manufacturing Operations)*. (Adopted July 7, 1999). Retrieved from: https://www.baaqmd.gov/~/media/dotgov/files/rules/reg-8-rule-52-polystyrene-polypropylene-and-polyethylene-foam-product-manufacturing-operations-adopt/documents/rg0852.pdf?la=en&rev=24382013a8c9405a94c7027907f43fb4

[263] SCAQMD. *Rule 1175 (Control of Emissions from the Manufacture of Polymeric Cellular (Foam) Products).* (Amended November 5, 2010). Retrieved from: http://www.aqmd.gov/docs/default-source/rule-book/reg-xi/rule-1175.pdf?sfvrsn=4

Potential Emission Reduction Opportunities

As demonstrated above, Rule 4682 currently has in place the most stringent measures feasible to implement in the Valley. No additional emission reduction opportunities have been identified at this time.

Contingency Measure Evaluation

As discussed in Chapter 6, contingency measures are immediately implemented ONLY if triggered by an unanticipated milestone or attainment failure. The District reviewed this control measure for a potential contingency component. The District concludes that this control measure is not an appropriate contingency measure because the most stringent feasible controls are already in place, and a contingency trigger is incompatible with the technologies involved in reducing emissions from this category.

Evaluation Findings

Rule 4682 meets or exceeds federal RACT requirements for this source category based upon evaluation of applicable federal regulations, state standards, and other air districts' rules. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

C.51 RULE 4684 POLYESTER RESIN OPERATIONS

Emissions Inventory (Summer Average – Tons per day)

	2017	2023	2026	2029	2032	2035	2037
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VOC	0.18	0.17	0.18	0.18	0.19	0.20	0.21

District Rule 4684 Description

District Rule 4684 applies to commercial and industrial polyester resin operations, organic solvent cleaning, and the storage and disposal of all solvents and waste solvent materials associated with such operations. The polyester resin users typically make composite materials by mixing the resin with glass fiber to make a product. This rule also covers manufacturers of boats and yachts as well as those making fiberglass shower units. Polyester resin operations that use less than 20 gallons per month are exempt from the requirements of this rule.

How does District Rule 4684 compare with federal and state rules and regulations?

Federal Regulations

There are no New Source Performance Standards applicable to this source category.

A. Control Techniques Guidelines (CTG)

District staff conducted a comprehensive evaluation of EPA CTG requirements. EPA has not adopted updates to the following CTGs since EPA found that Rule 4684 met RACT requirements through EPA's approval of the *2014 RACT SIP*. Therefore, further evaluation is not necessary at this time.

- *Control of Volatile Organic Compound Leaks from Synthetic Organic Chemical Polymer and Resin Manufacturing Equipment (EPA-450/3-83-006 1984/03)*
- *Control of Volatile Organic Compound Emissions from Manufacture of High-Density Polyethylene, Polypropylene, and Polystyrene Resins (EPA-450/3-83-008 (1983/11)*
- *Control Techniques Guidelines for Fiberglass Boat Manufacturing Materials (EPA-453/R-08-004 2008/09)*

State Regulations

There are no state regulations applicable to this source category.

How does District Rule 4684 compare to rules in other air districts?

District staff compared emission limits, optional control requirements, and work practice standards in District Rule 4684 to comparable requirements in rules from the following California nonattainment areas:

- Bay Area AQMD Regulation 8, Rule 50 (Amended December 2, 2009)[264]
- Sacramento Metropolitan AQMD Rule 465 (Amended September 25, 2008)[265]
- South Coast AQMD Rules 1162 (Amended July 8, 2005)[266]
- Ventura County APCD Rule 74.14 (Amended April 12, 2005)[267]

The District reviewed the rule requirements implemented prior to EPA's approval of the *2014 RACT SIP* and found that Rule 4684 continues to implement RACT levels of control.

Potential Emission Reduction Opportunities

As demonstrated above, Rule 4684 currently has in place the most stringent measures feasible to implement in the Valley. No additional emission reduction opportunities have been identified at this time.

Contingency Measure Evaluation

As discussed in Chapter 6, contingency measures are immediately implemented ONLY if triggered by an unanticipated milestone or attainment failure. The District reviewed this control measure for a potential contingency component. The District concludes that this control measure is not an appropriate contingency measure because the most stringent feasible controls are already in place, and a contingency trigger is incompatible with the technologies involved in reducing emissions from this category.

Evaluation Findings

Rule 4684 meets or exceeds federal RACT requirements for this source category based upon evaluation of applicable federal regulations, state standards, and other air districts' rules. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

---

[264] BAAQMD. *Regulation 8, Rule 50 (Polyester Resin Operations).* (Amended December 2, 2009). Retrieved from: https://www.baaqmd.gov/~/media/dotgov/files/rules/reg-8-rule-50-polyester-resin-operations/documents/rg0850.pdf?la=en&rev=ea70610abffe492baabcc431e82d71c6

[265] SMAQMD. *Rule 465 (Polyester Resin Operations).* (Amended September 25, 2008). Retrieved from: http://www.airquality.org/ProgramCoordination/Documents/rule465.pdf

[266] SCAQMD. *Rule 1162 (Polyester Resin Operations).* (Amended July 8, 2005). Retrieved from: http://www.aqmd.gov/docs/default-source/rule-book/reg-xi/r1162.pdf?sfvrsn=4

[267] VCAPCD. *Rule 74.14 (Polyester Resin Material Operations).* (Amended April 12, 2005). Retrieved from: http://www.vcapcd.org/Rulebook/Reg4/RULE%2074.14.pdf

C.52 RULE 4691 VEGETABLE OIL PROCESSING OPERATIONS

Emissions Inventory (Summer Average – Tons per day)

	2017	2023	2026	2029	2032	2035	2037
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VOC	0.00	0.00	0.00	0.00	0.00	0.00	0.00

District Rule 4691 Description

District Rule 4691 controls VOC emissions from facilities that extract oil from vegetable sources, like cottonseeds and corn. The purpose of this rule is to limit VOC emissions from vegetable oil processing operations.

How does District Rule 4691 compare with federal and state rules and regulations?

Federal Regulations

There are no Control Techniques Guidelines, Alternative Control Techniques, or New Source Performance Standards applicable to this source category.

State Regulations

There are no state regulations applicable to this source category.

How does District Rule 4691 compare to rules in other air districts?

District staff compared emission limits, optional control requirements, and work practice standards in District Rule 4691 to comparable requirements in rules from the following California nonattainment areas:

- Bay Area AQMD Regulation 8, Rule 41 (amended June 1, 1994)[268]

Sacramento Metropolitan AQMD, South Coast AQMD, and Ventura County APCD do not have analogous rules for this source category. For the remaining above-listed rule, the District reviewed the rule requirements implemented prior to EPA's approval of the *2014 RACT SIP* and found that Rule 4691 continues to implement RACT levels of control.

[268] BAAQMD. *Regulation 8, Rule 41 (Vegetable Oil Manufacturing Operations).* Retrieved from: https://www.baaqmd.gov/~/media/dotgov/files/rules/reg-8-rule-41-vegetable-oil-manufacturing-operations/documents/rg0841.pdf?la=en&rev=ddab2443af2147f190da3e57fa659d3e

Potential Emission Reduction Opportunities

The District only has one facility subject to this rule and is already equipped with emission control technologies that go beyond Rule 4691 requirements. Therefore, the District did not identify any additional emission reduction opportunities at this time.

Contingency Measure Evaluation

As discussed in Chapter 6, contingency measures are immediately implemented ONLY if triggered by an unanticipated milestone or attainment failure. The District reviewed this control measure for a potential contingency component. The District concludes that this control measure is not an appropriate contingency measure because the most stringent feasible controls are already in place, and a contingency trigger is incompatible with the technologies involved in reducing emissions from this category.

Evaluation Findings

Rule 4691 meets or exceeds federal RACT requirements for this source category based upon evaluation of applicable federal regulations, state standards, and other air districts' rules. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

C.53 RULE 4692 COMMERCIAL CHARBROILERS

Emissions Inventory (Summer Average – Tons per day)

	2017	2023	2026	2029	2032	2035	2037
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VOC	0.44	0.46	0.47	0.48	0.50	0.51	0.52

District Rule 4692 Description

Currently, District Rule 4692 reduces emissions by requiring catalytic oxidizers for chain-driven charbroilers that meet rule applicability thresholds. Charbroiler exhaust transfers 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 transfers it to a heat recovery system. Rule 4692 requires emission controls for chain-driven charbroilers that cook 400 pounds of meat or more per week. The original adoption of the Rule reduced PM10 and VOC emissions by 85%, and the 2008 amendments reduced PM2.5 emissions by 24%.

A variety of technologies for capturing emissions from underfired charbroilers have been tested over the years, including electrostatic precipitators (ESP), mechanical or media filtration, and wet scrubbers. ESPs and mechanical or media filtration are the most widely installed technologies for controlling PM from commercial underfired charbroilers. However, no cost-effective technologies have been demonstrated as achieved in practice to date. As such, the rule currently does not have control requirements specific to underfired charbroilers. The District adopted amendments to Rule 4692 on June 21, 2018, to add reporting and registration requirements for commercial underfired charbroiler units.

In December 2020, the District Governing Board approved a multipronged strategy to identify opportunities to reduce emissions from underfired charbroilers. Through this strategy, the District will continue to evaluate emission reduction opportunities for this source category.

How does District Rule 4692 compare with federal and state rules and regulations?

Federal Regulations

There are no Control Techniques Guidelines, Alternative Control Techniques, or New Source Performance Standards, applicable to this source category.

State Regulations

There are no state regulations applicable to this source category.

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

District staff compared emission limits, optional control requirements, and work practice standards in District Rule 4692 to comparable requirements in rules from the following California nonattainment areas:

- Bay Area AQMD Regulation 6, Rule 2 (Amended December 5, 2007)[269]
- New York Department of Environmental Protection Title 24 of the Administrative Code, Section 24-149.4 (Amended November 6, 2016)[270]
- South Coast AQMD Rule 1138 (Adopted November 14, 1997)[271]
- Ventura County APCD Rule 74.25 (Adopted October 12, 2004)[272]

The District reviewed the rule requirements implemented prior to EPA's approval of the *2014 RACT SIP*, and found that Rule 4692 continues to implement RACT levels of control. Additionally, these analogous rules specifically target PM emissions only, whereas SJVAPCD Rule 4692 reduces VOC emissions through chain driven control requirements. Therefore, no additional analysis is necessary at this time.

Potential Emission Reduction Opportunities

The District is currently evaluating opportunities to reduce emissions from underfired charbroilers in the Valley. However, the controls involved in reducing emissions from these units have not been demonstrated or designed to reduce VOC or NOx emissions and have been focused on reducing particulate matter emissions only. Therefore, the District did not identify any emission reduction opportunities at this time.

Contingency Measure Evaluation

As discussed in Chapter 6, contingency measures are immediately implemented ONLY if triggered by an unanticipated milestone or attainment failure. The District reviewed this control measure for a potential contingency component. The District concludes that this control measure is not an appropriate contingency measure because the most stringent feasible controls are already in place, and a contingency trigger is incompatible with the technologies involved in reducing emissions from this category.

---

[269] BAAQMD. *Regulation 6 Rule 2 (Commercial Cooking Equipment).* (Amended December 5, 2007). Retrieved from: https://www.baaqmd.gov/~/media/dotgov/files/rules/reg-6-rule-2-commercial-cooking-equipment/documents/rg0602.pdf?la=en&rev=42fc0966398c43f9b585572708a5ea70

[270] New York Department of Environment Protection. *Title 24 of the Administrative Code, Section 24-149.4 (Commercial Char Broilers).* (Amended November 6, 2016). Retrieved from: https://www1.nyc.gov/assets/dep/downloads/pdf/air/air-pollution-control-code.pdf

[271] SCAQMD. *Rule 1138 (Control of Emissions from Restaurant Operations).* (Adopted November 14, 1997). Retrieved from: https://www.aqmd.gov/docs/default-source/rule-book/reg-xi/rule-1138.pdf?sfvrsn=4

[272] VCAPCD. *Rule 74.25 (Restaurant Cooking Operations).* (Adopted October 12, 2004). Retrieved from: http://www.vcapcd.org/Rulebook/Reg4/RULE%2074.25.pdf

Evaluation Findings

Rule 4692 meets or exceeds federal RACT requirements for this source category based upon evaluation of applicable federal regulations, state standards, and other air districts' rules. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

C.54 RULE 4693 BAKERY OVENS

Emissions Inventory (Summer Average – Tons per day)

	2017	2023	2026	2029	2032	2035	2037
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VOC	0.33	0.33	0.35	0.37	0.39	0.42	0.44

District Rule 4693 Description

The requirements of District Rule 4693 apply to bakery ovens operated at major source facilities, which emit VOCs during the baking of yeast-leavened products. The purpose of this rule is to limit VOC emissions from these sources. EPA finalized approval of the 2002 adoption of Rule 4693 on April 26, 2004, and deemed this rule as being at least as stringent as established RACT requirements.[273]

How does District Rule 4693 compare with federal and state rules and regulations?

Federal Regulations

There are no Control Technique Guidelines or New Source Performance Standards applicable to this source category.

A. Alternative Control Techniques (ACT)

- *Alternative Control Techniques Document - Bakery Ovens (EPA-453/R-92-017 1992/12)*

EPA has not adopted updates to this ACT since EPA approved Rule 4693 as meeting RACT requirements through EPA's approval of the *2014 RACT SIP*. Therefore, further evaluation is not necessary at this time.

State Regulations

There are no state regulations applicable to this source category.

[273] EPA. *Revisions to the California State Implementation Plan, San Joaquin Valley Unified Air Pollution Control District*; Direct Final Rule. 69 Fed. Reg. 80, Pp. 22441-22443. (April 26, 2004). Retrieved from: http://www.gpo.gov/fdsys/pkg/FR-2004-04-26/pdf/04-9279.pdf

How does District Rule 4693 compare to rules in other air districts?

District staff compared emission limits, optional control requirements, and work practice standards in District Rule 4693 to comparable requirements in rules from the following California nonattainment areas:

- Bay Area AQMD Regulation 8, Rule 42 (Amended June 1, 1994)[274]
- Sacramento Metropolitan AQMD Rule 458 (Amended September 5, 1996)[275]
- South Coast AQMD Rule 1153 (Amended January 13, 1995)[276]

Ventura County APCD does not have an analogous rule for this source category. For the remaining above-listed rules, the District reviewed the rule requirements implemented prior to EPA's approval of the *2014 RACT SIP* and found that Rule 4693 continues to implement RACT levels of control.

Potential Emission Reduction Opportunities

As demonstrated above, Rule 4693 currently has in place the most stringent measures feasible to implement in the Valley. No additional emission reduction opportunities have been identified at this time.

Contingency Measure Evaluation

As discussed in Chapter 6, contingency measures are immediately implemented ONLY if triggered by an unanticipated milestone or attainment failure. The District reviewed this control measure for a potential contingency component. The District concludes that this control measure is not an appropriate contingency measure because the most stringent feasible controls are already in place, and a contingency trigger is incompatible with the technologies involved in reducing emissions from this category.

Evaluation Findings

Rule 4693 meets or exceeds federal RACT requirements for this source category based upon evaluation of applicable federal regulations, state standards, and other air districts' rules. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

[274] BAAQMD. *Regulation 8, Rule 42 (Large Commercial Bread Bakeries)*. (Amended June 1, 1994). Retrieved from: https://www.baaqmd.gov/~/media/dotgov/files/rules/reg-8-rule-42-large-commercial-bread-bakeries/documents/rg0842.pdf?la=en&rev=dc6d019ab886429890c67e949953879a
[275] SMAQMD. *Rule 458 (Large Commercial Bread Bakeries).* (Amended September 5, 1996). Retrieved from: http://www.airquality.org/ProgramCoordination/Documents/rule458.pdf
[276] SCAQMD. *Rule 1153 (Commercial Bakery Ovens).* (Amended January 13, 1995). Retrieved from: http://www.aqmd.gov/docs/default-source/rule-book/reg-xi/rule-1153.pdf

C.55 RULE 4694 WINE FERMENTATION AND STORAGE TANKS

Emissions Inventory (Summer Average – Tons per day)

	2017	2023	2026	2029	2032	2035	2037
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VOC	4.00	4.11	4.37	4.58	4.86	5.16	5.37

District Rule 4694 Description

The purpose of District Rule 4694 is to reduce VOC emissions from the fermentation and bulk storage of wine, or achieve equivalent reductions from alternative emission sources.

The rule requires facilities to reduce the VOC emissions from fermentation by 35% of their baseline emissions annually. Tanks over 5,000 gallons in volume must be equipped with pressure/vacuum relief valves operating within 10% of the maximum allowable working pressure of the tank, and the temperature of stored wine maintained at or below 75 degrees Fahrenheit.

The rule exempts storage tanks constructed primarily of concrete or wood and wineries that emit less than 10 tons of VOC per year.

How does District Rule 4694 compare with federal and state rules and regulations?

Federal Regulations

There are no Control Techniques Guidelines applicable to this source category.

A. Alternative Control Techniques (ACT)

District staff conducted a comprehensive evaluation of EPA ACT requirements. EPA has not adopted updates to the following ACTs since EPA found that Rule 4694 met RACT requirements through EPA's approval of the *2014 RACT SIP*. Therefore, further evaluation is not necessary at this time.

- *Alternative Control Techniques Document – Volatile Organic Liquid Storage in Floating and Fixed Roof Tanks (EPA-453/R-94-001 1994/01)*

B. Standards of Performance for New Stationary Sources (NSPS)

- *40 CFR 60 Subpart Kb - Standards of Performance for Volatile Organic Liquid Storage Vessels (Including Petroleum Liquid Storage Vessels) for which*

Construction, Reconstruction, or Modification Commenced After July 23, 1984 (2021/01)

Subpart Kb is applicable to each storage vessel with a capacity greater than or equal to 75 cubic meters (equivalent to 19,812 gallons) used to store volatile organic liquids for which construction, reconstruction, or modification is commenced after July 23, 1984.

Pursuant to 40 CFR 60.110b(d)(7), this subpart does not apply to vessels used to store beverage alcohol. Thus, this rule is not applicable to wine tanks and no further analysis is necessary.

State Regulations

There are no state regulations applicable to this source category.

How does District Rule 4694 compare to rules in other air districts?

Bay Area AQMD, Monterey Bay ARD, Sacramento Metropolitan AQMD, San Luis Obispo County APCD, Santa Barbara County APCD, Ventura County APCD, and South Coast AQMD do not have an analogous rule for this source category.

Potential Emission Reduction Opportunities

As part of the *2016 Ozone Plan*, in November 2019, the District performed an analysis[277] of District Rule 4964 to evaluate the potential of implementing emission control technologies to reduce VOC emissions from wine fermentation processes and the related potential benefits to help reduce ozone concentrations. The District conducted a modeling analysis to provide an initial assessment of the ozone-reducing effectiveness of requiring additional VOC reductions from this source category through amending Rule 4694. Based on the modeling results, even when assuming control of 100% of the ethanol from all winery operations in the Valley, the resulting decrease in ozone was considered less than significant.

Rule 4694 currently has in place the most stringent measures feasible to implement in the Valley. No additional emission reduction opportunities have been identified at this time.

Contingency Measure Evaluation

As discussed in Chapter 6, contingency measures are immediately implemented ONLY if triggered by an unanticipated milestone or attainment failure. The District reviewed this control measure for a potential contingency component. The District concludes that this control measure is not an appropriate contingency measure because the most

[277] SJVAPCD. *Summary of Rule 4694 Analyses under the 2016 Ozone Plan*. November 2019. Retrieved from: http://valleyair.org/Air_Quality_Plans/docs/Rule-4694-Analysis-Summary.pdf

stringent feasible controls are already in place, and a contingency trigger is incompatible with the technologies involved in reducing emissions from this category.

Evaluation Findings

District Rule 4694 meets or exceeds federal RACT requirements for this source category based upon evaluation of applicable federal regulations and state standards. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

C.56 RULE 4695 BRANDY AGING AND WINE AGING OPERATIONS

Emissions Inventory (Summer Average – Tons per day)

	2017	2023	2026	2029	2032	2035	2037
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VOC	7.73	7.93	8.44	8.85	9.38	9.96	10.37

District Rule 4695 Description

The purpose of District Rule 4695 is to limit VOC emissions from brandy aging and wine aging operations. The emission requirements of this rule do not apply to stationary sources with VOC emissions less than 10 tpy. Additionally, this rule exempts wine storage tanks subject to District Rule 4694.

The rule requires all facilities to implement work practices to minimize emissions from the operations. Additionally, facilities with Uncontrolled Aging Emissions (UAE) equal to or exceeding both the thresholds in the table below are required to install/implement additional control technologies to minimize unnecessary atmospheric exposure of brandy or wine.

Table C-12 Brandy and Wine Aging Thresholds

Product Type	Annual Aging Inventory (gallons per year)	Uncontrolled Aging Emissions (lb-VOC/yr)
Brandy	40,000	8,000
Wine	590,000	16,000

Where:
UAE = TAAI * AEF

UAE = Uncontrolled Aging Emissions (ethanol), in pounds per year.
TAAI = Total Annual Aging Inventory, in gallons per year.
AEF = Aging Emission Factor, in pounds ethanol per gallon.

Brandy default AEF = 0.1986 pounds ethanol per gallon
Wine default AEF = 0.02783 pounds ethanol per gallon

Wine aging facilities that equal or exceed both the thresholds in the table above must either conduct aging operations in a warehouse not exceeding 70˚ Fahrenheit, or implement an alternative control technology to reduce the UAE.

Brandy aging facilities that equal or exceed both the thresholds in the table above must either conduct aging operations in a warehouse that contains certification as a Permanent Total Enclosure, pursuant to EPA Method 204, or implement an alternative control measure that results in a UAE of ≤ 0.3 proof gallons per 50 gallons. If operators choose to conduct aging operations in warehouses, the aging warehouses are required to maintain temperatures at or below 70˚ Fahrenheit. To minimize exposure, the rule

requires that operational maintenance and shutdowns do not exceed either 8 percent of the time during which the operation occurs or a maximum of 701 hours/year, whichever is less. Additionally, the warehouse must contain a continuous ventilation system connected to an approved VOC control device with a control efficiency of at least 98 percent, except for periods of downtime for maintenance. Critical control device operating parameters, such as inlet pressure and combustion chamber temperature must be equipped with a continuous automatic monitoring system.

Facilities that use non-porous tanks for aging wine are required to have pressure relief valves that can operate within 10 percent of the maximum allowable working pressure of each tank.

Facilities that exceed the UAE threshold must maintain records of the time of opening for all non-personnel access doors. All facilities must maintain daily and annual records of hours of operation and periods of outage of each VOC control device.

Throughput records and records of gallons lost while aging are also required.

How does District Rule 4695 compare with federal and state rules and regulations?

Federal Regulations

There are no Alternative Control Techniques, Control Techniques Guidelines, or New Source Performance Standards applicable to this source category.

State Regulations

There are no state regulations applicable to this source category.

How does District Rule 4695 compare to rules in other air districts?

Bay Area AQMD, Sacramento Metropolitan AQMD, Ventura County APCD, and South Coast AQMD do not have analogous rules for this source category.

Potential Emission Reduction Opportunities

Rule 4695 currently has in place the most stringent measures feasible to implement in the Valley. No additional emission reduction opportunities have been identified at this time.

Contingency Measure Evaluation

As discussed in Chapter 6, contingency measures are immediately implemented ONLY if triggered by an unanticipated milestone or attainment failure. The District reviewed this control measure for a potential contingency component. The District concludes that

this control measure is not an appropriate contingency measure because the most stringent feasible controls are already in place, and a contingency trigger is incompatible with the technologies involved in reducing emissions from this category.

Evaluation Findings

Rule 4695 meets or exceeds federal RACT requirements for this source category based upon evaluation of applicable federal regulations, state standards, and other air districts' rules. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

C.57 RULE 4702 INTERNAL COMBUSTION ENGINES

Emissions Inventory (Summer Average – Tons per day)

	2017	2023	2026	2029	2032	2035	2037
NOx	6.68	5.33	4.69	4.19	3.85	3.66	3.57
VOC	0.61	0.49	0.39	0.35	0.32	0.31	0.30

District Rule 4702 Description

District Rule 4702 applies to any internal combustion (IC) engine rated at 25 brake horsepower (bhp) or greater. The purpose of this rule is to limit NOx, CO, VOC, and SOx emissions from units subject to this rule. Rule 4702 has significantly reduced emissions from non-agricultural and agricultural IC engines, with substantial investments made by the affected sources to comply with the rule.

On August 19, 2021 the District Governing Board adopted amendments to Rule 4702. Adopted rule amendments lowered emission limits for NOx and VOCs for several categories of engines, established PM requirements for all categories of IC engines affected by the rule, and established SOx control requirements for agricultural engines. Compliance with these lower emission limits is required by 2024. Additionally, the option of paying an annual fee in lieu of complying with a NOx emissions limit would sunset by December 31, 2023.

Cost Effectiveness

As part of the August 2021 amendments to Rule 4702, the District estimated a cost effectiveness ranging up to $37,515 per ton of NOx reduced, depending on the engine type and compliance scenario.

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

Federal Regulations

There are no Control Techniques Guidelines applicable to this source category.

A. Alternative Control Techniques (ACT)

District staff conducted a comprehensive evaluation of EPA ACT requirements. EPA has made no changes to the below ACT since Rule 4702 was approved as meeting RACT requirements through EPA's approval of the *2014 RACT SIP*. Therefore, further evaluation is not necessary at this time.

- *Alternative Control Techniques Document - NOx Emissions from Stationary Reciprocating Internal Combustion Engines (EPA-453/R-93-032 1993/07, updated 2000/09)*

B. New Source Performance Standards (NSPS)

- *40 CFR 60 Subpart IIII - Standards of Performance for Stationary Compression Ignition Internal Combustion Engines (2020/12 and 2021/06)*

The NSPS of 40 CFR 60 Subpart IIII – Standards of Performance for Stationary Compression Ignition Internal Combustion Engines apply to stationary compression-ignition IC engines. 40 CFR 60 Subpart IIII establishes emission certification requirements for manufacturers of stationary compression-ignition IC engines. 40 CFR 60 Subpart IIII also establishes emission requirements for:

1. Owners and operators of compression-ignition IC engines for which construction commenced after July 11, 2005 and the engine was manufactured after April 1, 2006 for engines that are not fire pump engines; and
2. Owners and operators of compression-ignition IC engines for which construction commenced after July 11, 2005 and the engine was manufactured after July 1, 2006 for engines that were manufactured as certified National Fire Protection Association (NFPA) fire pump engines after July 1, 2006.

In 2014, the District evaluated the requirements of 40 CFR 60 Subpart IIII for the District's *2014 RACT SIP* and determined that Rule 4702 was at least as stringent as 40 CFR 60 Subpart IIII. Since that time, EPA approved amendments to 40 CFR 60 Subpart IIII on July 7, 2016, October 13, 2019, December 4, 2020, and June 29, 2021.

The July 7, 2016, amendments to 40 CFR 60 Subpart IIII allowed manufacturers to design stationary compression-ignition IC engines so that operators can temporarily override inducements that require operation of add-on emission control systems (i.e. SCR) during qualified emergency situations. In addition, the July 7, 2016, amendments extended the provisions that allow less stringent requirements for areas of Alaska that are not accessible by the Federal Aid Highway System (FAHS) to other remote areas of Alaska with limited accessibility, consistent with the definition of remote areas in 40 CFR 63 Subpart ZZZZ - National Emission Standards for Hazardous Air Pollutants (NESHAP) for Reciprocating Internal Combustion Engines (RICE).

The November 13, 2019, amendments to 40 CFR 60 Subpart IIII removed the requirement that model year 2014 and later stationary compression-ignition IC engines located in remote areas of Alaska must comply with the Tier 4 PM emission standards and instead required that these engines comply with Tier 3 PM emission standards. These amendments did not increase the stringency of any requirements in 40 CFR 60 Subpart IIII and parts of the amendments were only applicable to IC engines located in remote regions of Alaska.

EPA indicated that the purpose of the action that resulted in the December 4, 2020, amendments to 40 CFR Part 60 Subpart IIII was to update many of EPA's existing gasoline, diesel, and other fuel quality programs to improve overall compliance assurance and maintain environmental performance, while reducing compliance costs for industry and EPA.

The EPA action removed expired provisions, eliminated redundant compliance provisions, removed unnecessary and out-of-date requirements and replaced them with a single set of provisions and definitions that applies to all gasoline, diesel, and other fuel quality programs. EPA's action and the associated amendments did not change the stringency of the fuel quality standards. The amendments also removed an outdated reference to 40 CFR 80.510 for diesel fuel requirements, replaced it with the current reference to 40 CFR 1090.305, and updated the language limiting the maximum sulfur content of diesel fuel used in compression ignition IC engines subject to this subpart with a displacement of greater than or equal to 30 liters per cylinder. The December 4, 2020, amendments did not change any emission limits or emission control requirements of 40 CFR Part 60 Subpart IIII.

The June 29, 2021, amendments to 40 CFR Part 60 Subpart IIII were the result of EPA's action to remove references to outdated legacy parts for engine certification and replace them with the new regulatory parts in subchapter U (e.g. replacing reference to 40 CFR 89 with 40 CFR 1039), or to copy referenced text directly into 40 CFR 60. EPA stated "most of the changes for stationary engines in 40 CFR part 60 are intended to update references without changing standards or other provisions." The June 29, 2021, amendments included three more substantive changes. The first change allowed all manufacturers of emergency stationary IC engines to certify the engines using assigned deterioration factors. The second change allowed manufacturers of stationary spark-ignition IC engines to certify engines using the procedures in 40 CFR 1054. The third change allowed manufacturers to use any of the VOC measurement methods that are specified for highway or nonroad engines in 40 CFR 1065, Subpart C. The June 29, 2021, amendments to this subpart did not affect the requirements for operators of IC engines that are subject to this regulation.

Therefore, based on the types of changes made, the determination that Rule 4702 is at least as stringent as 40 CFR 60 Subpart IIII remains valid.

- *40 CFR 60 Subpart JJJJ - Standards of Performance for Stationary Spark Ignition Internal Combustion Engines (2020/12 and 2021/06)*

The NSPS of 40 CFR 60 Subpart JJJJ – Standards of Performance for Stationary Spark Ignition Internal Combustion Engines apply to stationary spark ignition IC engines. 40 CFR 60 Subpart JJJJ establishes emission requirements for manufacturers of stationary spark ignition IC engines. 40 CFR 60 Subpart JJJJ also establishes emission requirements for owners and operators of stationary spark ignition IC engines that commence construction after June 12, 2006, where the IC engines are manufactured on or after: July 1, 2007, for engines with a maximum rated power greater than or equal to

500 bhp, except lean-burn engines with a maximum engine power greater than or equal to 500 bhp and less than 1,350 bhp; January 1, 2008, for lean-burn engines with a maximum rated power greater than or equal to 500 bhp and less than 1,350 bhp; July 1, 2008, for engines with a maximum rated power less than 500 bhp; or January 1, 2009, for emergency engines with a maximum rated power greater than 19 kW (25 bhp).

In 2014, the District evaluated the requirements of 40 CFR 60 Subpart JJJJ for the District's RACT Demonstration for the 8-Hour Ozone SIP (June 19, 2014) and determined that Rule 4702 was at least as stringent as 40 CFR 60 Subpart JJJJ. Since that time, EPA approved amendments to 40 CFR 60 Subpart JJJJ on December 4, 2020, and June 29, 2021.

EPA indicated that the purpose of the action that resulted in the December 4, 2020, amendments to 40 CFR Part 60 Subpart JJJJ was to update many of EPA's existing gasoline, diesel, and other fuel quality programs to improve overall compliance assurance and maintain environmental performance, while reducing compliance costs for industry and EPA. The EPA action removed expired provisions, eliminated redundant compliance provisions, removed unnecessary and out-of-date requirements and replaced them with a single set of provisions and definitions that applies to all gasoline, diesel, and other fuel quality programs. EPA's action and the associated amendments did not change the stringency of the fuel quality standards. The amendments to 40 CFR Part 60 Subpart JJJJ removed an outdated reference to 40 CFR 80.195 for gasoline fuel requirements and replaced it with the current reference to 40 CFR 1090.205. The December 4, 2020 amendments did not change any emission limits or emission control requirements of 40 CFR Part 60 Subpart JJJJ.

The June 29, 2021, amendments to 40 CFR Part 60 Subpart JJJJ were the result of EPA's action to remove references to outdated legacy parts for engine certification and replace them with the new regulatory parts in subchapter U (e.g. replacing reference to 40 CFR 90 with 40 CFR 1054), or to copy referenced text directly into 40 CFR 60. EPA stated "most of the changes for stationary engines in 40 CFR 60 are intended to update references without changing standards or other provisions." The June 29, 2021, amendments included three more substantive changes. The first change allowed all manufacturers of emergency stationary IC engines to certify the engines using assigned deterioration factors. The second change allowed manufacturers of stationary spark-ignition IC engines to certify engines using the procedures in 40 CFR 1054. The third change allowed manufacturers to use any of the VOC measurement methods that are specified for highway or nonroad engines in 40 CFR 1065, subpart C. The June 29, 2021, amendments to this subpart did not affect the requirements for operators of IC engines that are subject to this regulation.

Therefore, based on the types of changes made, the determination that Rule 4702 is at least as stringent as 40 CFR 60 Subpart JJJJ remains valid.

State Regulations

District staff conducted a comprehensive evaluation of California regulatory requirements. No updates occurred to the following state regulations since EPA's approval of the District's *2014 RACT SIP*. Therefore, further evaluation is not necessary at this time.

- *California Environmental Protection Agency Air Resources Board Determination of Reasonably Available Control Technology and Best Available Retrofit Control Technology for Stationary Spark-Ignited Internal Combustion Engines (2001/11)*
- *Title 17 California Code of Regulations (CCR), Section 93115 - Airborne Toxic Control Measure (ATCM) for Stationary Compression-Ignition Engines (2004/02)*

For the following, more recently amended state regulation, the District is providing an evaluation.

- *Title 17 CCR, Section 93116 - Airborne Toxic Control Measure (ATCM) for Diesel Particulate Matter from Portable Engines Rated at 50 (Horsepower and Greater (2018/08)*

CARB adopted amendments to the ATCM in 2018 to add a distinction between large and small fleets and add a simplified schedule for compliance with the phase-out of Tier 1, 2, and 3 engines, with an extended compliance deadline for large and small fleets. Additionally, CARB extended the compliance deadline for large fleets that choose to comply with the optional fleet average PM standards by seven years, and lowered the average PM standard for large fleets complying with the optional PM standard. Lastly, CARB added the option for low-use engines (200 hours/year of less) to be exempt from the ATCM, and gave additional time for existing Tier 1 and Tier 2 engines to be designated as low-use or emergency use engines.

The primary purpose of the 2018 amendments was to give additional time for engines to comply with the requirements of the ATCM. Overall, the requirements in 4702 remain as stringent as the requirements of the ATCM.

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

District staff compared emission limits, optional control requirements, and work practice standards in District Rule 4702 to comparable requirements in rules from the following nonattainment areas:

- Bay Area AQMD Regulation 9, Rule 8 (Amended July 25, 2007)[278]

[278] BAAQMD. *Regulation 9, Rule 8 (Nitrogen Oxides and Carbon Monoxide from Stationary Internal Combustion Engines)*. (Amended July 25, 2007). Retrieved from: https://www.baaqmd.gov/~/media/dotgov/files/rules/reg-9-rule-8-nitrogen-oxides-and-carbon-monoxide-from-stationary-internal-combustion-engines/documents/rg0908.pdf?la=en

- Sacramento Metropolitan AQMD Rule 412 (Adopted June 1, 1995)[279]
- Ventura County APCD Rule 74.9 (Amended November 8, 2005)[280]
- Ventura County APCD Rule 74.16 (Adopted January 8, 1991)[281]
- South Coast AQMD Rule 1110.2 (Amended November 1, 2019)[282]

The District reviewed the rule requirements implemented prior to EPA's approval of the *2014 RACT SIP*, and found that Rule 4702 continues to implement RACT levels of control. The below comparison tables demonstrate that, for more recently amended rules, District Rule 4702 continues to meet RACT.

South Coast AQMD

- SCAQMD Rule 1110.2 (Emissions from Gaseous- And Liquid-Fueled Engines)

	SJVAPCD Rule 4702	SCAQMD Rule 1110.2
Applicability	IC engines rated at ≥ 25 bhp	Stationary and portable IC engines rated more than 50 bhp
Exemptions	• Limited to operate less than 100 hrs/yr • De-rated engine that has been physically limited and restricted by permit to an operational level of < 50 hp not used in agricultural operation (prior to 6/1/04) • De-rated engine that has been physically limited and restricted by permit to an operational level of < 50 bhp used in agricultural operation (prior to 6/1/05)	• IC engines powering orchard wind machines; • Emergency IC engines permitted to operate no more than 200 hours per year; • Laboratory IC engines used in research and testing purposes; • IC Engines operated for purposes of performance verification and testing of engines; • Auxiliary IC engines used to power other engines or gas turbines during start-ups; • Portable engines that are registered under the state Portable Equipment Registration Program (PERP) • IC engines operating on San Clemente Island; • Tier 4 certified stationary agricultural IC engines for which the electric utility rejected an application for an electrical line extension to the engine location or that do not qualify for Carl Moyer Program funding; • IC engine start-up periods, until sufficient operating temperatures

[279] SMAQMD. *Rule 412 (Stationary Internal Combustion Engines Located at Major Stationary Sources of NOx)*. (Adopted June 1, 1995). Retrieved from: http://www.airquality.org/ProgramCoordination/Documents/rule412.pdf
[280] VCAPCD. *Rule 74.9 (Stationary Internal Combustion Engines)*. (Amended November 8, 2005). Retrieved from: http://www.vcapcd.org/Rulebook/Reg4/RULE%2074.9.pdf
[281] VCAPCD. *Rule 74.16 (Oilfield Drilling Operations)*. (Adopted January 8, 1991). Retrieved from: http://www.vcapcd.org/Rulebook/Reg4/RULE%2074.16.pdf
[282] SCAQMD. *Rule 1110.2 (Emissions from Gaseous- and Liquid-Fueled Engines)*. (Amended November 1, 2019). Retrieved from: http://www.aqmd.gov/docs/default-source/rule-book/reg-xi/rule-1110-2.pdf

	SJVAPCD Rule 4702	SCAQMD Rule 1110.2
		are reached for proper operation of emission control equipment or for the tuning of the engines and/or emission control equipment, and engine shutdown periods. The periods shall not exceed 30 minutes, unless a longer period, not exceeding two hours, is approved in writing; • IC engine start-ups, after an engine overhaul or major repair, or the replacement of catalytic emission control equipment, for a period not to exceed four operating hours; • Initial commissioning of a new IC engine for a period not exceeding 150 operating hours; • IC engines rated 100 bhp or less used exclusively for electrical generation at remote two-way radio transmission towers where no utility, electricity, or natural gas is available within a ½ mile radius, and is fired exclusively on diesel #2, compressed natural gas, or liquefied petroleum gas; • NOx emissions from existing IC engines subject to SCAQMD RECLAIM Program (pursuant to SCAQMD Rule 2001 – RECLAIM Applicability); • IC engines operated in either the Southern California Coastal Waters or Outer Continental Shelf Waters that power cranes and are certified to meet the Tier 4 Final emission standards • The facility operator of MM PRIMA DESHECHA ENERGY, LLC provided that a plan was submitted before July 1, 2016, for the permanent shutdown of all equipment subject to Rule 1110.2 by October 1, 2022; and • IC engines located at landfills or publicly owned treatment works that are subject to a NOx emission limit in a Regulation XI rule adopted or amended after November 1, 2019

	SJVAPCD Rule 4702	SCAQMD Rule 1110.2
Requirements		
Non-Agricultural Rich-Burn Waste Gas-Fueled IC Engines (ppmv @ *15% oxygen on a dry basis)*		
NOx	11 ppmv	11 ppmv
VOC	90 ppmv	30 ppmv
Non-Agricultural Rich-Burn Cyclic Loaded, Field Gas Fueled IC Engines (ppmv @ *15% oxygen on a dry basis)*		
NOx	11 ppmv	No Such Category
VOC	90 ppmv	
Non-Agricultural Rich-Burn Limited Use IC Engines (ppmv @ *15% oxygen on a dry basis)*		
NOx	11 ppmv	No Such Category
VOC	90 ppmv	
Non-Agricultural Rich-Burn IC Engines Not Listed Above (ppmv @ *15% oxygen on a dry basis)*		
NOx	11 ppmv	11 ppmv
VOC	90 ppmv	30 ppmv
Non-Agricultural Lean-Burn Limited Use IC Engines (ppmv @ *15% oxygen on a dry basis)*		
NOx	11 ppmv	No Such Category
VOC	90 ppmv	
Non-Agricultural Lean-Burn IC Engines Used for Gas Compression (ppmv @ *15% oxygen on a dry basis)*		
NOx	40 ppmv or 93% reduction	No Such Category
VOC	90 ppmv	
Non-Agricultural Lean-Burn Waste Gas-Fueled IC Engines (ppmv @ *15% oxygen on a dry basis)*		
NOx	40 ppmv or 90% reduction	11 ppmv
VOC	90 ppmv	30 ppmv
Agricultural Operation Spark-Ignited Rich-Burn IC Engines[283] (ppmv @ *15% oxygen on a dry basis)*		
NOx	11 ppmv or 0.15 g/bhp-hr	11 ppmv
VOC	90 ppmv	30 ppmv
Agricultural Operation Spark-Ignited Lean-Burn IC Engines[284] (ppmv @ *15% oxygen on a dry basis)*		
NOx	0.6 g/bhp-hr or 43 ppmv	11 ppmv
VOC	90 ppmv	30 ppmv
Agricultural Operation Compression-Ignited IC Engines[285] (ppmv @ *15% oxygen on a dry basis)*		
NOx	Tier 3 or Tier 4 Certified IC Engine	11 ppmv, or Tier 4 Certified IC Engine
VOC	Tier 3 or Tier 4 Certified IC Engine	30 ppmv, or Tier 4 Certified IC Engine

District Rule 4702 has similar limits compared to SCAQMD Rule 1110.2 and both rules have significantly lower emission limits than other California District rules. In the couple

[283] There are only 2 rich-burn spark ignited engines operating in SCAQMD per discussions with SCAQMD staff
[284] There are no lean-burn spark ignited ag engines operating in SCAQMD per discussions with SCAQMD staff
[285] Information from SCAQMD indicates that there are no stationary non-emergency diesel IC engines that operate in the SCAQMD

of areas that SCAQMD limits are lower, SCAQMD has determined that their current emission requirements are equivalent to BACT. Because the SCAQMD Rule 1110.2 emission limits are equivalent to BACT, these emission limits go far beyond RACT requirements. In addition, the SCAQMD's Regional Clean Air Incentives Market (RECLAIM) program currently exempts IC engines at RECLAIM facilities from the NOx emission limits of SCAQMD Rule 1110.2. Although the recent amendments to SCAQMD rules set a schedule for IC engines at RECLAIM facilities to comply with SCAQMD Rule 1110.2 by December 31, 2023, currently many facilities in the SCAQMD remain exempt from the requirements of the rule. Therefore, the emission limits of SCAQMD Rule 1110.2 are not directly comparable to limits in District rules that do not have similar exemptions to the rule requirements. Also, even when the SCAQMD RECLAIM facilities begin to comply with the SCAQMD Rule 1110.2, it does not change the fact that the emission limits in the rule are beyond RACT and more comparable to BACT, as discussed above. Therefore, District Rule 4702 is as stringent as SCAQMD Rule 1110.2.

Potential Emission Reduction Opportunities

Over the years, the District has adopted numerous generations of rules and rule amendments for engines that have significantly reduced NOx and VOC emissions from this source category. As part of these regulatory efforts, hundreds of engines in the Valley have been equipped with the best available NOx and VOC control technologies. Even though significant effort has already been made to reduce emissions from this source category, the possibility of further reducing emissions from units greater than 50 bhp is evaluated in the following discussion.

The two primary methods of controlling NOx emissions from engines is to retrofit them with either a SCR system or non-selective catalytic reduction (NSCR) system to reduce NOx formation. NSCR systems are also effective at reducing VOCs, while SCR systems require an additional oxidization catalyst for VOC control. The District is already requiring the use of NSCR systems to reduce NOx and VOC emissions in the current rule and no further analysis will be conducted for NSCR. The District also considered the feasibility of reducing emissions through electrification and solar powered motors.

Selective Catalytic Reduction Systems

A SCR system is a well-established control technology for reducing NOx from lean-burn engines. NOx is reduced to molecular nitrogen by adding an exhaust gas treatment system consisting of a catalyst module and a reagent injection system to add the reagent to the engine exhaust. SCR systems must operate at a certain temperature range to effectively reduce NOx in the exhaust gas by injecting either ammonia stored in aqueous or anhydrous form and generated on demand or urea into the post-combustion zone of the engine. SCR systems have significant initial capital cost. The installed cost of an SCR system for a lean-burn IC engine is estimated to be over $120,000 to $300,000 depending on the size of the unit. Additionally, the annual operation and

maintenance cost for a single SCR system is between $16,000 and $60,000, depending on the size of the unit. Due to these factors, SCR systems are not a cost effective control system for some lean-burn engines at this time, such as the typical size range IC engines used in agricultural operations.

Electrification and Solar

To ensure that all potential emission reduction opportunities are evaluated, the District performed a review of electric and solar powered motors. Electric and solar powered motors are commercially available and generally cost about the same as similarly sized spark-ignited units. Economic impacts would also be influenced by the increasing cost of electricity in California as electricity rates rose 48% from 2010 to 2020 (9.8 cents/kW-hr to 14.55 cents/kW-hr) based on annual data for 2020 provided by the U.S. Energy Information Administration.[286] The California Energy Commission projects that electricity prices will further rise by an average of 15% between 2020 to 2035 across all sectors.[287] Additionally, for solar powered motors, there is an inconsistency to how much electricity can be produced at any location, based on the availability of direct sunlight and the amount of space a facility is able to designate towards solar panels. The specific consideration of crop land would come into play for engines that operate as a part of an agricultural facility, as many farmers would have difficulty designating space for the solar equipment. In addition, there is a lack of existing electric infrastructure in many areas of the Valley, including some farms and oil fields. There would be considerable costs associated with the line extension and other technology necessary to gain access to electricity or solar power in these remote locations.

For facilities that lack the infrastructure needed to connect to the electrical power grid, there are additional technologies that would be necessary in order to operate an electric or solar powered pump motor. These facilities could potentially incur much larger costs because of the need to install excess capacity, and water storage or batteries to store the electrical energy generated when the solar system was not generating electricity. The installation and maintenance of these systems could raise the costs of an electric engine/solar-system exponentially, with estimated cost-effectiveness values of $150,000 - $260,000, or higher, per ton of emissions reduced for each unit installed, depending on the size of the engine.

Due to the technological and economic challenges, it is not feasible for the District to set a standard requiring engines to be replaced with electric motors or solar-powered motors at this time. To promote the use of electric motors where feasible, the District currently offers an incentive funding grant covering up to 85% of the cost to install an electric motor to replace an existing agricultural IC engine.

[286] U.S. Energy Information Administration, Form EIA-860, Annual Electric Generator Report, U.S. Energy Information Administration, Form EIA-861, Annual Electric Power Industry Report, U.S. Energy Information Administration, Form EIA-923, Power Plant Operations Report and predecessor forms.
[287] California Energy Commission. *Electricity Rate Scenarios*. September 30, 2021. Retrieved from: https://www.energy.ca.gov/sites/default/files/2021-09/1%20Electricity%20Rate%20Forecast%20Updates_ADA.pdf

Overall, the District has not identified any additional emission reduction opportunities at this time.

Contingency Measure Evaluation

As discussed in Chapter 6, contingency measures are immediately implemented ONLY if triggered by an unanticipated milestone or attainment failure. The District reviewed this control measure for a potential contingency component. The District concludes that this control measure is not an appropriate contingency measure because the most stringent feasible controls are already in place, and a contingency trigger is incompatible with the technologies involved in reducing emissions from this category.

Evaluation Findings

Rule 4702 meets or exceeds federal RACT requirements for this source category based upon evaluation of applicable federal regulations, state standards, and other air districts' rules. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

C.58 RULE 4703 STATIONARY GAS TURBINES

Emissions Inventory (Summer Average – Tons per day)

	2017	2023	2026	2029	2032	2035	2037
NOx	2.66	2.25	2.28	2.09	2.00	1.98	1.96
VOC	0.75	0.69	0.70	0.68	0.68	0.70	0.72

District Rule 4703 Description

District Rule 4703 limits NO_X and CO emissions from stationary gas turbines with ratings equal to or greater than 0.3 MW or a maximum heat input of more than 3.0 MMBtu/hr. The main rule requirement is the limitation of NO_X emissions. Laboratory units used in research and testing for the advancement of gas turbine technology, units limited by permit condition to be operated exclusively for firefighting and/or flood control, and emergency standby units limited by permit condition to operate less than 100 hours per calendar year for maintenance and testing purposes are not subject to the emission requirements of this rule.

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

Federal Regulations

There are no Control Techniques Guidelines applicable to this source category.

A. Alternative Control Techniques (ACT)

District staff conducted a comprehensive evaluation of EPA ACT requirements. EPA has not adopted updates to the below ACT since EPA's approval of the *2014 RACT SIP*. Therefore, further evaluation is not necessary at this time.

- *Alternative Control Techniques Document - NOx Emissions from Stationary Gas Turbines (EPA-453/R-93-007 1993/01)*

B. New Source Performance Standards (NSPS)

District staff conducted a comprehensive evaluation of EPA NSPS requirements. EPA has not adopted updates to these NSPS since EPA's approval of the *2014 RACT SIP*. Therefore, further evaluation is not necessary at this time.

- *40 CFR 60 Subpart GG - Standards of Performance for Stationary Gas Turbines (2009/03)*
- *40 CFR 60 Subpart TTTT - Standards of Performance for Greenhouse Gas Emissions for Electric Generating Units (2015/10)*

State Regulations

There are no state regulations applicable to this source category.

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

District staff compared emission limits, optional control requirements, and work practice standards in District Rule 4703 to comparable requirements in rules from the following nonattainment areas:

- Bay Area AQMD Regulation 9, Rule 9 (Amended December 6, 2006)[288]
- Sacramento Metropolitan AQMD Rule 413 (Amended March 24, 2005)[289]
- South Coast AQMD Rule 1134 (Amended April 5, 2019)[290]
- Ventura County APCD Rule 74.23 (Amended November 12, 2019)[291]

The District reviewed the rule requirements implemented prior to EPA's approval of the *2014 RACT SIP*, and found that Rule 4703 continues to implement RACT levels of control. The below comparison tables demonstrate that, for more recently amended rules, District Rule 4703 continues to meet RACT.

South Coast AQMD

- SCAQMD Rule 1134 (Emissions of Oxides of Nitrogen from Stationary Gas Turbines)

	SJVAPCD Rule 4703	SCAQMD Rule 1134
Applicability	Gas turbines rated ≥ 0.3 MW or with a maximum heat input rating of > 3 MMBtu/hr	Gas turbines rated ≥ 0.3 MW output or with a maximum heat input rating of > 3 MMBtu/hr and operated on gaseous and/or liquid fuel

[288] BAAQMD. *Regulation 9, Rule 9 (Nitrogen Oxides from Stationary Gas Turbines).* (Amended December 6, 2006). Retrieved from: https://www.baaqmd.gov/~/media/dotgov/files/rules/reg-9-rule-9-nitrogen-oxides-and-carbon-monoxide-from-stationary-gas-turbines/documents/rg0909.pdf?la=en&rev=fed388c23f264d6ebd5e6e40096bdf79.
[289] SMAQMD. *Rule 413 (Stationary Gas Turbines).* (Amended March 24, 2005). Retrieved from: http://www.airquality.org/ProgramCoordination/Documents/rule413.pdf.
[290] SCAQMD. *Rule 1134 (Emissions of Oxides of Nitrogen from Stationary Gas Turbines).* (Amended April 5, 2019). Retrieved from: http://www.aqmd.gov/docs/default-source/rule-book/reg-xi/rule-1134.pdf?sfvrsn=4.
[291] VCAPCD. *Rule 74.23 (Stationary Gas Turbines).* (Amended November 12, 2019). Retrieved from: http://www.vcapcd.org/Rulebook/Reg4/RULE%2074.23.pdf.

<table>
<tr><th></th><th>SJVAPCD Rule 4703</th><th colspan="2">SCAQMD Rule 1134</th></tr>
<tr><td>Exemptions</td><td>• Laboratory turbines used in research and testing for the advancement of gas turbine technology.
• Units limited by permit condition to be operated exclusively for firefighting and/or flood control.
• Emergency standby turbines limited by permit condition to operate less than 100 hours per calendar year for maintenance and testing purposes.</td><td colspan="2">• Laboratory turbines used in research and testing
• Gas turbines used exclusively for firefighting and/or flood control
• Emergency standby units used to provide electrical power, water pumping for flood control or firefighting, potable water pumping, or sewage pumping provided non-resettable engine hour requirement and operate less than 200 hrs/yer.
• Stationary gas turbines: subject to Rule 1135 – Emissions of Oxides of Nitrogen from Electricity Generating Facilities; located at petroleum refineries, landfills, or publicly owned treatment works; or fueled by landfill gas.
• Combined cycle gas turbines installed prior to 4/5/2019 have conditional exemptions
• Low use installed prior to 4/15/2019 has specific exemptions and subject to NOx limits at 12 ppmv</td></tr>
<tr><td rowspan="4">Requirements</td><td>The operator of any stationary gas turbine shall not operate a unit in such a manner that results in NO_X emissions, referenced at 15% O_2, shall not exceed the following limits</td><td colspan="2">A person shall not operate a stationary gas turbine unless NO_X emission concentrations, referenced at 15% O_2, do not exceed the following limits:</td></tr>
<tr><td colspan="3">Units Rated < 3 MW</td></tr>
<tr><td>Gas Fuel - 9 ppm
Liquid Fuel - 25 ppm</td><td>Current Limits
Gas Fuel - 42 ppm
Liquid Fuel - 65 ppm</td><td>Jan. 1, 2024 Limits
<u>Combined Cycle:</u>
Gas Fuel - 2 ppm
<u>Simple Cycle:</u>
Gas Fuel – 2.5 ppm</td></tr>
<tr><td colspan="3">Units Rated ≥ 3 MW and < 10 MW</td></tr>
<tr><td><u>Pipeline Gas:</u>
Steady State Operation – 8 ppm
Non-Steady State Operation – 12 ppm
Liquid Fuel – 25 ppm

<u>< 877 hr/yr:</u>
Gas Fuel - 9 ppm
Liquid Fuel - 25 ppm

<u>≥ 877 hr/year and not listed above:</u>
Gas Fuel - 5 ppm
Liquid Fuel - 25 ppm</td><td>Current Limits
<u>< 877 hr/yr:</u>
Gas Fuel- 42.0 ppm
Liquid Fuel - 65 ppm
<u>≥ 877 hr/year</u>
Gas Fuel- 42.0 ppm
Liquid Fuel - 65 ppm
<u>Pipeline Gas units with no SCR:</u>
3.5 ppm</td><td>Jan. 1, 2024 Limits
<u>< 877 hr/yr:</u>
Combined Cycle: Gas Fuel - 2 ppm
Simple Cycle: Gas Fuel – 2.5 ppm
<u>Simple Cycle:</u>
2.5 ppm
<u>≥ 877 hr/year:</u>
Combined Cycle: Gas Fuel - 2 ppm
Simple Cycle: Gas Fuel – 2.5 ppm</td></tr>
</table>

	SJVAPCD Rule 4703	SCAQMD Rule 1134	
	Units Rated ≥ 10 MW		
	Combined Cycle: Gas Fuel - 5 ppm (standard) Gas Fuel – 3 ppm (enhanced) Liquid Fuel – 25 ppm *Simple Cycle and ≥ 877 hr/yr:* Gas Fuel - 5 ppm (standard) Gas Fuel - 3 ppm (enhanced) Liquid Fuel – 25 ppm *Simple Cycle and > 200 hr/yr and < 877 hr/yr:* Gas Fuel - 5 ppm Liquid Fuel – 25 ppm *Simple Cycle and ≤ 200 hr/yr:* Gas Fuel - 25 ppm Liquid Fuel – 42 ppm	***Current Limits*** *< 877 hr/yr:* Gas Fuel- 42.0 ppm Liquid Fuel - 65 ppm ≥*10.0 MW, no SCR* Gas Fuel- 15 ppm Liquid Fuel - 42 ppm ≥*10.0 MW w/ SCR* Gas Fuel- 9 ppm Liquid Fuel - 25 ppm	***Jan. 1, 2024 Limits*** *Combined Cycle:* Gas Fuel: 2 ppm *< 877 hr/yr:* Combined Cycle: Gas Fuel - 2 ppm Simple Cycle: Gas Fuel – 2.5 ppm *Simple Cycle and > 200 hr/yr and < 877 hr/yr:* 2.5 ppm *Simple Cycle and ≤ 200 hr/yr:* 2.5 ppm

The requirements established in District Rule 4703 and SCAQMD Rule 1134 have been previously approved by EPA as implementing, at minimum, a RACT level of stringency. When the new SCAQMD limits do take effect, the requirements of SCAQMD Rule 1134 for stationary gas turbines will go beyond RACT, and have not been widely adopted in other California District rules. Additionally, given the District's existing stringent limits, the cost-effectiveness associated with the installation of additional controls are in excess of RACT cost-effectiveness levels.

Therefore, District Rule 4703 continues to implement RACT levels of control.

Ventura County APCD

- VCAPCD Rule 74.23 (Stationary Gas Turbines)

	SJVAPCD Rule 4703	VCAPCD Rule 74.23
Applicability	Gas turbines ≥ 0.3 MW or a maximum heat input rating of 3 MMBtu/hr	Gas turbines ≥ 0.3 MW or greater
Exemptions	• Laboratory turbines used in research and testing for the advancement of gas turbine technology. • Units limited by permit condition to be operated exclusively for firefighting and/or flood control. • Emergency standby turbines limited by permit condition to operate less than 100 hours per calendar year for maintenance and testing purposes.	• Laboratory units used in research and testing for the advancement of gas turbine technology. • Units operated exclusively for firefighting and/or flood control. • Units operated less than 200 hours per calendar year. • Emergency standby units operating during either an emergency or maintenance operation. Maintenance operation is limited to 104 hours per calendar year.
Requirements	The operator of any stationary gas turbine shall not operate a unit in such a manner that results in NO_X emissions,	A person shall not operate a stationary gas turbine unless NO_X emission concentrations, referenced at 15% O_2, do not exceed the following limits.

	SJVAPCD Rule 4703	VCAPCD Rule 74.23
	referenced at 15% O_2, shall not exceed the following limits:	However, the rule also includes a provision for alternative means of producing equivalent emission reductions at the facility site or in the community for units where compliance with the below limits would exceed the established cost-effectiveness thresholds of the district.
	Units Rated < 3 MW	
	Gas Fuel - 9 ppm Liquid Fuel - 25 ppm	***Current Limits*** Gas Fuel - 42 ppm Liquid Fuel - 65 ppm ***January 1, 2024 Limits*** Natural Gas - 2.5 ppm All digester gas fired units - 9 ppm Liquid Fuel - 30 ppm
	Units Rated ≥ 3 MW and < 10 MW	
	Pipeline Gas: Steady State Operation – 8 ppm Non-Steady State Operation – 12 ppm Liquid Fuel – 25 ppm *< 877 hr/yr:* Gas Fuel - 9 ppm Liquid Fuel - 25 ppm *≥ 877 hr/year and not listed above:* Gas Fuel - 5 ppm Liquid Fuel - 25 ppm	***Current Limits*** *< 877 hr/yr:* Gas Fuel- 42.0 ppm Liquid Fuel - 65 ppm *≥ 877 hr/year* Gas Fuel- 42.0 ppm Liquid Fuel - 65 ppm ***January 1, 2024 Limits*** *Pipeline Gas:* Liquid Fuel - 30 ppm *< 877 hr/yr:* Natural Gas – 2.5 ppm All digester gas fired units – 9 ppm Liquid Fuel - 30 ppm *≥ 877 hr/year* Natural Gas – 2.5 ppm All digester gas fired units – 9 ppm Liquid Fuel - 30 ppm
	Units Rated ≥ 10 MW	
	Combined Cycle: Gas Fuel - 5 ppm (standard) Gas Fuel – 3 ppm (enhanced) Liquid Fuel – 25 ppm *Simple Cycle and ≥ 877 hr/yr:* Gas Fuel - 5 ppm (standard) Gas Fuel - 3 ppm (enhanced) Liquid Fuel – 25 ppm *Simple Cycle and > 200 hr/yr and < 877 hr/yr:* Gas Fuel - 5 ppm Liquid Fuel – 25 ppm *Simple Cycle and ≤ 200 hr/yr:* Gas Fuel - 25 ppm	***Current Limits*** *< 877 hr/yr:* Gas Fuel- 42.0 ppm Liquid Fuel - 65 ppm *≥10.0 MW, no SCR* Gas Fuel- 15 ppm Liquid Fuel - 42 ppm *≥10.0 MW w/ SCR* Gas Fuel- 9 ppm Liquid Fuel - 25 ppm ***January 1, 2024 Limits*** *≥ 877 hr/yr:* Natural Gas – 2.5 ppm All digester gas fired units – 9 ppm Liquid Fuel - 30 ppm

	SJVAPCD Rule 4703	VCAPCD Rule 74.23
	Liquid Fuel – 42 ppm	*> 200 hr/yr and < 877 hr/yr:* Natural Gas – 2.5 ppm All digester gas fired units – 9 ppm Liquid Fuel - 30 ppm *≤ 200 hr/yr:* Gas Fuel - 25 ppm All digester gas fired units – 9 ppm Liquid Fuel – 30 ppm

VCAPCD recently amended Rule 74.23 in November 2019 to lower NOx emission limits; however, the limits would not take effect until January 1, 2024. Furthermore, VCAPCD's Rule 74.23 includes an alternative compliance option for facilities that exempts units from meeting the limits under certain conditions, including unfavorable cost-effectiveness. When the new VCAPCD limits do take effect, the requirements of Rule 74.23 for stationary gas turbines will go beyond RACT, and have not been widely adopted in other District rules.

Therefore, District Rule 4703 continues to implement RACT levels of control.

Potential Emission Reduction Opportunities

Potential Emission Reduction Opportunities

The District has adopted numerous rule amendments to Rule 4703 – Stationary Gas Turbines that have successfully and significantly reduced NOx emissions from this source category in the Valley. In an effort to identify potential emission NOx reduction opportunities, the District has evaluated the economic feasibility of requiring limits as low as 2 ppmvd NOx @ 15% O2 for combined-cycle gas turbines and 2.5 ppmvd NOx @ 15% O2 for simple cycle gas turbines.

Selective Catalytic Reduction

Most of the gas turbines in the San Joaquin Valley are already equipped with selective catalytic reduction (SCR) systems to reduce NOx emissions. An SCR operates as an external control device where flue gases and ammonia reagent are passed through an appropriate catalyst. Ammonia, is injected upstream of the catalyst where it reacts and reduces NOx, over the catalyst bed, to form elemental nitrogen and other by-products. In simple-cycle turbines, SCR is placed downstream of dilution fan and oxidation catalyst (CO control device), whereas, in combined-cycle configuration, SCR is placed downstream of multiple pieces of equipment including duct burner, heat recovery steam generator (HRSG), oxidation catalyst, etc.

Typically there is enough room available in a simple cycle power plants to retrofit the unit with a modern SCR system capable of meeting 2.5 ppm NOx without moving other components. In contrast, combined-cycle power plants are compact and will usually

require system components to be moved in order to accommodate a modern SCR system capable of meeting 2.0 ppm NOx.

To achieve NOx limits of 2 or 2.5 ppmv, an existing SCR system would either have to be expanded or replaced with a new modern SCR system. SCR system involves SCR housing, catalyst, ammonia injection system, ammonia flow monitor and control system, ammonia tanks, etc.

To be consistent with the existing categories in Table 5-3 of Rule 4703, the District has conducted cost effectiveness analyses to retrofit existing gas turbines with SCR systems for the following four scenarios:

1. Retrofit cost for a modern SCR system for units less than 3 MW unit to comply with 2 ppmvd NOx @ 15% O2*
2. Retrofit cost for a modern SCR system for units between 3 MW to 10 MW to comply with 2 ppmvd NOx @ 15% O2*
3. Retrofit cost of an SCR system for units greater than 10 MW simple cycle unit to comply with 2.5 ppmvd NOx @ 15% O2
4. Retrofit cost of an SCR system for units greater than 10 MW combined cycle to comply with 2 ppmvd NOx @ 15% O2

* Nearly all the permitted units rated less than 10 MW are cogeneration units. Therefore, the cost analyses for #1 and #4 above assume the turbine is a cogeneration unit.

Calculation Methodology

First, total annual cost is calculated using SCR retrofit cost for each category. Then, the potential NOx emission reduction for each turbine category is determined by taking the difference between the potential emissions and the emissions that could be reliably achievable by retrofitting the system with latest SCR technology capable of achieving 2.0 ppmv NOx @ 15% O_2 for cogeneration turbines and 2.5 ppmv NOx @ 15% O_2 for simple cycle turbines. Each unit is conservatively assumed to be operated for 8,760 hours per year at the maximum rated heat input capacity (MMBtu/hr).

NOx Reduction (tons/yr)

= (Current NOx Emission Factor – Potential NOx Emission Factor) ppm (@ 15% O2) x 10^{-6} x 46 lb-NO_2/lb-mol x 8,578 ft^3-exhaust/MMBtu x (20.95/(20.95 – 15)) x 1 lb-mol/379.5 ft^3-exhaust x Heat Input Rate (MMBtu/hr) x Operating Hours (hr/yr) x ton/2,000

Cost Effectiveness ($/ton)
= Total Annual Cost ($/yr) ÷ NOx Reductions (tons/yr)

1. Retrofit cost of units less than 3 MW unit with an SCR system capable of achieving 2 ppmvd NOx @ 15% O2

Item	Value	Units/Source	Cost
Turbine Rating	2	MW	
SCR Cost/KW	475	$/kW, District facility*	
Operating Hours	8,760	hr/yr	
Direct Capital Costs			
Total Purchased Equip Cost (PEC)	$/kW x 1000 kW		$950,000
Freight	5% PEC	2015 Plan for the 1997 PM 2.5 Standard - Rule 4703 Control Measure Analysis	$47,500
Sales Tax	8.25%PEC	2015 Plan for the 1997 PM 2.5 Standard - Rule 4703 Control Measure Analysis	$78,375
Direct Installation Costs	25% PEC	2015 Plan for the 1997 PM 2.5 Standard - Rule 4703 Control Measure Analysis	$237,500
Total Direct Capital Costs			$1,313,375
Indirect Capital Costs			
Facilities	5% PEC	2015 Plan for the 1997 PM 2.5 Standard - Rule 4703 Control Measure Analysis	$47,500
Engineering	10% PEC	2015 Plan for the 1997 PM 2.5 Standard - Rule 4703 Control Measure Analysis	$95,000
Process Contingency	5% PEC	2015 Plan for the 1997 PM 2.5 Standard - Rule 4703 Control Measure Analysis	$47,500
Total Indirect Capital Costs			$190,000
Project Contingency	20%PEC	2015 Plan for the 1997 PM 2.5 Standard - Rule 4703 Control Measure Analysis	$190,000
Total Capital Costs (TCC)	Direct Capital + Indirect Capital + Project Contingency		$1,693,375
Annualized Capital Costs (10 years @ 4% interest)	0.1233 TCC		$208,793
Direct Annual Costs			
Operating Costs			
Operator	0.5 hr/shift, $25/hr	OAQPS	$13,688
Supervisor	15% of operator cost	OAQPS	$2,053
Maintenance Costs			
Labor	0.5 hr/shift, $25/hr	OAQPS	$13,688
Materials	100% of labor cost	OAQPS	$13,688
Utility Costs			
Electricity Costs		not included	
Catalyst Replacement		not included	
Catalyst Disposal		not included	
Ammonia		not included	
NH3 Injection Skid		not included	
Total Direct Annual Costs			$43,116
Indirect Annual Costs			
Overhead	60% of operating and maintenance	OAQPS	$25,869
Administrative	2% PEC	OAQPS	$19,000
Insurance	1% PEC	OAQPS	$9,500

Item	Value	Units/Source	Cost
Property Tax	1% PEC	OAQPS	$9,500
Capital Recovery	0.13 x PEC (10% int. rate, 15 yr. period)	OAQPS	$123,500
Total Indirect Annual Costs			$187,369

Total Annual Costs	Annualized capital + Direct Annual + Indirect Annual		**$439,278**

** Per power consultant (Former SCR designer for John Zinc), cost to retrofit is highly variable, ranging from $100 to $850 per kW. Large range because cost is highly dependent upon on how much equipment needs to be moved. Most units in valley are cogeneration units which would require equipment to be reconfigured. Thus, $475/kw average cost was chosen for the average retrofit.*

Cost Effectiveness Results

Type of Installation	Power Rating MW	Heat Input Rate MMBtu/hr	Current NOx Emission Factor (ppmvd @ 15% O2)	Potential NOx Emission Factor (ppmvd @ 15% O2)	NOx Reduction (tons/yr)	Total Annual Cost ($)	Cost Effectiveness ($/ton)
SCR system on a cogen system	2	30	9	2	1.26	$439,278	**$348,633.33**

2. Retrofit cost of an SCR system for units between 3 MW to 10 MW to comply with 2 ppmvd NOx @ 15% O2

Item	Value	Units/Source	Cost
Turbine Rating	3.5	MW	
SCR Cost/KW	475	$/kW, District facility*	
Operating Hours	8,760	hr/yr	
Direct Capital Costs			
Total Purchased Equip Cost (PEC)	$/kW x 1000 kW		$1,662,500
Freight	5% PEC	2015 Plan for the 1997 PM 2.5 Standard - Rule 4703 Control Measure Analysis	$83,125
Sales Tax	8.25%PEC	2015 Plan for the 1997 PM 2.5 Standard - Rule 4703 Control Measure Analysis	$137,156
Direct Installation Costs	25% PEC	2015 Plan for the 1997 PM 2.5 Standard - Rule 4703 Control Measure Analysis	$415,625
Total Direct Capital Costs			$2,298,406
Indirect Capital Costs			
Facilities	5% PEC	2015 Plan for the 1997 PM 2.5 Standard - Rule 4703 Control Measure Analysis	$83,125
Engineering	10% PEC	2015 Plan for the 1997 PM 2.5 Standard - Rule 4703 Control Measure Analysis	$166,250
Process Contingency	5% PEC	2015 Plan for the 1997 PM 2.5 Standard - Rule 4703 Control Measure Analysis	$83,125
Total Indirect Capital Costs			$332,500
Project Contingency	20%PEC	2015 Plan for the 1997 PM 2.5 Standard - Rule 4703 Control Measure Analysis	$332,500

Item	Value	Units/Source	Cost
Total Capital Costs (TCC)	Direct Capital + Indirect Capital + Project Contingency		$2,963,406
Annualized Capital Costs (10 years @ 4% interest)	0.1233 TCC		$365,388
Direct Annual Costs			
Operating Costs			
Operator	0.5 hr/shift, $25/hr	OAQPS	$13,688
Supervisor	15% of operator cost	OAQPS	$2,053
Maintenance Costs			
Labor	0.5 hr/shift, $25/hr	OAQPS	$13,688
Materials	100% of labor cost	OAQPS	$13,688
Utility Costs			
Electricity Costs		not included	
Catalyst Replacement		not included	
Catalyst Disposal		not included	
Ammonia		not included	
NH3 Injection Skid		not included	
Total Direct Annual Costs			$43,116
Indirect Annual Costs			
Overhead	60% of operating and maintenance	OAQPS	$25,869
Administrative	2% PEC	OAQPS	$33,250
Insurance	1% PEC	OAQPS	$16,625
Property Tax	1% PEC	OAQPS	$16,625
Capital Recovery	0.13 x PEC (10% int. rate, 15 yr. period)	OAQPS	$216,125
Total Indirect Annual Costs			$308,494
Total Annual Costs	Annualized capital + Direct Annual + Indirect Annual		**$716,998**

** Per power consultant (Former SCR designer for John Zinc), cost to retrofit is highly variable, ranging from $100 to $850 per kW. Large range because cost is highly dependent upon on how much equipment needs to be moved. Most units in valley are cogeneration units which would require equipment to be reconfigured. Thus, $475/kw average cost was chosen for the average retrofit.*

Cost Effectiveness Results

Type of Installation	Power Rating MW	Heat Input Rate MMBtu/hr	Current NOx Emission Factor (ppmvd @ 15% O2)	Potential NOx Emission Factor (ppmvd @ 15% O2)	NOx Reduction (tons/yr)	Total Annual Cost ($)	Cost Effectiveness ($/ton)
SCR system on a cogen system	3.5	51.7	5	2	0.93	$716,998	**$770,965.59**

3. Retrofit cost of an SCR system for units greater than 10 MW simple cycle unit to comply with 2.5 ppmvd NOx @ 15% O2

Item	Value	Units/Source	Cost
Turbine Rating	50	MW, Simple Cycle	
SCR Cost	4,100,000	From SCR Consultant*	
Operating Hours	8,760		
Direct Capital Costs			
Total Purchased Equip Cost (PEC)		See Above	$4,100,000
Freight	5% PEC	2015 Plan for the 1997 PM 2.5 Standard - Rule 4703 Control Measure Analysis	$205,000
Sales Tax	8.25%PEC	2015 Plan for the 1997 PM 2.5 Standard - Rule 4703 Control Measure Analysis	$338,250
Direct Installation Costs	25% PEC	2015 Plan for the 1997 PM 2.5 Standard - Rule 4703 Control Measure Analysis	$1,025,000
Total Direct Capital Costs			$5,668,250
Indirect Capital Costs			
Facilities	5% PEC	2015 Plan for the 1997 PM 2.5 Standard - Rule 4703 Control Measure Analysis	$205,000
Engineering	10% PEC	2015 Plan for the 1997 PM 2.5 Standard - Rule 4703 Control Measure Analysis	$410,000
Process Contingency	5% PEC	2015 Plan for the 1997 PM 2.5 Standard - Rule 4703 Control Measure Analysis	$205,000
Total Indirect Capital Costs			$820,000
Project Contingency	20%PEC	2015 Plan for the 1997 PM 2.5 Standard - Rule 4703 Control Measure Analysis	$820,000
Total Capital Costs (TCC)	Direct Capital + Indirect Capital + Project Contingency		$7,308,250
Annualized Capital Costs (10 years @ 4% interest)	0.1233 TCC		$901,107
Direct Annual Costs			
Operating Costs			
Operator	0.5 hr/shift, $25/hr	OAQPS	$13,688
Supervisor	15% of operator cost	OAQPS	$2,053
Maintenance Costs			
Labor	0.5 hr/shift, $25/hr	OAQPS	$13,688
Materials	100% of labor cost	OAQPS	$13,688
Utility Costs			
Electricity Costs		not included	$0
Cat Replacement, Ammonia Reagent, and Loss of Power from Backpressure		EPA Combustion Turbine NOx Technology Memo (jan 2022)	$70,000
Total Direct Annual Costs			$113,116
Indirect Annual Costs			

Item	Value	Units/Source	Cost
Overhead	60% of operating and maintenance	OAQPS	$25,869
Administrative	2% PEC	OAQPS	$82,000
Insurance	1% PEC	OAQPS	$41,000
Property Tax	1% PEC	OAQPS	$41,000
Capital Recovery	"0.13 x PEC		
(10% int. rate, 15 yr. period)"	OAQPS	$533,000	
Total Indirect Annual Costs			**$722,869**

Total Annual Costs	Annualized capital + Direct Annual + Indirect Annual		**$1,737,092**

** Per power consultant (Former SCR designer for John Zinc), cost to retrofit is highly variable, ranging from $100 to $850 per kW. Large range because cost is highly dependent upon on how much equipment needs to be moved. Most units in valley are cogeneration units which would require equipment to be reconfigured. Thus, $475/kw average cost was chosen for the average retrofit.*

Cost Effectiveness Results

Type of Installation	Power Rating MW	Heat Input Rate MMBtu/hr	Current NOx Emission Factor (ppmvd @ 15% O2)	Potential NOx Emission Factor (ppmvd @ 15% O2)	NOx Reduction (tons/yr)	Total Annual Cost ($)	Cost Effectiveness ($/ton)
Retrofit - Simple Cycle	50	500	5	2.5	7.48	$1,737,092	**$232,231.55**

4. Retrofit cost of an SCR system for units greater than 10 MW combined cycle to comply with 2 ppmvd NOx @ 15% O2

Item	Value	Units/Source	Cost
Turbine Rating	90	MW, Simple Cycle	
SCR Cost	6,200,000	Combustion Turbine NOx Technology Memo (jan 2022)	
Operating Hours	8,760		
Direct Capital Costs			
Total Purchased Equip Cost (PEC)		See Above	$6,200,000
Freight	5% PEC	2015 Plan for the 1997 PM 2.5 Standard - Rule 4703 Control Measure Analysis	$310,000
Sales Tax	8.25%PEC	2015 Plan for the 1997 PM 2.5 Standard - Rule 4703 Control Measure Analysis	$511,500
Direct Installation Costs	25% PEC	2015 Plan for the 1997 PM 2.5 Standard - Rule 4703 Control Measure Analysis	$1,550,000
Total Direct Capital Costs			$8,571,500
Indirect Capital Costs			
Facilities	5% PEC	2015 Plan for the 1997 PM 2.5 Standard - Rule 4703 Control Measure Analysis	$310,000

Item	Value	Units/Source	Cost
Engineering	10% PEC	2015 Plan for the 1997 PM 2.5 Standard - Rule 4703 Control Measure Analysis	$620,000
Process Contingency	5% PEC	2015 Plan for the 1997 PM 2.5 Standard - Rule 4703 Control Measure Analysis	$310,000
Total Indirect Capital Costs			$1,240,000
Project Contingency	20%PEC	2015 Plan for the 1997 PM 2.5 Standard - Rule 4703 Control Measure Analysis	$1,240,000
Total Capital Costs (TCC)	Direct Capital + Indirect Capital + Project Contingency		$11,051,500
Annualized Capital Costs (10 years @ 4% interest)	0.1233 TCC		$1,362,650
Direct Annual Costs			
Operating Costs			
Operator	0.5 hr/shift, $25/hr	OAQPS	$13,688
Supervisor	15% of operator cost	OAQPS	$2,053
Maintenance Costs			
Labor	0.5 hr/shift, $25/hr	OAQPS	$13,688
Materials	100% of labor cost	OAQPS	$13,688
Utility Costs			
Electricity Costs		not included	$0
Cat Replacement, Ammonia Reagent, and Loss of Power from Backpressure		EPA Combustion Turbine NOx Technology Memo (jan 2022)	$300,000
Total Direct Annual Costs			$343,116
Indirect Annual Costs			
Overhead	60% of operating and maintenance	OAQPS	$25,869
Administrative	2% PEC	OAQPS	$124,000
Insurance	1% PEC	OAQPS	$62,000
Property Tax	1% PEC	OAQPS	$62,000
Capital Recovery	"0.13 x PEC		
(10% int. rate, 15 yr. period)"	OAQPS	$806,000	
Total Indirect Annual Costs			$1,079,869
Total Annual Costs	Annualized capital + Direct Annual + Indirect Annual		**$2,785,635**

** Per power consultant (Former SCR designer for John Zinc), cost to retrofit is highly variable, ranging from $100 to $850 per kW. Large range because cost is highly dependent upon on how much equipment needs to be moved. Most units in valley are cogeneration units which would require equipment to be reconfigured. Thus, $475/kw average cost was chosen for the average retrofit.*

Cost Effectiveness Results

Type of Installation	Power Rating MW	Heat Input Rate MMBtu/hr	Current NOx Emission Factor (ppmvd @ 15% O2)	Potential NOx Emission Factor (ppmvd @ 15% O2)	NOx Reduction (tons/yr)	Total Annual Cost ($)	Cost Effectiveness ($/ton)
Retrofit - Combined Cycle	90	1,100	5	2	19.74	$2,785,635	**$141,116.26**

As demonstrated above, the District determined that the cost of achieving these lower NOx limits would be infeasible, with cost effectiveness ranging from $141,116.26/ton - $770,965.59/ton, depending on the specifications of the unit. As such, it is not cost-effective to reduce the limits of Rule 4703 to limits as low as 2 ppmvd NOx @ 15% O2 for combined-cycle gas turbines and 2.5 ppmvd NOx @ 15% O2 for simple cycle gas turbines.

Contingency Measure Evaluation

As discussed in Chapter 6, contingency measures are immediately implemented ONLY if triggered by an unanticipated milestone or attainment failure. The District reviewed this control measure for a potential contingency component. The District concludes that this control measure is not an appropriate contingency measure because the most stringent feasible controls are already in place, and a contingency trigger is incompatible with the technologies involved in reducing emissions from this category.

Evaluation Findings

Rule 4703 meets or exceeds federal RACT requirements for this source category based upon evaluation of applicable federal regulations, state standards, and other air districts' rules. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

C.59 RULE 4902 RESIDENTIAL WATER HEATERS

Emissions Inventory (Summer Average – Tons per day)

	2017	2023	2026	2029	2032	2035	2037
NOx	1.32	1.19	1.17	1.18	1.19	1.19	1.18
VOC	0.14	0.15	0.15	0.15	0.15	0.15	0.15

District Rule 4902 Description

Adopted July 17, 1993, District Rule 4902 is a point-of-sale rule that limits NOx emissions from natural gas-fired residential water heaters with heat input rates less than or equal to 75,000 Btu/hr. The original rule enforced a NOx emissions limit of 40 nanograms of NOx per Joule of heat output (ng/J). Amendments in March 2009 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, or tankless, water heaters. EPA finalized approval of Rule 4902 on May 5, 2010.[292]

As a point-of-sale rule, Rule 4902 affects water heater manufacturers, plumbing wholesalers, retail home supply stores, plumbers and contractors, and homeowners. This source category encompasses several types of water heaters, including conventional storage water heaters, demand water heaters, heat pump water heaters, solar water heaters, and tankless coil and indirect water heaters. Water heater options also vary by fuel type, which includes electricity, fuel oil, geothermal energy, natural gas, propane, and solar energy.

Conventional storage water heaters are the most common. They have an insulated tank sized from 20 to 80 gallons and natural gas fired units have a gas burner under the tank regulated by a thermostat. Demand water heaters, also known as instantaneous or tankless water heaters, heat water as it is required and do not use a storage tank. As soon as there is a demand for hot water, a gas burner heats cold water as it travels through a pipe in the unit. Natural gas-fired units generally provide hot water at a rate upwards of 5 gallons per minute.

A tankless coil water heater heats water flowing through a heat exchanger installed in a furnace or boiler. Similar to the tankless coil water heater, an indirect water heater uses a furnace or boiler. Fluid heated by the furnace or boiler circulates through a heat exchanger in a storage tank.

Manufacturers have focused on combustion modifications to meet the lower NOx limit, as required in other California air districts. Combustion modification systems reduce thermal NOx formation by changing the flame characteristics to reduce peak flame

[292] EPA. *Revisions to the California State Implementation Plan, San Joaquin Valley Unified Air Pollution Control District;* Final Rule. 75 Fed. Reg. 86, pp. 24408 – 24409. (2010, May 5), (to be codified at 40 CFR 52) retrieved from: http://www.gpo.gov/fdsys/pkg/FR-2010-05-05/pdf/2010-10404.pdf

temperature. Different burner designs, such as low NOx and ultra-low NOx burners, achieve combustion modification for residential water heaters. Some of the design principles used in low NOx and ultra-low NOx burners include staged air burners, staged fuel burners, pre-mix burners, internal recirculation, and radiant burners.

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

Federal Regulations

There are no Control Techniques Guidelines, Alternative Control Techniques, or New Source Performance Standards applicable to this source category.

State Regulations

There are no state regulations applicable to this source category.

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

District staff compared emission limits, optional control requirements, and work practice standards in District Rule 4902 to comparable requirements in rules from the following California nonattainment areas:

- Bay Area AQMD Regulation 9, Rule 6 (Amended November 7, 2007)[293]
- Sacramento Metropolitan AQMD Rule 414 (Amended October 25, 2018)[294]
- San Diego County APCD Rule 69.5.1 (Adopted June 24, 2015)[295]
- South Coast AQMD Rule 1121 (Amended September 3, 2004)[296]
- Ventura County APCD Rule 74.11 (Amended January 12, 2010)[297]

The District reviewed the rule requirements implemented prior to EPA's approval of the *2014 RACT SIP* and found that Rule 4902 continues to implement RACT levels of control. The below comparison tables demonstrate that, for more recently amended rules, District Rule 4902 continues to meet RACT.

[293] BAAQMD. *Regulation 9, Rule 6 (Nitrogen Oxides Emissions from Natural Gas-Fired Boilers and Water Heaters).* (Amended November 7, 2007). Retrieved from: https://www.baaqmd.gov/~/media/dotgov/files/rules/reg-9-rule-6-nitrogen-oxides-emissions-from-natural-gasfired-water-heaters/documents/rg0906.pdf?la=en&rev=70876e62c74040df8c646077d00d3c86

[294] SMAQMD. *Rule 414 (Water Heaters, Boilers and Process Heaters Rated Less than 1,000,000 BTU Per Hour).* (Amended October 25, 2018). Retrieved from: http://www.airquality.org/ProgramCoordination/Documents/rule414.pdf

[295] SBAPCD. *Rule 69.5.1 (Natual Gas-Fired Water Heaters). (Adopted June 24, 2015).* Retrieved from: https://www.sdapcd.org/content/dam/sdapcd/documents/rules/current-rules/Rule-69.5.1.pdf

[296] SCAQMD. *Rule 1121 (Control of Nitrogen Oxides from Residential Type, Natural Gas-Fired Water Heaters).* (Amended September 3, 2004). Retrieved from: http://www.aqmd.gov/docs/default-source/rule-book/reg-xi/rule-1121.pdf?sfvrsn=4

[297] VCAPCD. *Rule 74.11 (Natural Gas-Fired Water Heaters).* (Revised January 12, 2010). Retrieved from: http://www.vcapcd.org/Rulebook/Reg4/RULE%2074.11.pdf

Sacramento Metropolitan AQMD

- SMAQMD Rule 414 (Water Heaters, Boilers and Process Heaters Rated Less than 1,000,000 BTU Per Hour)

	SJVAPCD Rule 4902	SMAQMD Rule 414
Applicability	Manufacturers, distributors, retailers, and installers of PUC quality natural gas-fired residential water heaters with heat input rates ≤ 75,000 Btu/hr	Any person who manufactures, distributes, offers for sale, sells, or installs any type of water heater (such as tank or tankless/instantaneous), boiler or process heater, with a rated heat input capacity < 1,000,000 Btu/hr, fired with gaseous or nongaseous fuels, for use in this District.
Exemptions	• PUC quality natural gas fired water heaters with rated heat input of > 75,000 Btu/hr • Water heaters using fuels other than PUC quality natural gas • Water heaters used exclusively in recreational vehicles	• Water heaters used in recreational vehicles • Pool/spa heaters with a heat input rating of less than 75,000 Btu/hr • Water heaters, boilers and process heaters fired with liquefied petroleum gas • Hot water pressure washers fired with gaseous or liquid fuels

Requirements	No person shall manufacture for sale, distribute, sell, offer for sale, or install within the District any PUC quality natural gas-fired:
	• Mobile home water heater unless it is certified to a NOx emission level of ≤ 40 ng/J
	• Pool heater unless it is certified to a NOx emission level of ≤ 40 ng/J.
	• Water heater, excluding mobile home water heaters, instantaneous water heaters, and pool heaters, unless it is certified to a NOx emission level of ≤ 10 ng/J.
	• Instantaneous water heater unless it is certified to a NOx emission level of ≤ 14 ng/J.
		A person shall only distribute, offer for sale, sell, or install within the SMAQMD a water heater, boiler or process heater with certified NOx and CO emissions ≤ the following limits:
		• < 75,000 Btu/hr:
		  ○ Mobile home: 40 ng/J
		  ○ All others: 10 ng/J
		• 75,000 - <400,000 Btu/hr:
		  ○ Pool/Spa: 40 ng/J
		  ○ All others: 14 ng/J
		• 400,000 to <1 million Btu/hr:
		  ○ All types: 14 ng/J NOx and 400 ppmv CO @ 3% O2

The District evaluated the requirements contained within SMAQMD Rule 414 and found no requirements that were more stringent than those already in District Rule 4902. Requirements for units with a rating greater than 75,000 Btu/hr but less than 2,000,000 Btu/hr are included under District Rule 4308 and have at least as stringent or more stringent limits than those in SMAQMD Rule 414.

San Diego County APCD

- SDAPCD Rule 69.5.1 (Natural Gas-Fired Water Heaters)

	SJVAPCD Rule 4902	SDAPCD Rule 69.5.1
Applicability	Manufacturers, distributors, retailers, and installers of PUC quality natural	Manufacturers, distributors, retailers, and installers of natural gas-fired water

	SJVAPCD Rule 4902	SDAPCD Rule 69.5.1
	gas-fired residential water heaters with heat input rates ≤ 75,000 Btu/hr	heaters, with heat input rates < 75,000 Btu/hr
Exemptions	• PUC quality natural gas fired water heaters with rated heat input of > 75,000 Btu/hr • Water heaters using fuels other than PUC quality natural gas • Water heaters used exclusively in recreational vehicles	• Water heaters with a rated heat input capacity of ≥75,000 Btu/hr • Water heaters used in recreational vehicles • Water heaters used exclusively to heat swimming pools and hot tubs • Water heaters using fuels other than natural gas • Instantaneous water heaters • Existing or relocated water heaters
Requirements	No person shall manufacture for sale, distribute, sell, offer for sale, or install within the District any PUC quality natural gas-fired: • Mobile home water heater unless it is certified to a NOx emission level of ≤ 40 ng/J • Pool heater unless it is certified to a NOx emission level of ≤ 40 ng/J. • Water heater, excluding mobile home water heaters, instantaneous water heaters, and pool heaters, unless it is certified to a NOx emission level of ≤ 10 ng/J. • Instantaneous water heater unless it is certified to a NOx emission level of ≤ 14 ng/J.	• No person shall manufacture for sale, distribute, sell, offer for sale, or install within SDAPCD any gas-fired water heaters unless it is certified to a NOx emission level of ≤ 10 ng/J; or 15 ppmv at 3% O2, dry • No person shall manufacture for sale, distribute, sell, offer for sale, or install within SDAPCD any gas-fired mobile home water heater unless it is certified to a NOx emission level of ≤ 40 ng/J; or 55 ppmv at 3% O2, dry

The District evaluated the requirements contained within SDAPCD Rule 69.5.1 and found no requirements that were more stringent than those already in District Rule 4902.

Potential Emission Reduction Opportunities

As part of the 2022 State SIP Strategy[298] CARB committed to adopting a zero-emission standard for space and water heaters. The primary goal of this measure is to reduce emissions from space and water heaters installed in new and existing residential and commercial buildings. Beginning in 2030, 100 percent of sales of new residential water heaters would need to comply with the emission standard. CARB would design any such standard in collaboration with energy and building code regulators, and with air districts, to ensure it was consistent with all state and local efforts, working carefully with communities to consider any housing cost or affordability impacts. CARB expects that this regulation would rely heavily on heat pump technologies currently sold to electrify new and existing homes.

[298] CARB. 2022 State Strategy for the State Implementation Plan. https://ww2.arb.ca.gov/resources/documents/2022-state-strategy-state-implementation-plan-2022-state-sip-strategy

In regards to including electrification requirements for new buildings and appliance replacements in existing buildings, it is notable that, to date, no other region has adopted a SIP-approved heater or furnace electrification measure. At this time, electrification requirements are beyond RACT and not cost effective for sources subject to Rule 4902. Statewide action is critical for supporting the advancement and wide-scale deployment of zero-emission technologies. The District will continue to closely track the development of new zero-emissions technologies and control measures adopted by CARB for this source category. Additionally, the District will conduct a further study in an effort to identify potential emission reduction opportunities from residential water heaters, as discussed in more detail in Chapter 3.

Contingency Measure Evaluation

As discussed in Chapter 6, contingency measures are immediately implemented ONLY if triggered by an unanticipated milestone or attainment failure. The District reviewed this control measure for a potential contingency component. The District concludes that this control measure is not an appropriate contingency measure because the most stringent feasible controls are already in place, and a contingency trigger is incompatible with the technologies involved in reducing emissions from this category.

Evaluation Findings

Rule 4902 meets or exceeds federal RACT requirements for this source category based upon evaluation of applicable federal regulations, state standards, and other air districts' rules. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

C.60 RULE 4905 NATURAL GAS-FIRED, FAN-TYPE CENTRAL FURNACES

Emissions Inventory (Summer Average – Tons per day)

	2017	2023	2026	2029	2032	2035	2037
NOx	3.45	3.02	2.75	2.50	2.23	1.96	1.87
VOC	0.27	0.28	0.28	0.28	0.28	0.28	0.28

District Rule 4905 Description

District 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 central furnaces for use in 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. Adopted on October 20, 2005, Rule 4905 established NOx limits for residential central furnaces supplied, sold, or installed in the Valley. January 2015 amendments lowered the NOx emission limit for residential units from 40 ng/J (0.093 lb/MMBtu) to 14 ng/J, and expanded rule applicability to include commercial units with a NOx emission limit of 14 ng/J and units installed in manufactured homes with a NOx emission limit of 40 ng/J to be lowered to 14 ng/J in 2018. The amendments allowed for the sale of non-compliant units during an initial 36-month implementation period in exchange for the payment of an emissions fee for each non-compliant unit sold, distributed, or installed in the Valley. EPA approved these amendments into the SIP effective April 28, 2016.[299]

The District has subsequently amended District Rule 4905 several times to extend the implementation period for certain unit types as a response to the limited number of certified compliant units available by the compliance deadline dates. This allowed additional time necessary to continue technology development and the certification process, while providing strong incentive for accelerated deployment of compliant units. Manufacturers have been successful in meeting the compliance deadlines and developing furnace technologies that meet the 14 ng/J NOx limit for all unit types except manufactured home furnaces, which have a compliance deadline of September 30, 2023.

The most common type of heating system for residential and commercial buildings are furnaces fueled by natural gas that use forced air distribution. A thermostat controls the central furnace, which sends a signal to turn the unit on or off when the building temperature does not match a chosen set point. A valve then opens to send natural gas to the burners, which combusts the gas directly into the heat exchangers. A blower pulls air from inside the building through a filter, across the heat exchanger, and through

[299] EPA. *Approval of California Air Plan Revisions, San Joaquin Valley Unified Air Pollution Control District and South Coast Air Quality Management District. Final Rule*. 81 Fed. Reg. 17390. (2016, March 29). (to be codified at 40 CFR Part 52). https://www.gpo.gov/fdsys/pkg/FR-2016-03-29/pdf/2016-06962.pdf

a series of ducts and vents to different areas of the building. Exhaust from the combustion exits the building through a separate duct.

Condensing units use an additional heat exchanger to extract the latent heat in the flue (exhaust) gas by cooling the combustion gasses to near ambient temperature and thereby increase the heating efficiency by up to 10%. The water vapor in the flue gas is condensed, collected, and drained.

Units installed in manufactured homes use the same types of materials and operating principles as commercial and residential units; however, significant differences exist. Furnaces installed in manufactured homes use sealed combustion, pre-heat the air typically to 50-60°F, use a concentric vent, and exhaust gases are vented through the inside core of the vent pipe. Furnaces installed in manufactured homes also have to comply with strict space restrictions.[300]

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

Federal Regulations

There are no Control Techniques Guidelines, Alternative Control Techniques, or New Source Performance Standards applicable to this source category.

State Regulations

There are no state regulations applicable to this source category.

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

District staff compared emission limits, optional control requirements, and work practice standards in District Rule 4905 to comparable requirements in rules from the following California nonattainment areas:

- Bay Area AQMD Regulation 9, Rule 4 (Amended December 7, 1983)[301]
- South Coast AQMD Rule 1111 (Amended October 1, 2021)[302]
- Ventura County APCD Rule 74.22 (Adopted November 9, 1993)[303]

[300] U.S. Department of Energy. (2014, July 7). *Energy Conservation Program for Consumer Products: Energy Conservation Standards for Residential Furnace Fans.* Retrieved 9/23/14 from: https://www.federalregister.gov/articles/2014/07/03/2014-15387/energy-conservation-program-for-consumer-products-energy-conservation-standards-for-residential.

[301] BAAQMD. *Regulation 9, Rule 4 (Nitrogen Oxides from Fan Type Residential Central Furnaces).* (Amended December 7, 1983). Retrieved from: https://www.baaqmd.gov/~/media/dotgov/files/rules/reg-9-rule-4-nitrogen-oxides-from-fan-type-residential-central-furnaces/documents/rg0904.pdf?la=en&rev=e67bf6e164d94de39b44caa30ce17fd7

[302] SCAQMD. *Rule 1111 (Reduction of NOx Emissions from Natural-Gas-Fired, Fan-Type Central Furnaces).* (Amended October 1, 2021). Retrieved from: http://www.aqmd.gov/docs/default-source/rule-book/reg-xi/rule-1111.pdf?sfvrsn=4

[303] VCAPCD. *Rule 74.22 (Natural Gas-Fired, Fan-Type Central Furnaces).* (Amended November 9, 1993). Retrieved from: http://www.vcapcd.org/Rulebook/Reg4/RULE%2074.22.pdf

Sacramento Metropolitan AQMD does not have an analogous rule for this source category. The District reviewed the rule requirements implemented prior to EPA's approval of the *2014 RACT SIP*, and found that Rule 4905 continues to implement RACT levels of control. The below comparison table demonstrates that, for the more recently amended rule, District Rule 4905 continues to meet RACT.

South Coast AQMD

- SCAQMD Rule 1111 (Reduction of NOx Emissions from Natural-Gas-Fired, Fan-Type Central Furnaces)

	SJVAPCD Rule 4905	SCAQMD Rule 1111
Applicability	Residential and commercial furnaces with rated heat input capacity of < 175,000 btu/hr or < 65,000 btu/hr for combination heating and cooling units	Residential and commercial furnaces with rated heat input capacity of < 175,000 btu/hr or < 65,000 btu/hr for combination heating and cooling units
Exemptions	Natural gas furnace not exceeding NOx emissions of 40 ng/J and installed with propane conversion kit for propane firing only	• Furnaces installed in mobile homes before October 1, 2012 • Natural gas furnace installed with propane conversion kit for propane firing only • Downflow and large-sized (≥100,000 btu/hr) condensing and noncondensing furnaces, replacing existing furnaces in the high-altitude areas
Requirements	Furnaces must not exceed NOx limit of 14 ng/J	Furnaces must not exceed NOx limit of 14 ng/J

The District evaluated the requirements contained within SCAQMD Rule 1111 and found no requirements that were more stringent than those already in District Rule 4905.

Potential Emission Reduction Opportunities

As part of the 2022 State SIP Strategy[304] CARB committed to adopting a zero-emission standard for space and water heaters. The primary goal of this measure is to reduce emissions from space and water heaters installed in new and existing residential and commercial buildings. Beginning in 2030, 100 percent of sales of new furnaces would need to comply with the emission standard. CARB would design any such standard in collaboration with energy and building code regulators, and with air districts, to ensure it was consistent with all state and local efforts, working carefully with communities to consider any housing cost or affordability impacts. CARB expects that this regulation would rely heavily on heat pump technologies currently sold to electrify new and existing homes.

[304] CARB. 2022 State Strategy for the State Implementation Plan. https://ww2.arb.ca.gov/resources/documents/2022-state-strategy-state-implementation-plan-2022-state-sip-strategy

In regards to including electrification requirements for new buildings and appliance replacements in existing buildings, it is notable that, to date, no other region has adopted a SIP-approved heater or furnace electrification measure. At this time, electrification requirements are beyond RACT and not cost effective for sources subject to Rule 4905. Statewide action is critical for supporting the advancement and wide-scale deployment of zero-emission technologies. The District will continue to closely track the development of new zero-emissions technologies and control measures adopted by CARB for this source category. Additionally, the District will conduct a further study in an effort to identify potential emission reduction opportunities from furnaces, as discussed in more detail in Chapter 3.

Contingency Measure Evaluation

As discussed in Chapter 6, contingency measures are immediately implemented ONLY if triggered by an unanticipated milestone or attainment failure. The District reviewed this control measure for a potential contingency component. The District concludes that this control measure is not an appropriate contingency measure because the most stringent feasible controls are already in place, and a contingency trigger is incompatible with the technologies involved in reducing emissions from this category.

Evaluation Findings

Rule 4905 meets or exceeds federal RACT requirements for this source category based upon evaluation of applicable federal regulations, state standards, and other air districts' rules. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

C.61 EMISSION INVENTORY CODES

The following are the emission inventory codes used for the allocation of emissions as presented in this attainment plan.

Table C-13 Emission Inventory Codes

Control Measure	Emission Inventory Codes
Rule 4103 (Open Burning)	670-660-0262-9842; 670-660-0262-9862; 670-660-0262-9874; 670-660-0262-9884; 670-660-0262-9888; 670-660-0262-9892; 670-662-0262-9878; 670-668-0200-9858; 670-668-0200-9872; 670-668-0200-9886; 670-995-0240-9848
Rule 4106 (Prescribed Burns)	670-666-0200-0000; 670-670-0200-0000
Rule 4301 (Fuel Burning Equipment)	None
Rule 4302 (Incinerator Burning)	130-130-0110-0000; 130-130-0130-0000; 130-130-0240-0000; 130-130-0266-0000; 130-130-0324-0000; 130-130-1500-0000
Rule 4306/Rule 4320 (Advanced Emission Reduction Options for Boilers, Steam Generators, and Process Heaters Greater than 5.0 Mmbtu/Hr)	010-005-0110-0000; 010-005-0124-0000; 010-005-0130-0000; 010-005-0300-0000; 010-005-1220-0000; 010-005-1530-0000; 010-010-0110-0000; 020-005-0110-0000; 030-005-0110-0000; 030-005-0124-0000; 030-005-0130-0000; 030-005-1220-0000; 030-005-1530-0000; 030-010-0100-0000; 030-010-0110-0000; 030-010-0130-0000; 030-010-1220-0000; 030-010-1500-0000; 030-010-1600-0000; 030-015-0110-0000; 030-015-0130-0000; 040-005-0110-0000; 040-005-0124-0000; 040-005-0130-0000; 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; 050-005-0300-0000; 050-005-0320-0000; 050-005-1100-0000; 050-005-1220-0000; 050-005-1510-0000; 050-005-1520-0000; 050-005-1530-0000; 050-005-3220-0000; 050-010-0110-0000; 050-010-0120-0000; 050-010-0130-0000; 050-010-0320-0000; 050-010-1220-0000; 050-010-1224-0000; 050-010-1500-0000; 052-005-0110-0000; 052-005-0122-0000; 052-005-0124-0000; 052-005-0130-0000; 052-005-1100-0000; 052-005-1220-0000; 052-005-1510-0000; 052-005-1520-0000; 052-005-1530-0000; 052-010-0110-0000; 052-010-0120-0000; 052-010-1224-0000; 052-010-1500-0000; 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; 060-005-1530-0000; 060-010-0100-0000; 060-010-0110-0000; 060-010-0120-0000; 060-010-0130-0000; 060-010-0142-0000; 060-010-1220-0000; 060-010-1500-0000; 099-010-0120-0000 The EICs are the same for Rules 4306/4320, 4307, and 4308; the three rules share a combined emission inventory.
Rule 4307 (Boilers, Steam Generators and Process Heaters 2 – 5 MMBtu/hr)	The EICs are the same for Rules 4306/4320, 4307, and 4308; the three rules share a combined emission inventory.
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.

Control Measure	Emission Inventory Codes
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)	110-132-0110-0000; 110-132-0130-0000; 110-132-0136-0000; 110-132-0146-0000; 120-132-0136-0000; 130-132-0110-0000; 130-132-0130-0000; 130-132-0136-0000; 310-320-0010-0000; 310-320-0110-0000; 310-320-0120-0000; 310-320-0130-0000; 310-320-0136-0000; 310-320-1600-0000; 320-320-0010-0000; 320-320-0110-0000; 320-320-0120-0000; 320-320-0130-0000; 330-320-0010-0000
Rule 4313 (Lime Kilns)	Lime kilns are not included in the CARB emissions inventory. There are no lime kilns currently operating in the Valley.
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; 010-005-0254-0000; 020-005-0214-0000; 020-005-0218-0000; 020-005-0220-0000; 020-005-0230-0000; 030-005-0214-0000; 050-005-0214-0000; 050-005-0240-0000; 050-005-0254-0000; 052-005-0212-0000; 052-005-0240-0000; 052-005-0254-0000; 060-005-0240-0000; 060-005-0243-0000; 060-005-0250-0000; 060-005-0264-0000
Rule 4354 (Glass Melting Furnaces)	410-403-5018-0012; 460-460-7037-0000; 460-460-7039-0000;
Rule 4401 (Steam-Enhanced Crude Oil Production Wells)	The emissions from this source category are accounted for in Rule 4409.
Rule 4402 (Crude Oil Production Sumps)	310-300-1600-0000; 310-301-1600-0000
Rule 4404 (Heavy Oil Test Station - Kern County)	The emissions from this source category are accounted for in Rule 4409.
Rule 4407 (In-Situ Combustion Well Vents)	The emissions from this source category are accounted for in Rule 4409.
Rule 4408 (Glycol Dehydration Systems)	The emissions from this source category are accounted for in Rule 4409.
Rule 4409 (Components at Light Crude Oil Production Facilities, Natural Gas Production Facilities, and Natural Gas Processing Facilities)	310-302-0100-0000; 310-302-0110-0000; 310-302-1600-0000; 310-303-0100-0000; 310-303-1600-0000; 310-304-0100-0000; 310-304-0110-0000; 310-304-1600-0000; 310-306-1600-0000; 310-308-1600-0000; 310-308-0110-0000; 310-310-0110-0000; 310-310-1600-0000; 310-316-0100-0000; 310-316-0110-0000; 310-316-1600-0000; 310-352-0100-0000; 310-356-0110-0000; 330-302-1600-0000; 330-304-1600-0000; 330-306-1600-0000
Rule 4453 (Refinery Vacuum Producing Devices or Systems)	The emissions from this source category are accounted for in Rule 4409.
Rule 4454 (Refinery Process Unit Turnaround)	The emissions from this source category are accounted for in Rule 4409.
Rule 4455 (Components at Petroleum Refineries, Gas Liquids Processing Facilities, and Chemical Plants)	320-302-0010-0000; 320-304-0010-0000; 320-306-0010-0000; 320-316-0010-0000
Rule 4565 (Biosolids, Animal Manure, and Poultry Litter Operations)	199-170-0240-0000; 199-170-0260-0000; 199-995-0260-0000; The EICs are the same for Rules 4565 and 4566; the two rules share a combined emission inventory.
Rule 4566 (Organic Material Composting Operations)	The EICs are the same for Rules 4565 and 4566; the two rules share a combined emission inventory.

Control Measure	Emission Inventory Codes
Rule 4570 (Confined Animal Facilities)	620-618-0262-0101; 620-618-0262-0102; 620-618-0262-0103; 620-618-0262-0104; 620-618-0262-0105; 620-618-0262-0106; 620-618-0262-0107; 620-618-0262-0108; 620-618-0262-0109; 620-618-0262-0110; 620-618-0263-0000
Rule 4601 (Architectural Coatings)	520-520-91XX-0000; 520-520-92XX-0000
Rule 4602 (Motor Vehicle Assembly Coatings)	The emissions from this source category are accounted for in Rule 4612.
Rule 4603 (Surface Coating of Metal Parts and Products, Plastic Parts and Products, and Pleasure Crafts)	230-220-9000-0000; 230-220-9020-0000; 230-220-9040-0000; 230-220-9052-0000; 230-220-9100-0000; 230-226-9000-0000; 230-226-9054-0000; 230-226-9100-0000; 230-226-9200-0000; 230-230-9000-0000; 230-230-9020-0000; 230-230-9040-0000; 230-230-9050-0000; 230-230-9052-0000; 230-230-9054-0000; 230-230-9100-0000; 230-230-9120-0000; 230-230-9200-0000; 230-236-9000-0000; 230-236-9020-0000; 230-236-9100-0000
Rule 4604 (Can and Coil Coating Operations)	230-228-9000-0000; 230-228-9020-0000; 230-228-9052-0000; 230-228-9054-0000; 230-228-9057-0000; 230-228-9100-0000; 230-228-9200-0000
Rule 4605 (Aerospace Assembly and Component Coating Operations)	230-238-9000-0000, 230-238-9020-0000; 230-238-9100-0000, 230-238-9200-0000
Rule 4606 (Wood Products and Flat Wood Paneling Products Coating Operations)	230-232-9000-0000; 230-232-9020-0000; 230-232-9040-0000; 230-232-9052-0000; 230-232-9054-0000; 230-232-9100-0000; 230-232-9200-0000; 230-234-9000-0000; 230-234-9010-0000; 230-234-9040-0000; 230-234-9050-0000
Rule 4607 (Graphic Arts and Paper, Film, Foil, and Fabric Coatings)	230-222-9000-0000; 230-222-9040-0000; 230-222-9100-0000; 230-224-9000-0000; 230-224-9200-0000; 240-240-3202-0000; 240-240-3314-0000; 240-240-8302-0000; 240-260-8400-0000; 240-262-8400-0000; 240-264-8000-0000; 240-264-8400-0000; 240-266-8350-0000; 240-266-8400-0000; 240-268-8400-0000; 240-995-8000-0000; 240-995-8400-0000
Rule 4610 (Glass Coating Operations)	The emissions from this source category are accounted for in Rule 4354.
Rule 4612 (Motor Vehicle and Mobile Equipment Coating Operations)	230-218-9000-0000; 230-218-9010-0000; 230-218-9020-0000; 230-218-9040-0000; 230-218-9050-0000; 230-218-9052-0000; 230-218-9054-0000; 230-218-9100-0000; 230-218-9200-0000
Rule 4621 (Gasoline Transfer into Stationary Storage Containers, Delivery Vessels, and Bulk Plants)	330-330-1000-0000; 330-330-1110-0000; 330-374-1100-0000; 330-376-1100-0000; 330-382-1100-0000; 330-382-1110-0000; 330-382-1120-0000; 330-384-1100-0000; 330-384-1110-0000; 330-384-1120-0000; 330-390-0010-0000; 330-390-1100-0000; 330-390-1400-0000; 330-395-1100-0000; 330-396-1100-0000; 330-397-1100-0000
Rule 4622 (Gasoline Transfer into Motor Vehicle Fuel Tanks)	330-378-1100-0000; 330-380-1100-0000

Control Measure	Emission Inventory Codes
Rule 4623 (Storage of Organic Liquids)	310-322-1600-0000; 310-324-1100-0000; 310-324-1600-0000; 310-325-0100-0000; 310-326-1000-0000; 310-326-1420-0000; 310-326-1600-0000; 310-326-1610-0000; 310-326-2000-0000; 310-326-2026-0000; 310-326-3220-0000; 310-326-4998-0000; 310-328-1000-0000; 310-328-1110-0000; 310-328-1130-0000; 310-328-1420-0000; 310-328-1600-0000; 310-328-1610-0000 310-328-2000-0000; 310-328-2026-0000; 310-328-3000-0000; 310-328-3033-0000; 310-328-3156-0000; 310-328-3174-0000; 310-328-3220-0000; 310-328-4998-0000; 310-995-1600-0000; 320-322-1000-0000; 320-322-1130-0000; 320-322-1214-0000; 320-322-1420-0000; 320-322-1600-0000; 320-322-1610-0000; 320-324-1000-0000; 320-324-1100-0000; 320-324-1110-0000; 320-324-1224-0000; 320-326-1000-0000; 320-326-1214-0000; 320-326-1410-0000; 320-326-1610-0000; 320-328-1000-0000; 320-328-1110-0000; 320-328-1214-0000; 320-328-1410-0000; 320-328-1610-0000; 330-326-1110-0000; 330-326-1420-0000; 330-328-1000-0000; 330-328-1110-0000; 330-328-1600-0000; 330-328-1610-0000; 430-328-7006-0000
Rule 4624 (Transfer of Organic Liquid)	330-302-0010-0000; 330-304-0010-0000; 330-316-0010-0000; 330-318-0110-0000; 330-308-0110-0000; 330-316-0010-0000; 330-316-1600-0000; 330-332-1000-0000; 330-338-0010-0000; 330-382-1130-0000; 330-384-1130-0000; 330-995-1100-0000; 330-995-0010-0000; 330-995-0110-0000
Rule 4625 (Wastewater Separators)	320-340-0010-0000
Rule 4641 (Cutback, Slow Cure, and Emulsified Asphalt, Paving and Maintenance Operations)	540-560-0400-0000; 540-562-0400-0000; 540-564-0400-0000; 540-566-0400-0000
Rule 4642 (Solid Waste Disposal Sites)	120-120-0240-0000; 120-122-0242-0000
Rule 4651 (Soil Decontamination Operations)	140-995-0010-0000; 140-995-0110-0000; 140-995-0120-0000; 140-995-0240-0000
Rule 4652 (Coatings and Ink Manufacturing)	410-995-8400-0000; 410-407-9000-0000
Rule 4653 (Adhesives and Sealants)	250-292-8200-0000; 250-292-8202-0000; 250-292-8250-0000
Rule 4661 (Organic Solvents)	The emissions from this source category are accounted for in Rules 4662 and 4663.
Rule 4662 (Organic Solvent Degreasing Operations)	220-204-0500-0000; 220-204-3008-0000; 220-204-3022-0000; 220-204-3083-0000; 220-204-3176-0000; 220-204-3204-0000; 220-204-3246-0000; 220-204-3333-0000; 220-204-3339-0000; 220-204-3344-0000; 220-204-8104-0000; 220-204-8106-0000; 220-206-3083-0000; 220-206-3107-0000; 220-206-3246-0000; 220-206-3300-0000; 220-206-3301-0000; 220-206-3328-0000; 220-206-3344-0000; 220-206-3346-0000; 220-206-8106-0000

Control Measure	Emission Inventory Codes
Rule 4663 (Organic Solvent Cleaning, Storage, and Disposal)	220-208-0500-0000; 220-208-3022-0000; 220-208-3083-0000; 220-208-3176-0000; 220-208-3204-0000; 220-208-3246-0000; 220-208-3333-0000; 220-208-3339-0000; 220-208-3344-0000; 220-208-3346-0000; 220-208-8104-0000; 220-208-8106-0000; 230-216-8350-0000; 230-240-0500-0000; 230-240-3008-0000; 230-240-3060-0000; 230-240-3202-0000; 230-240-3232-0000; 230-240-3252-0000; 230-240-3372-0000; 230-240-8300-0000; 230-240-8302-0000; 230-240-8350
Rule 4672 (Petroleum Solvent Dry Cleaning Operations)	210-200-3300-0000; 210-200-3328-0000; 210-200-8000-0000; 210-200-8100-0000; 210-200-8150-0000
Rule 4681 (Rubber Tire Manufacturing)	410-402-0248-0000
Rule 4682 (Polystyrene, Polyethylene, and Polypropylene Products Manufacturing)	410-404-5034-0000; 410-404-5036-0000; 410-404-5038-0000; 410-404-5044-0000; 410-404-5046-0000
Rule 4684 (Polyester Resin Operations)	410-403-5018-0000; 410-404-5016-0000; 410-404-5028-0000; 410-404-5030-0000
Rule 4691 (Vegetable Oil Processing Operations)	420-420-6030-0000
Rule 4692 (Commercial Charbroiling)	690-680-6000-0000
Rule 4693 (Bakery Ovens)	420-412-6012-0000; 420-412-6037-0000
Rule 4694 (Wine Fermentation and Storage Tanks)	420-408-6090-0000
Rule 4695 (Brandy Aging and Wine Aging Operations)	420-410-6090-0000
Rule 4702 (Internal Combustion Engines)	010-040-0110-0000; 010-040-0142-0000; 010-040-1100-0000; 010-040-1200-0000; 020-040-0110-0000; 020-040-1200-0000; 030-040-0110-0000; 030-040-0124-0000; 030-040-0130-0000; 030-040-1100-0000; 030-040-1200-0000; 030-040-1210-0000; 030-040-1600-0000; 040-040-0110-0000; 050-040-0012-0000; 050-040-0110-0000; 050-040-0120-0000; 050-040-0122-0000; 050-040-0124-0000; 050-040-0146-0000; 050-040-1100-0000; 050-040-1200-0000; 050-040-1210-0000; 050-040-1299-0000; 050-040-3220-0000; 052-040-0110-0000; 052-040-0124-0000; 052-040-0146-0000; 052-040-1100-0000; 052-040-1200-0000; 052-042-0110-0000; 052-042-1200-0000; 052-042-1200-0010; 052-042-1200-0011; 060-040-0012-0000; 060-040-0110-0000; 060-040-0120-0000; 060-040-0124-0000; 060-040-0130-0000; 060-040-0142-0000; 060-040-0146-0000; 060-040-1100-0000; 060-040-1200-0000; 060-040-1210-0000; 060-995-1220-0000; 099-040-0136-0000; 099-040-1200-0000
Rule 4703 (Stationary Gas Turbines)	010-045-0110-0000; 010-045-0112-0000; 010-045-1200-0000; 020-045-0110-0000; 020-045-1200-0000; 030-045-0110-0000; 030-045-0130-0000; 030-045-1200-0000; 040-045-0134-0000; 040-045-1412-0000; 050-045-0110-0000; 050-045-1200-0000; 050-045-1299-0000; 052-045-0110-0000; 052-045-0146-0000; 052-045-1200-0000; 060-045-0012-0000; 060-045-0110-0000; 060-045-0146-0000; 060-045-1200-0000; 060-045-1400-0000; 060-045-1412-0000; 060-045-1420-0000; 060-045-1450-0000

Control Measure	Emission Inventory Codes
Rule 4902 (Residential Water Heaters)	610-608-0110-0000
Rule 4905 (Natural Gas – Fired, Fan Type Residential Central Furnace)	610-606-0110-0000; 060-020-0110-0000

APPENDIX G

Appendix C from the *2018 PM2.5 Plan*

This page intentionally blank.

Appendix C

Stationary Source Control Measure Analyses

This page intentionally blank.

TABLE OF CONTENTS

C. STATIONARY SOURCE CONTROL MEASURE ANALYSES

The San Joaquin Valley (Valley) faces significant challenges in attaining national ambient air quality standards (NAAQS, or standards) for PM2.5 and ozone. Despite the progress made to improve the Valley's air quality through the implementation of the multiple attainment plans adopted by the San Joaquin Valley Air Pollution Control District (District) and clean air investments by Valley businesses and residents. Substantial additional emissions reductions are needed, particularly from mobile sources under California Air Resources Board (CARB) and U.S. Environmental Protection Agency (EPA) jurisdiction that make up over 85% of remaining Valley NOx emissions. The Valley has already attained the PM10 standard and the 1997 PM2.5 24-hour 65 µg/m³ standard. Tough and innovative rules, such as those for indirect source review, residential wood burning, 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, 2008 PM2.5 Plan, 2012 PM2.5 Plan, 2013 Plan for the Revoked 1-Hour Ozone Standard, 2015 Plan for the 1997 PM2.5 Standard, 2016 Plan for the 2008 8-Hour Ozone Standard,* and the *2016 Moderate Area Plan for the 2012 PM2.5 Standard*. Chapter 4 of this *2018 Plan for the 1997, 2006, and 2012 PM2.5 Standards* (Plan) includes a discussion about District regulations that have already been adopted and that achieve new emissions reductions after 2013 contributing to attainment. Appendix D contains mobile sources analyses and discussions.

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, for this Plan the District has evaluated all potential additional opportunities for reducing emissions to achieve expeditious attainment of the federal PM2.5 NAAQS. This appendix reflects the comprehensive evaluation performed by the District to examine emissions sources in the Valley to identify additional potential emission reduction strategies for inclusion in this Plan.

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. The search for emission reduction opportunities goes beyond traditional regulatory strategies and considers other opportunities for timely, innovative, and cost-effective emissions reductions, including new incentive programs.

This appendix consists of a literature review and evaluation of emission reduction opportunities for 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, solicit public input during the Plan development process, and demonstrate compliance with Clean Air Act control strategy requirements for PM2.5 nonattainment areas.

CLEAN AIR ACT REQUIREMENTS

With respect to control strategy requirements, the federal Clean Air Act (CAA) requires demonstration of Reasonably Available Control Measures (RACM) for Moderate non-attainment areas under Section 189(a)(1)(C); Best Available Control Measures (BACM) for Serious non-attainment areas under Section 189(b)(1)(B); and Most Stringent Measures (MSM) for Serious non-attainment areas seeking an extension under section 188(e). The guidelines for demonstrating compliance with these requirements are provided in EPA's 2016 *Fine Particulate Matter National Ambient Air Quality Standards: State Implementation Plan Requirements; Final Rule*, codified at 81 FR 58009. The control strategy requirements are based on the non-attainment status of the area.

For each federal PM2.5 standard, the San Joaquin Valley's nonattainment status is as follows:

1997 PM2.5 Standard (24-hour 65 µg/m³ and Annual 15 µg/m³)

- Plan focus on annual standard – San Joaquin Valley has already attained 24-hour portion of the standard, based on monitoring data from the three year period from 2014 to 2016
- Attainment deadline December 31, 2015
- Serious area 5% Plan with attainment deadline of December 31, 2020

2006 PM2.5 Standard (24-hour 35 µg/m³)

- Serious area Plan with attainment deadline of December 31, 2024 with 5-year extension request

2012 PM2.5 Standard (annual 12 µg/m³)

- Attainment deadline under "Serious" classification of December 31, 2025
- This Plan would be submitted three years ahead of 2022 federal submission deadline

MODERATE AREA CONTROL STRATEGY REQUIREMENTS

Pursuant to CFR Section 51.1009, the state shall identify, adopt, and implement control measures on sources of direct PM2.5 and significant PM2.5 precursors (oxides of nitrogen, (NOx)) located in any Moderate PM2.5 nonattainment area or portion thereof located within the state consistent with the following:

- The state shall identify potential control measures to reduce emissions from sources of direct PM2.5 and PM2.5 precursors (NOx)
- For any potential control measure, the area may make a demonstration that such measure is not technologically or economically feasible to implement in the area

by the end of the sixth calendar year following the effective date of designation, and may eliminate such measure from further consideration.
    - **Technological feasibility** may include, but is not limited to, a source's processes and operating procedures, raw materials, physical plant layout, and potential environmental impacts such as increased water pollution, waste disposal, and energy requirements.
    - **Economic feasibility** may include but is not limited to capital costs, operating and maintenance costs, and cost-effectiveness.
    - A detailed written justification for eliminating a potential control measure on the basis of technological or economic infeasibility shall be included with the control measure evaluation.
- **If the state demonstrates through air quality modeling that the area can attain** the applicable PM2.5 NAAQS by the end of the sixth calendar year following the effective date of designation of the area, the state shall adopt and implement all technologically and economically feasible control measures that are necessary to bring the area into attainment by such date.
    - The state shall also adopt and implement all other technologically and economically feasible measures that, when considered collectively, would advance the attainment date for the area by at least 1 year.
    - Any control measure that can be implemented by 4 years after the effective date of designation of the Moderate PM2.5 nonattainment area shall be considered RACM for the area. Any such control measure that is also a control technology shall be considered to be reasonably available control technology (RACT) for the area.
    - Any control measure that can only be implemented during the period beginning 4 years after the effective date of designation of the Moderate PM2.5 nonattainment area through the end of the sixth calendar year following the effective date of designation of the area shall be considered an *additional reasonable measure* for the area.
- **If the state demonstrates that the area cannot practicably attain** the applicable PM2.5 NAAQS by the end of the sixth calendar year following the effective date of designation of the area, the state must adopt all technologically and economically feasible control measures that can be implemented in whole or in part by the end of the sixth calendar year following the effective date of designation of the area.

The Valley is currently designated as Moderate non-attainment for the 2012 PM2.5 Standard and cannot practicably attain this standard by the end of the sixth calendar year following the effective date of designation of the area. The District adopted the *2016 Moderate Area Plan for the 2012 PM2.5 Standard*, including an attainment impracticability demonstration and a request for reclassification of the Valley from Moderate nonattainment to Serious nonattainment. This Plan was submitted to CARB for review and consideration in September of 2016.

The control measure evaluations in this appendix go beyond the level of analysis required to satisfy Clean Air Act Moderate area attainment plan requirements, including RACM and RACT, as follows:

- ✓ All emission source categories that emit direct PM2.5 or a significant PM2.5 precursor (NOx) have been evaluated.
- ✓ For each source category, source, or activity, an inventory of direct PM2.5 and PM2.5 precursors has been provided.
- ✓ Measures in other NAAQS nonattainment areas are identified and evaluated in each control measure analysis.
- ✓ Any other control measures or technologies achieved in practice in other areas are evaluated for technological and economic feasibility of implementation in the Valley.
- ✓ A detailed justification for the rejection of any measures based on technological or economic infeasibility has been provided.
- ✓ The control measure analysis evaluates technological and economic feasibility beyond those that can only be implemented within 4 years or 6 years.

SERIOUS AREA CONTROL STRATEGY REQUIREMENTS

The District is classified as Serious nonattainment for multiple PM2.5 standards. For each PM2.5 NAAQS, the Valley has a different nonattainment classification, which results in different requirements and deadlines for each standard, as summarized above. As a result of the District's attainment status for the three different federal PM2.5 standards, the District must demonstrate an increasing stringency of analysis for evaluating the feasibility of control measures to reduce direct PM2.5 and PM2.5 precursors. The different requirements for each standard are outlined below.

CONTROL STRATEGY REQUIREMENTS FOR THE 1997 PM2.5 STANDARD

For the 1997 PM2.5 standard, the District is classified as Serious nonattainment. Persuant to §189(d) of the CAA, the District is required to submit a plan demonstrating that the annual emissions inventory for PM2.5 and significant PM2.5 precursors achieve reductions by at least 5% annually until the Valley attains the 1997 standard. The District's 5% demonstration, contained in Chapter 5, relies on emission reductions occurring as a result of current control measures. The adoption and implementation of additional feasible measures identified in this appendix will ensure that the emission inventory for direct PM2.5 and PM2.5 precursors will continue to be reduced and will ensure attainment of the 1997 PM2.5 standard no later than 2020.

CONTROL STRATEGY REQUIREMENTS FOR THE 2006 PM2.5 STANDARD

For the 2006 PM2.5 standard, the District is classified as Serious nonattainment and is requesting an attainment deadline date extension from 2019 to 2024 due to the impracticability of attaining the 24-hour 35 $\mu g/m^3$ standard by 2019. This Plan demonstrates that the District will attain the 2006 PM2.5 NAAQS by 2024.

Section 51.1010 (b) states that, for a Serious PM2.5 nonattainment area that cannot practicably attain the applicable PM2.5 NAAQS by the end of the tenth calendar year following the date of designation of the area, the state shall identify, adopt, and implement the most stringent control measures that are included in the attainment plan for any state or are achieved in practice in any state and that can be feasibly implemented in the area, consistent with the following requirements:

1. The state shall identify all sources of direct PM2.5 emissions and all sources of PM2.5 precursors
2. The state shall identify potential control measures to reduce emissions from the identified sources as follows:
    a) The state shall identify the most stringent measures adopted into any State Implementation Plan (SIP) or used in practice to control emissions in any state.
    b) The state shall reconsider and reassess any measures previously rejected by the state during the development of any previous Moderate area or Serious area attainment control strategy for the area.
3. The state may make a demonstration that a measure identified is not technologically or economically feasible to implement in the area by 5 years after the applicable attainment date for the area, and may eliminate such whole or partial measure from further consideration.
    a) A detailed written justification must be provided for eliminating any potential measure on the basis of technological or economic infeasibility.
4. The state shall adopt and implement all control measures identified as economically and technologically feasible that shall collectively achieve attainment as expeditiously as practicable, and not later than five years after the applicable attainment date for the area.

Because BACM and BACT represent the ‘‘best’’ level of control feasible for an area, in some cases it may be possible for the MSM requirement to result in no more controls and no more emissions reductions in an area than result from the implementation of BACM and BACT. Stated another way, there may be sources or categories for which no other feasible controls exist beyond what a state has already adopted as BACM or BACT.

This Plan satisfies the requirements for a Serious nonattainment area seeking an attainment date extension as follows:

- ✓ The updated emissions inventory is included in this Plan.
- ✓ The control measure evaluations analyze all potential control measures achieved in practice or identified as potential MSM in other regions, as obtained from:
    - A comprehensive review of other air district plans and regulations
    - A review of the RACT/BACT/LAER Clearinghouse
    - A review of measures included in EPA’s Menu of Control Measures document[1]
- ✓ Measures rejected as BACM/BACT in previous District attainment plans were reanalyzed to see if they were feasible for implementation given the longer time to the attainment date.
- ✓ Measures already implemented in the Valley were evaluated to see if an increase in coverage of the measure would increase emission reductions from the source category.

[1] The Menu of Control Measures document is available at: http://www3.epa.gov/ttn/naaqs/pdfs/MenuofControlMeasures.pdf

- ✓ A reasoned justification is provided for any potential MSM which was found to be technologically or economically infeasible for implementation in the Valley.

This appendix demonstrates all prohibitory stationary source measures currently in place meet or exceed MSM. Measures that go beyond MSM which were found to be technologically and economically feasible for implementation in the Valley are proposed as commitments for this Plan in Chapter 4, with the date for implementation being as soon as feasibly possible.

CONTROL STRATEGY REQUIREMENTS FOR THE 2012 PM2.5 STANDARD

For the 2012 PM2.5 standard, the District is classified as Moderate nonattainment, and is requesting to be reclassified to Serious nonattainment due to the demonstrated impracticability of attaining the 2012 annual standard of 12 $\mu g/m^3$ by the Moderate attainment deadline date of 2021. A reclassification to Serious nonattainment for the 2012 NAAQS would change the Valley's attainment date for the 2012 PM2.5 standard to 2025.

This Plan demonstrates that the Valley can attain the 12 $\mu g/m^3$ annual standard by 2025 through the implementation of all feasible potential control measures by the applicable attainment date. As a part of the Serious area attainment demonstration for this standard, in addition to implementing all feasible measures identified as RACM and RACT, and BACM for sources of direct PM2.5 and PM2.5 precursors determined through CARB modeling as significant PM2.5 precursurs, consistent with the following:[2]

- Identify all potential control measures to reduce emissions from all sources of direct PM2.5 emissions and sources of emissions of PM2.5 Plan precursors in the nonattainment area by surveying other NAAQS nonattainment areas and identifying any measures for direct PM2.5 and PM2.5 Plan precursors not previously identified by the District during the development of the Moderate area attainment plan
- Adopt and implement all feasible potential control measures.
    - Any control measure that can be implemented by the end of the fourth year following the date of reclassification of the area to Serious shall be considered BACM. Any such control measure that is also a control technology for a stationary source in the area shall be considered BACT for the area.
    - Any control measure that can be implemented between the end of the fourth year following the date of reclassification of the area to Serious and the applicable attainment date for the area shall be considered an *additional feasible measure*.
- The District may make a demonstration that any measure is not technologically or economically feasible to implement in whole or in part by the end of the tenth calendar year following the effective date of designation of the area, and may eliminate such whole or partial measure from further consideration.

[2] § 51.1010 Serious area attainment Plan control strategy requirements

- For purposes of evaluating the technological feasibility of a potential control measure, the District may consider factors including but not limited to a source's processes and operating procedures, raw materials, physical plant layout, and potential environmental impacts such as increased water pollution, waste disposal, and energy requirements.
- For purposes of evaluating the economic feasibility of a potential control measure, the District may consider capital costs, operating and maintenance costs, and cost-effectiveness of the measure.
- The District shall submit to the EPA as part of its Serious area attainment plan submission a detailed written justification for eliminating from further consideration any potential control on the basis of technological or economic infeasibility.
- For potential measures demonstrating as not technologically or economically feasible to implement, a written justification shall include an explanation of how the criteria for determining the technological and economic feasibility of potential control measures are more stringent than its criteria for determining the technological and economic feasibility of potential control measures for RACM for the same sources.

The control measure evaluations in this appendix go beyond the level of analysis required to satisfy Clean Air Act Serious Area attainment plan requirements, including BACM and BACT, as follows:

- ✓ All emission source categories that emit direct PM2.5 or a significant PM2.5 precursor (NOx) have been evaluated.
- ✓ For each source category, source, or activity, an inventory of direct PM2.5 and PM2.5 precursors has been provided.
- ✓ Measures in other NAAQS nonattainment areas are identified and evaluated in the "Potential Regulatory Emission Reductions" section of each control measure analysis.
- ✓ A comprehensive list of control measures considered for each source category is included as a part of each control measure evaluation.
- ✓ Building on the level of analysis required for a Moderate nonattainment plan, the control measure evaluations go beyond RACM by evaluating all potential control measures achieved in practice that can feasibly be implemented by the attainment date of 2025
    - Control measure commitments and dates are identified in Chapter 4. Measures implemented within 4 years of a Serious nonattainment classification are considered *BACM*, and associated control technologies are considered *BACT*.
    - Measures implemented after 4 years after the effective date of classification to Serious nonattainment are considered *additional reasonable measures.*
- ✓ For measures determined not feasible, a thorough explanation of criteria used to make such determinations is provided.
- ✓ For each technologically feasible measure, the following information is provided in regards to economic feasibility:

- The control efficiency by pollutant
- The possible emission reductions by pollutant
- The estimated cost per ton of pollutant reduced; and
- A determination of whether the measure is economically feasible, including an explanation of the conclusion and quantitative supporting documentation

✓ For each technologically and economically feasible control measure, a date for implementation of the rule or policy is included; the date for implementation of control measures relied on for the attainment demonstration shall be as early as feasibly practicable, and not later than the beginning of the attainment year.

SIGNIFICANT PRECURSORS

Pursuant to federal Clean Air Act §189(e), the sole explicit reference to the regulation of precursors in CAA Subpart 4, the control requirements applicable under plans addressing a PM2.5 NAAQS shall apply to major stationary sources of PM2.5 precursors, except where EPA determines that such sources do not contribute significantly to PM2.5 levels which exceed the standard in the area. CARB modeling performed for the development of this attainment Plan demonstrates that VOC, Ammonia, and SOx are not significant precursors for the formation of PM2.5 in the San Joaquin Valley (Appendix G). Therefore, CARB and the District have excluded VOC, SOx, and ammonia from control requirements in the SIP.

Even though the District is not required to evaluate ammonia as part of this Plan, this Appendix includes a full analysis of the potential control of ammonia sources, including an evaluation of BACM and MSM feasible for implementation in the Valley.

APPENDIX C ORGANIZATION AND EVALUATION

Each control measure evaluation includes a discussion of the rule applicability and rule adoption/amendment history; an overview of the source category and affected sources; an emissions inventory table for the source category; a regulatory evaluation; a technological feasibility and cost-effectiveness analysis of any other potential BACM and MSM; and a summary of the evaluation findings. The sections below elaborate in more detail with respect to the information included within each individual evaluation.

Discussion

This section provides an overview of rule applicability, identifies what types of emissions the rule controls, provides the rule adoption/amendment history, and discusses additional pertinent details, as necessary.

Emissions Inventory

Each emissions inventory table lists the annual average and wintertime average (November through April) PM2.5 and NOx emissions for the respective source category. The data provided in this section is a compilation of the data sources identified in the emission inventory appendix. See Appendix B (Emission Inventory) for additional information.

Source Category

This section discusses what types of units, industries, or operations are included in the respective source category.

How does the District Rule compare with federal and state rules and regulations?

As part of the regulatory evaluation, District rules and source categories are compared to federal and state 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 – Federal regulations include the following regulations and guidance documents:

- Control Techniques Guidelines (CTG)[3]
- Alternative Control Techniques (ACT)[4]
- New Source Performance Standards (NSPS)[5]
- National Emission Standards for Hazardous Air Pollutants (NESHAP)[6]
- Maximum Achievable Control Technology (MACT)[7]

[3] EPA. Control Techniques Guidelines. Retrieved from http://www.epa.gov/groundlevelozone/SIPToolkit/ctgs.html
[4] EPA. Alternative Control Techniques. Retrieved from http://www.epa.gov/groundlevelozone/SIPToolkit/ctgs.html
[5] EPA. 40 CFR 60 – Standards of Performance for New Stationary Sources (NSPS). Retrieved from http://www.tceq.state.tx.us/permitting/air/rules/federal/60/60hmpg.html
[6] EPA. 40 CFR 61 – National Emission Standards for Hazardous Air Pollutants (NESHAPs). Retrieved from http://www.tceq.state.tx.us/permitting/air/rules/federal/61/61hmpg.html
[7] EPA. 40 CFR 63 – Maximum Achievable Control Technology (MACT). Retrieved from http://www.tceq.state.tx.us/permitting/air/rules/federal/63/63hmpg.html

State Regulations – Generally, state regulations are specific to mobile sources and consumer products. However, there are some California Health and Safety Code (CH&SC) requirements and CARB Airborne Toxic Control Measures (ATCM)[8] that apply to stationary and area sources. While most of the rules evaluated in this Plan do not have a state regulation associated with their source category, any relevant state guidelines are evaluated within this section.

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

District staff compared analgous rules in other air districts to District rules for the control of emissions from PM2.5 and NOx source cateogies. All potential BACM/MSM identified through this regulatory evaluation were thoroughly evaluated using the key factors identified in EPA's *2016 Fine Particulate Matter National Ambient Air Quality Standards: State Implementation Plan Requirements; Final Rule*, codified at 81 FR 58009, to determine if potential opportunities qualify as BACM/MSM for the Valley.

Additional Emission Reduction Opportunities

The District reviewed the following areas to identify any additional potential BACM/MSM, exclusive of potential BACM/MSM evaluated in the "Regulatory Evaluation" section:

- Any emission reduction opportunities identified/considered in previously adopted District plans that were determined to be beyond RACT at that time.
- New emission reduction opportunities adopted in California SIPs, SIPs in other states, or achieved in practice in other areas.

All potential BACM/MSM identified were then thoroughly evaluated for technological and economic feasibility. The District reviewed staff reports and studies from other air districts, EPA technical guidance documents, and applicable study data from the scientific community to assist in evaluating the technological and economic feasibility of potential BACM/MSM.

Evaluation Findings

This section completes the control measure evaluation and provides a summary of the District's findings based on the control measure evaluation.

[8] California Air Resources Board (CARB). Airborne Toxic Control Measures (ATCMs). Retrieved from http://www.arb.ca.gov/toxics/atcm/atcm.htm

C.1 Rule 4103 (Open Burning)

Discussion

Historically, the practice for disposing of agricultural materials has been the open burning of the materials in the field. Burning agricultural materials provides an economically feasible method for the timely disposal of these materials, helps prevent the spread of plant diseases, and controls weeds and pests. The air quality impacts from open burning in the Valley have long been a significant concern for the District and Valley growers, and numerous measures have been successfully implemented over the years to minimize these impacts.

Rule 4103 was originally adopted on June 18, 1992, to regulate and coordinate the use of open burning while minimizing smoke impacts on the public. Rule 4103 has since been amended seven times and become progressively more stringent. In 2003, California Senate Bill (SB) 705 (CH&SC Section (§) 41855.5 and 41855.6) established a schedule to phase out the open burning of agricultural material but provided for a postponement of the phase-out where justified by technical and economic impediments. The phase out requirements of SB 705 have been incorporated into Rule 4103 and were implemented beginning June 1, 2005. The District also operates a comprehensive Smoke Management System (SMS) to manage open burning and only allow the limited amount of burning that is still permissible to take place on days with favorable meteorology and in amounts that will not cause a significant impact on air quality. Due to the management of open burning under the District's comprehensive SMS, modeling conducted for the development of this Plan demonstrates that additional emission reductions from this source category would not significantly contribute to attainment of the applicable PM2.5 standards.

Emissions Inventory

POLLUTANT	2013	2017	2019	2020	2022	2023	2024	2025	2026	2028
	Annual Average - Tons per day									
PM2.5	2.27	2.25	2.24	2.23	2.22	2.22	2.21	2.21	2.20	2.19
NOx	1.60	1.59	1.58	1.57	1.57	1.56	1.56	1.55	1.55	1.54
	Winter Average - Tons per day									
PM2.5	3.46	3.43	3.42	3.41	3.40	3.39	3.38	3.37	3.36	3.35
NOx	2.44	2.41	2.40	2.39	2.38	2.38	2.37	2.36	2.36	2.35

Source Category

The Valley, in adherence with SB 705, has the toughest restrictions on agricultural burning in the state. Rule 4103 was last amended on April 5, 2010, to incorporate the final provisions of the SB 705 phase out schedule directly into the rule to more efficiently allow the District, with the concurrence of CARB, to consider the feasibility of non-burning alternatives for specific crops and materials and postpone burn prohibitions where it is determined there are no feasible alternatives.

Through Rule 4103, the District no longer allows the burning of field crops (with the exception of a certain percentage of rice), prunings (with the exception of pome fruit

prunings, and a limited amount of surface harvested pruning acreage), and orchard removals (with the exception of small acreage removals, vineyard removals, pome fruit removals, and citrus removals). A limited amount of additional burning is allowed for disease prevention, noxious weeds, ditch banks and canals, ponding and levee banks, and diseased beehives, provided rule requirements are met and meteorological conditions are appropriate.

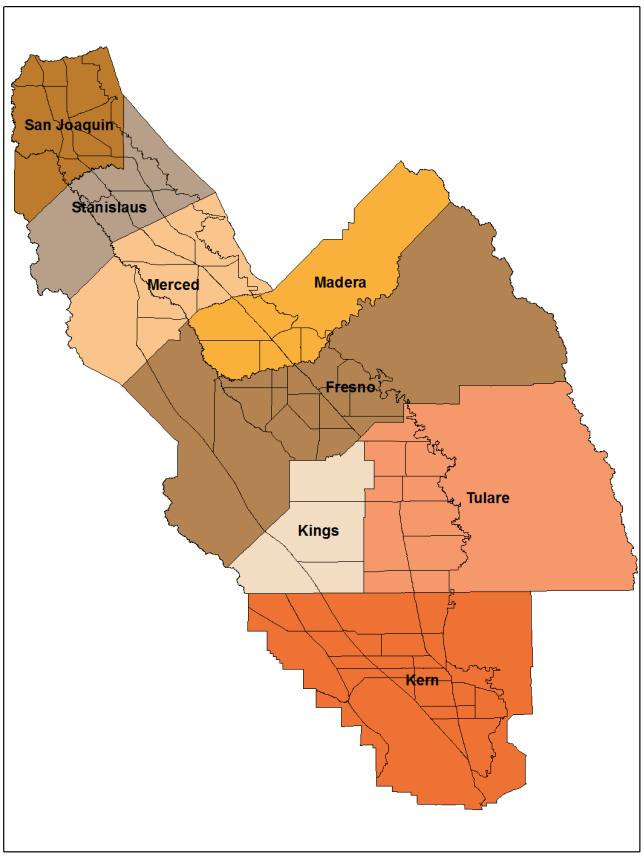
Rule 4103 also contains requirements for collecting, sorting, drying, and igniting agricultural materials; the timing, monitoring, and maintenance of burns; and specific requirements for field crop burning, ditch bank and levee maintenance, contraband materials, Russian thistle (tumbleweeds), and diseased materials. Additionally, the rule details a set of conditions that must be met for a burn permit to be issued.

Smoke Management System (SMS)

The District uses the SMS to manage the Valley's remaining open burning of agricultural crops and materials. On a daily basis, the District analyzes projected local meteorology, the air quality conditions, the atmospheric holding capacity, the amount of burning already approved in a given area, and the potential impacts on downwind populations. Through the results of this daily analysis, the District uses the SMS to manage 97 Valley burn zones (see Figure C-1) and allocates daily burning allowances if appropriate. This approach ensures the District limits the distribution of air pollutant emissions from open burning temporally and spatially, providing flexibility of burn days for growers while minimizing the impact on the public.

Properly managed burning allocations under the SMS ensures that air quality impacts, health impacts, and public nuisance from open burning of agricultural materials are minimized to the fullest extent feasible.

Figure C-1 Agricultural Burn Zones Defined in the District SMS



HOW DOES DISTRICT RULE 4103 COMPARE WITH FEDERAL AND STATE RULES AND REGULATIONS?

Federal Regulations

There are no EPA CTG, ACT, NSPS, NESHAP, or MACT requirements for this source category.

State Regulations

- CH&SC §41850-41866 (Agricultural Burning)
- 17 CCR §80100-80330 (Smoke Management Guidelines for Agricultural and Prescribed Burning)

The requirements of the above state regulations are implemented through Rule 4103. The District has continued to work closely with Valley stakeholders to identify feasible alternatives to open burning of various agricultural materials and to meet its legal obligation under state law. Unlike other areas of the state that are prohibited from banning agricultural burning,[9] the District is required to phase out agricultural burning in accordance with CH&SC §41855.5, and has done so for most crop categories. In addition to the requirements of CH&SC §41855.5, state law requires the District to

[9] CH&SC §41850 requires that "agricultural burning be reasonably regulated and not prohibited."

postpone the burn prohibition dates for specific types of agricultural material if the District makes three specific determinations and CARB concurs.[10] The determinations are: (1) there are no economically feasible alternatives to open burning for that type of material; (2) open burning for that type of material will not cause or substantially contribute to a violation of an air quality standard; and (3) there is no long-term federal or state funding commitment for the continued operation of biomass facilities in the Valley or the development of alternatives to burning.

The District has prepared three reports on agricultural burning activities in the Valley since 2010. The reports have evaluated every crop category for feasible alternatives to open burning and provided recommendations for allowing or prohibiting the open burning of each crop category as outlined by the Senate Bill.

- *2010 Final Staff Report and Recommendations on Agricultural Burning.* After working extensively with stakeholders to understand viable alternatives to open burning and the associated costs, the District provided recommendations for allowing or prohibiting the open burning of specific agricultural material categories. CARB provided a 2-year concurrence on District recommended postponements, based on the lack of feasible alternatives to open burning.
- *2012 Update: Recommendations on Agricultural Burning.* The 2012 report showed that in the two years since the 2010 report, there had been no significant changes in the economic feasibility of alternatives to agricultural burning, the amount of agricultural materials accepted at biomass facilities continued to fluctuate based on market conditions, and there were no long-term federal or state funding commitments for the operation of biomass facilities or development of alternatives to burning. CARB provided an additional 3-year concurrence on the District's recommended postponements, based on the continued lack of feasible alternatives to open burning.
- *2015 Agricultural Burning Review.* The 2015 report demonstrated continued lack of feasible alternatives, a failing biomass industry resulting in less acceptance of agricultural materials, and a continued lack of long-term federal or state funding commitments for the operation of biomass facilities of development of alternatives to open burning. CARB concurred with the District's findings.

The next report will be conducted in 2020. This analysis will contain a comprehensive analysis of the feasibility of alternatives to open burning for different crop categories, including costs and availability of emerging technologies. Once completed the report will be submitted to CARB for their review and concurrence.

[10] CH&SC §41855.6

HOW DOES DISTRICT RULE 4103 COMPARE TO RULES IN OTHER AIR DISTRICTS?

BAAQMD

- BAAQMD Regulation 5 (Open Burning) *(Amended June 19, 2013)*

	SJVAPCD	BAAQMD
Applicability	Open burning conducted in the San Joaquin Valley Air Basin, with the exception of prescribed burning and hazard reduction burning (regulated under District Rule 4106)	Open burning in the BAAQMD
Exemption	Fires used for cooking, campfires, and religious fires where the fuel is clean, dry wood or charcoal are exempt. Emergency burning by a fire agency, the respectful burning of an unserviceable American flag, bags used for agricultural chemicals, and raisin trays are also exempted. Specific exemptions and provisions for burning contraband and emergency agricultural burns that would cause economic loss if denied.	Fires set only for cooking of food for human beings; fires burning as safety flares or for the combustion of waste gases; the use of flame cultivation when the burning is performed with LPG or natural gas-fired burners designed and used to kill seedling grass and weeds and the growth is such that the combustion will not continue without the burner; fires set for the purposes of fire training using one gallon or less of flammable liquid per fire; further requirements for conditional exemptions (similar to SJV).
Requirements	No burning of garbage or other materials. Burning shall be allocated by the APCO dependent on dispersion conditions and shall avoid negative impacts to receptors. No permit shall be issued for the burning of the following categories of agricultural waste, except for crops covered by Section 5.5.2: 5.5.1.1 Field Crops, 5.5.1.2 Prunings, 5.5.1.3 Weed Abatement, except for categories covered by Section 5.5.3, 5.5.1.4 Orchard Removals, 5.5.1.5 Vineyard Removal Materials, 5.5.1.6 Surface Harvested Prunings, and 5.5.1.7 Other Materials. Additional requirements for burning times, drying times, contraband burning. Permit required for the burning of Russian Thistle, and a conditional burning permit required for diseased materials with specific requirements, burn plans required for fire suppression training, burning of contraband, BMP selection required for weed maintenance.	No specific crop phase-outs or bans. Recreational fires allowed on non-curtailment days; on permissive burn days the following fires are allowed with permission from the APCO (specific requirements for each category): disease and pest, crop replacement, orchard pruning and attrition, double cropping stubble, stubble, hazardous materials (hazard reduction burning), fire training, flood debris, irrigation ditches, flood control, range management, forest management, marsh management, contraband, filmmaking, and public exhibition.

SCAQMD

- SCAQMD Rule 444 (Open Burning) *(Amended July 12, 2013)*

The District evaluated the requirements contained within SCAQMD's Rule 444 and found no requirements that were more stringent than those already in Rule 4103. SCAQMD Rule 444 was last amended on July 12, 2013 to expand rule applicability to include beach burning. The amendments apply to sources that do not exist within District's boundaries, and therefore are unnecessary to be required in the Valley to satisfy BACM or MSM requirements. Rule 444 also restricts burning on residential wood combustion curtailment days. This is a practice that has already been implemented by the District through the Smoke Management System procedures, and which is also included in District Rule 4103, Section 5.2, whereby "the APCO shall allocate burning based on the predicted meteorological conditions and whether the total tonnage to be emitted would allow the volume of smoke and other contaminants to cause a public nuisance, impact smoke-sensitive areas, or create or contribute to an exceedance of an ambient air quality standard." District Rule 4103 is as stringent as, or more stringent than, SCAQMD Rule 444.

	SJVAPCD	SCAQMD
Applicability	Open burning conducted in the San Joaquin Valley Air Basin, with the exception of prescribed burning and hazard reduction burning	Agricultural burning, disposal of Russian thistle, prescribed burning, fire prevention/suppression training, open detonation or use of pyrotechnics, fire hazard removal, disposal of infectious waste, other than hospital waste, research of testing materials, equipment or techniques, disposal of contraband, residential burning, beach burning
Exemption	Fires used for cooking, campfires, and religious fires where the fuel is clean, dry wood or charcoal are exempt. Emergency burning by a fire agency, the respectful burning of an unserviceable American flag, bags used for agricultural chemicals, and raisin trays are also exempted. Specific exemptions and provisions for burning contraband and emergency agrcultural burns that would cause economic loss if denied.	Fire suppression training by fire agencies, open burning to protect crops from freezing (requires emergency burn plan to be submitted), open burning on islands located 15 miles or more from the mainland, fireworks displays, explosives detonation, recreational fires/ceremonial fires. Food prep fires and fires "for warmth at social gatherings" are allowed.
Requirements	No burning of garbage or other materials. Burning shall be allocated by the APCO dependent on dispersion conditions and shall avoid negative impacts to receptors. No permit shall be issued for the burning of the following categories of agricultural waste, except for crops covered by Section 5.5.2: 5.5.1.1 Field Crops,	No specific crop phase outs or bans. Burning of waste/garbage is prohibited. No burning unless it is a permissive burn day or a marginal burn day on which burning is permitted in the applicable source/receptor area and such burning is not prohibited by the applicable public fire protection agency. Specific requirements for burn authorization requests and permit conditions for each category of burning (similar to SJV).

	SJVAPCD	SCAQMD
	5.5.1.2 Prunings, 5.5.1.3 Weed Abatement, except for categories covered by Section 5.5.3, 5.5.1.4 Orchard Removals, 5.5.1.5 Vineyard Removal Materials, 5.5.1.6 Surface Harvested Prunings, and 5.5.1.7 Other Materials. Additional requirements for burning times, drying times, contraband burning. Permit required for the burning of Russian Thistle, and a conditional burning permit required for diseased materials with specific requirements, burn plans required for fire suppression training, burning of contraband, BMP selection required for weed maintenance.	

SMAQMD

- SMAQMD Rule 501 (Agriculture Burning) *(Amended April 3, 1997)*

The District evaluated the requirements contained within SMAQMD's Rule 501 and found no requirements that were more stringent than those already in Rule 4103.

	SJVAPCD	SMAQMD
Applicability	Open burning conducted in the San Joaquin Valley Air Basin, with the exception of prescribed burning and hazard reduction burning	Agricultural burning, including: agricultural waste (trees, prunings, rice straw and stubble, field crop residue) disease prevention, range improvement, wildlife/game habitat, irrigation system management, forest management, wild land vegetation management, paper containers of agricultural chemicals
Exemption	Fires used for cooking, campfires, and religious fires where the fuel is clean, dry wood or charcoal are exempt. Emergency burning by a fire agency, the respectful burning of an unserviceable American flag, bags used for agricultural chemicals, and raisin trays are also exempted. Specific exemptions and provisions for burning contraband and emergency agricultural burns that would cause economic loss if denied.	Similar exemptions as Valley for agricultural operations, including burning of bags used for agricultural chemicals and emergency agricultural burns which would cause economic loss if denied.

	SJVAPCD	SMAQMD
Requirements	No burning of garbage or other materials. Burning shall be allocated by the APCO dependent on dispersion conditions and shall avoid negative impacts to receptors. No permit shall be issued for the burning of the following categories of agricultural waste, except for crops covered by Section 5.5.2: 5.5.1.1 Field Crops, 5.5.1.2 Prunings, 5.5.1.3 Weed Abatement, except for categories covered by Section 5.5.3, 5.5.1.4 Orchard Removals, 5.5.1.5 Vineyard Removal Materials, 5.5.1.6 Surface Harvested Prunings, and 5.5.1.7 Other Materials. Additional requirements for burning times, drying times, contraband burning. Permit required for the burning of Russian Thistle, and a conditional burning permit required for diseased materials with specific requirements, burn plans required for fire suppression training, burning of contraband, BMP selection required for weed maintenance.	No specific crop phase outs or bans (subject to air basin-wide rice burning reduction) Permit holder must contact District for permission to burn and ensure that it is not a No Burn day, and must contact the fire protection agency having jurisdiction over the burn location. Specific drying time requirements for different agricultural materials (similar to SJV)

VCAPCD

- VCAPCD Rule 56 (Open Burning) *(Amended November 11, 2003)*
- The District evaluated the requirements contained within VCAPCD's Rule 56 and found no requirements that were more stringent than those already in Rule 4103.

	SJVAPCD	VCAPCD
Applicability	Open burning conducted in the San Joaquin Valley Air Basin, with the exception of prescribed burning and hazard reduction burning	Combustible materials in open outdoor fires
Exemption	Fires used for cooking, campfires, and religious fires where the fuel is clean, dry wood or charcoal are exempt. Emergency burning by a fire agency, the respectful burning of an unserviceable American flag, bags used for agricultural chemicals, and raisin trays are also exempted. Specific exemptions and provisions for burning contraband and emergency agricultural burns that	This rule shall not apply to open outdoor fires used only for the heating or cooking of food for human consumption or for recreational purposes when such fires are confined to a fireplace or barbecue pit. Flag burning, fire suppression training, fire agency/public officer allowed to set fires to reduce hazards as needed (similar to SJV).

	SJVAPCD	VCAPCD
	would cause economic loss if denied.	
Requirements	No burning of garbage or other materials. Burning shall be allocated by the APCO dependent on dispersion conditions and shall avoid negative impacts to receptors. No permit shall be issued for the burning of the following categories of agricultural waste, except for crops covered by Section 5.5.2: 5.5.1.1 Field Crops, 5.5.1.2 Prunings, 5.5.1.3 Weed Abatement, except for categories covered by Section 5.5.3, 5.5.1.4 Orchard Removals, 5.5.1.5 Vineyard Removal Materials, 5.5.1.6 Surface Harvested Prunings, and 5.5.1.7 Other Materials. Additional requirements for burning times, drying times. Permit required for the burning of Russian Thistle, and a conditional burning permit required for diseased materials with specific requirements, burn plans required for fire suppression training, burning of contraband, BMP selection required for weed maintenance.	No specific crop phase-outs or bans. Permit required for open burning, burning only allowed on permissive burn days. Open burning is allowed for the following purposes only: a. The disposal of agricultural wastes in the pursuit of agricultural operations. b. Range improvement burning. c. Wildland vegetation management burning. d. Levee, reservoir or ditch maintenance. e. The disposal of Russian thistle (*Salsola kali* or tumbleweed). Specific burn times, drying times, and permit conditions also specified (similar to SJV).

ADDITIONAL EMISSION REDUCTION OPPORTUNITIES

As demonstrated above, in adherence with applicable state laws instituted under SB705, the San Joaquin Valley has the toughest restrictions on agricultural burning in the state. The District regulations have phased out the burning of all field crops (with the exception of rice), almost all prunings, and almost all orchard removals.

Until 2014, the restrictions imposed by the District resulted in an 80% reduction in the open burning of agricultural waste in the Valley. The exceptional drought conditions that the Valley experienced from 2012 to 2016 resulted in hundreds of thousands of acres of orchards, vineyards and other agricultural crops being fallowed or removed. These conditions, paired with the demise of the biomass industry which had previously provided the primary alternative to agricultural burning for a significant amount of the agricultural waste generated in the Valley, has created a severe waste disposal issue. Additionally, there are currently no long-term federal or state funding commitments to support the operation of biomass facilities or development of alternatives to open agricultural burning. The combination of these factors has resulted in an increase in open burning over the past several years and threatens the District's ability to continue to maintain broad restrictions on open burning of agricultural waste into the future due to

the lack of feasible alternatives capable of handling the volume of agricultural waste generated in the Valley each year.

Finding technologically feasible, cost-effective alternatives to open burning of agricultural waste is mandated by law if the current prohibitions are to be retained. Under CH&SC Section 41855.6, the District may postpone burn restrictions for any category of agricultural waste crop where all the following apply:

- There is no economically feasible alternative means of eliminating the waste
- There is no long-term federal or state funding commitment for the continued operation of biomass facilities or development of alternatives to burning
- The continued issuance of burn permits will not cause or substantially contribute to a violation of any air quality standard

As noted above, biomass power plants have historically provided the main alternative to the open burning of agricultural waste. Biomass burning of agricultural material has been preferable to open burning as it combusts the material more completely, results in fewer emissions, and provides an alternative source of renewable energy in the Valley.

Disposal of Agricultural Materials Severely Impacted by Biomass Power Plant Shutdowns

The biomass industry is primarily the product of the Public Utility Regulatory Policy Act (PURPA) which was enacted in 1978 at the height of the energy crisis to promote the use of alternative nonutility power generation. Today, these facilities are fully depreciated and have lost, or are nearing the ends of, their long-term contracts to sell their power to the utilities. In addition, biomass facilities are facing numerous obstacles to remain in operation including price disadvantage, demand for intermittent power instead of baseload power, and lack of federal and state funding.

Much has changed in the energy markets since PURPA was implemented. Natural gas has replaced oil for electricity generation, and supplies of natural gas have increased, driving down the wholesale cost of electricity. California has adopted a Renewable Portfolio Standard (RPS) that requires 33% of the power that is purchased by utilities be renewable. This has driven competition to fill the renewable energy needs of the state. Under the RPS, Investor Owned Utilities (IOUs) have tended to favor lower cost intermittent sources of renewable power, such as solar and wind. This has left the biomass industry in a position where the power that they produce is not desirable, since most biomass plants provide baseload power instead of intermittent power, and the current rate being paid for power does not allow them to remain viable.

Given the current energy policy, the biomass industry does not compete well under the current procurement policies of the state's IOUs. Historically, the biomass facilities have demanded 12-13 cents per kilowatt-hour, which has been necessary to retain economic viability. Pricewise, this places biomass facilities at a competitive disadvantage with other renewable fuels that can be procured at a much lower cost. Under the state's RPS, program pricing information is confidential; however, anecdotal evidence is that currently the IOUs are purchasing power from solar and wind facilities at approximately 8 cents per kilowatt-hour.

Another factor that negatively impacts the competitive position of biomass-generated power is the fact that such plants provide "baseload" power. As baseload generators, biomass facilities cannot produce power that can be turned on quickly, and therefore, cannot meet the power system's demand for "ramping services." The demand for ramping services is compounded by continued increase in the use of wind and solar renewable sources, which is partially triggered by the state's RPS goals. If current trends persist, this issue will worsen in the future. It is estimated that by 2020, solar and wind will account for three-quarters of the state's renewable power and 20% of the state's total electricity supply. The net effect of this is a further transition away from baseload generators to more flexible generators that can be turned on and off when needed. Under this scenario, not only do biomass facilities have difficulty competing directly on price, but they also do not provide the type of power that is desired. While under this scenario the state can meet its renewable power goals, the potential loss of biomass plants can impact the state's broader greenhouse gas reduction goals under AB 32 by increasing greenhouse gas (GHG) emissions in sectors that currently rely on biomass plants for disposal of materials including the agricultural industry, landfills, and forests.

The biomass industry has long relied on a combination of state and federal financial incentives to directly support their relatively higher production costs. These incentives have ranged from tax credits to monetary grants, which have all expired over the last decade. Examples of these programs include the federal Renewable Electricity Production Tax Credit (expired in 2013), the state Existing Renewable Facilities Program (expired in 2011), and the state Biomass-to-Energy Incentive Grant Program (expired in 2003). With the expiration of these programs, there are currently no long-term federal or state funding commitments for the operation of biomass facilities.

Since 2012, six Valley biomass facilities have shut down operations and now only five remain in operation. In 2015, the District took actions aimed at short- and long-term measures to alleviate the effect on agricultural growers of the biomass capacity shortfall in the Valley and to identify other alternatives to agricultural open burning. The District convened a workgroup with agricultural representatives to explore and advance waste disposal techniques as alternatives to open burning and traditional biomass power plants. In addition, the District requested that the Governor direct the California Public Utilities Commission to recognize the societal benefits of existing biomass facilities and their role in reducing emissions from agricultural open burning, and to extend Power Purchase Agreements with existing biomass facilities at current pricing levels.

Traditional biomass power plants need significant funding and legislative support, both of which are in short supply given state's current energy policies. The industry is on life support and is receiving some limited assistance due to the Governor's proclamation that ordered CPUC and California Energy Commission to enter into contracts with existing bioenergy facilities to take feedstock from high-hazard zones. The District has not supported this approach as it shifts emissions from high altitude forests to the communities on the Valley floor. Further complicating the issue for traditional biomass power plants is the opposition they face from local communities. Many of these facilities are located in or near disadvantaged communities and community members and

advocates have been critical of the emissions from these plants being concentrated in these communities.

Beyond Most Stringent Measures: District Efforts to Advance Alternatives

The loss of Valley biomass facilities has considerably reduced the available options to dispose of woody agricultural material. Additionally, the extreme drought conditions that the Valley experienced from 2012 to 2016 resulted in hundreds of thousands of acres of orchards, vineyards and other agricultural crops to be fallowed or removed and replaced with other crops. As a result, many agricultural growers have lost the primary economically feasible disposal option for agricultural material and there has been an extreme build-up of agricultural waste material in the Valley.

As a part of District efforts to identify and advance cleaner alternatives to open burning of agricultural waste, in November of 2017 the District held the Central Valley Summit on Alternatives to Open Burning of Agricultural Waste to bring together Valley growers, researchers/experts, representatives from the biomass power industry, representatives from new and developing technology vendors, and Valley stakeholders. The Summit demonstrated that additional research and resources are necessary to propel forward several emerging technologies and practices which may offer feasible alternatives to open burning in the future.

The District has identified soil incorporation of woody biomass, composting, various scales of biomass-to-power technologies, and air curtain burners as potential measures which were evaluated for technological and economic feasibility of implementation in the Valley. These measures are further discussed below.

Soil Incorporation of Woody Waste

Research has shown that soil re-incorporation is an effective means to utilize agricultural wood waste and that benefits may result from this practice in certain situations, including increased carbon content of soils and increased crop yield after the wood has fully decomposed.[1] However, researchers and farmers that have experimented with the practice highlighted the high costs of soil incorporation, the need to further understand feasibility of this practice with different crop and soil types, and the need to assess and understand the net emissions impact (combustion and dust emissions) associated with implementing this practice effectively. Due to the lack of full understanding of the potential disease and pest risks of this practice, as presented in scientific research,[2] the District will work to support further research to understand life-cycle emissions and potential pest infestation issues to help evaluate whether this practice could be recommended as a feasible alternative to open burning on a case-by-case basis.

[1] Holtz, B. (2017). Whole-Orchard Recycling Can Sequester Carbon and Improve Soil Fertility. *Resource Magazine*, *24*(4), 8-11.

[2] Holtz, B. A., Doll, D., Brooks, K., Martin-Duvall, T., Haanen, D., & Browne, G. (2009). Orchard Carbon Recycling and Replant Disease. *Research Proceedings (USA: Almond Board of California)*, 195-199.

Composting

District evaluation of composting has shown that composting is not technologically feasible as a large-scale alternative to open burning. Aggressive state policy designed to divert urban organic waste from landfills has led to the need to significantly expand composting infrastructure to meet legislative deadlines, limiting the ability of composting facilities to accommodate increased woody material from agricultural operations. Implementing composting solutions, either on farm or at local compost facilities, face permitting challenges and regulatory impediments as these operations increase VOC and methane emissions, and may pose water quality risks as well, if not properly controlled and mitigated.

There are also cost-effectiveness issues which would need to be addressed in using large scale composting to process agricultural waste. The costs of landfilling or composting the agricultural material involves transporting the material off-site to a landfill or composting site that will accept them. A local bio solids compost site indicated that some agricultural waste would be acceptable for composting; however, they do not have space for any of this material at present. A compost operator in Kern County indicated that the problem for composters is a shortage of nitrogenous materials (and water). Taking on more wood waste (a carbonaceous material) would only make the carbon to nitrogen ratio worse (i.e., higher), hence, it would be unlikely that any composters would accept this material at any price due to the current surplus of woody material in the Valley.

Advanced Biomass-to-Power Technologies

Next generation bioenergy solutions appear to be on the verge of broader deployment, but currently do not present a feasible alternative to open burning. While advancements in bioenergy solutions are moving rapidly and technologies are becoming closer to commercialization, more certainty about the availability of pipeline or electrical interconnection is necessary to assist with securing investments needed to get these projects off the ground. The Central Valley Summit included representatives from a broad range of technologies which included on-farm, off-site and transportable solutions covering large and small-scale electrical power production, renewable natural gas pipeline injection, and transportation fuel production.

Cellulosic ethanol is an advanced next-generation biofuel that can be made from agricultural wastes, wood chips, switch grass, corn stover, forest wastes, fast-growing trees, and other plant material. Currently, ethanol produced in the United States is most commonly made from corn kernels. In the United States, corn ethanol is primarily used as an alternative or additive to gasoline. Advanced biofuels are those that do not rely on the starch in corn kernels. Production of large quantities of ethanol from woody biomass will likely require the use of chemical treatment or enzymes to speed the breakdown of the cellulose in the biomass. Currently, the production of cellulosic ethanol is still in the demonstration phase of development.

Pyrolysis is a possible path to convert agricultural biomass to higher value products. Pyrolysis is the heating of an organic material, such as biomass, in the absence of oxygen. It is the first step of producing a flammable gas called synthetic gas (syngas).

Burning syngas to produce power offers certain advantages over directly burning the biomass because the gas can be cleaned and filtered to remove problematic chemical compounds. Using syngas is also potentially more efficient than direct combustion of biomass because the gas can be combusted at higher temperatures. Syngas can also be used to produce methanol and hydrogen, or converted into a liquid fuel. This is a viable alternative for farm-scale or small-scale power production, with lower emissions than existing biomass combustion power plants. There are currently only a few operational units in California, including two in the Valley.

Gasification/Cogeneration Plant Cost Data:
The International Renewable Energy Agency (IRENA) publication, *Renewable Energy Technologies: Cost Analysis Series* (June 2012), includes costs for gasification technologies. The following rough cost estimates were derived from the data included in the IRENA publication.

Equipment Type	Approximate Capital Cost (including installation, equipment, site upgrades)	Annual Maintenance and Operating*	Fuel Cost (including Transportation)**
Gasifier Powering a 50 MW Gas Turbine ~650 short tons/day of biomass fuel	$57,805,000	$2,601,225/year	$3,153,000/year
Gasifier powering a 4 MW ICE ~50 tons/day of biomass fuel	$1,778,400	$80,028/year	$158,080/year
Gasifier Powering a 600 kW CHP system ~8 tons/day of biomass fuel	$907,200	$40,824/year	$59,875/year

*Pursuant to the publication, the annual maintenance and operating cost ranges from 3% to 6% of the Capital Cost. 4.5% was used to estimate the annual maintenance and operating costs (which don't include the fuel and fuel transportation costs).
** Fuel and transportation costs vary greatly from one country to the next and one site to the next. Therefore, the accuracy of the estimate from the IRENA document may not be entirely representative of Valley sources.

Due to the high cost of the purchase and installation of these technologies, most of these types of projects have required funding from state, local, and federal governments. Questions remain as to whether these projects would be self-sustaining over the long term without incentives.

The District will make every effort to support the deployment of new technologies through incentive programs. Additionally, the District has an ongoing Technology Advancement Program solicitation to support the commercialization of technologies that provide alternatives to the open burning of biomass. Refer to Appendix F for a discussion of the District's Technology Advancement Program.

Air Curtain Burners

Air curtain burners may serve as a viable alternative to reducing emissions from open burning of agricultural waste**.** Air curtain burners have been shown to be up to 80% cleaner than open burning of wood waste, and when coupled with the District's smoke management systems have the potential to manage emissions from the disposal of agricultural waste very effectively. However, the process rate of these units (1 to 5 tons/hr) may limit the effectiveness of air curtain burners as a feasible alternative capable of handling the volume of agricultural waste generated in the Valley each year as it may take several units operating for multiple days just to process even small acreage removals. Nonetheless, the District is working to facilitate the use of air curtain burners to dispose of agricultural material under certain scenarios in combination with the District's smoke management systems.

The District will continue to evaluate alternatives to open burning of agricultural waste and will support the implementation of clean alternatives where technologically and economically feasible.

EVALUATION FINDINGS

District Rule 4103 remains more stringent than requirements for analogous rules in other regions and currently meets or exceeds RACM, BACM, and MSM level requirements for this source category. Additionally, due to the management of open burning under the District's comprehensive SMS, modeling conducted as part of this Plan demonstrates that this source category does not significantly contribute to attainment of the applicable PM2.5 standards. District analysis has confirmed for the development of this Plan that there continues to be a lack of feasible alternatives for open burning for the crop categories identified and there continues to be a lack of long-term federal and state funding commitments for the continued operation of biomass facilities in the Valley or development of alternatives to open burning as required by state law to phase out open burning of agricultural waste.

Despite the insignificant effect of this source category on attainment of the applicable PM2.5 standards and the lack of feasible alternatives to open burning, the District intends to maintain the restrictions currently contained within the rule while continuing to undertake efforts aimed at the development and deployment of feasible alternative technologies and practices to reduce open agricultural burning in the Valley. The District efforts will be conducted in close coordination with USDA-NRCS, agricultural sources, and researchers through established processes such as the Agricultural Technical Subcommittee. These efforts include the pursuit of the following:

- Continued implementation the District's Smoke Management System safeguards to ensure no adverse air quality impact from authorized agricultural open burning.
- Exploring the feasibility of utilizing air curtain burners subject to the District's Smoke Management System safeguards as an extension of agricultural operations.
- Continued support for state and federal financial assistance to promote cleaner alternatives for the disposal of agricultural waste.

- Development of new incentive programs to promote the development and deployment of emerging cleaner alternatives to the open burning of agricultural waste. In designing these programs, priority will be given to on-the-farm and scalable technologies including soil incorporation, advanced gasification technologies, and other alternatives, considering the full life-cycle of criteria pollutant emissions and associated impacts on air quality when assessing the feasibility of alternatives to open burning.

C.2 Rule 4104 (Emissions From The Reduction Of Animal Matter)

Discussion

Adopted in 1992, Rule 4104 limits the air contaminants from operations used for the reduction of animal matter by requiring gases, vapors, and gas-entrained effluent from the process to be incinerated at temperatures not less than 1200 degrees Fahrenheit or processed in an equally effective manner. Combustion units, the remaining portion of the operation that produces emissions, are regulated by other District rules; as such, those emissions are controlled by, and accounted for, as a part of other District rules.

Emissions Inventory

POLLUTANT	2013	2017	2019	2020	2022	2023	2024	2025	2026	2028
	Annual Average - Tons per day									
PM2.5	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Winter Average - Tons per day									
PM2.5	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Source Category

The reduction of animal matter source category includes rendering, cooking, drying, dehydration, digesting, evaporating, and protein concentration processes. The criteria pollutant emissions from this category are relatively small. The primary source of concern from this source category is odor, which is minimized through a venturi scrubber, cyclone, or packed bed scrubber for particulate matter control followed by a thermal oxidizer for VOC control. These facilities generally use steam from a boiler (indirect-fired) or a rotary dryer (direct-fired) for their operations, which generates NOx emissions from these combustion units; these combustion units are regulated by other District rules. There are currently seven active permitted units in the Valley.

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

Federal Regulations

There are no EPA CTG, ACT, NSPS, NESHAP, or MACT requirements for this source category.

State Regulations

There are no state regulations applicable to this source category.

HOW DOES DISTRICT RULE 4104 COMPARE TO RULES IN OTHER AIR DISTRICTS?

SCAQMD

- SCAQMD Rule 472 (Reduction of Animal Matter)

	SJVAPCD	SCAQMD
Applicability	Any source operation used for the reduction of animal matter.	Any equipment for the reduction of animal matter.
Exemption	Rule 4104 shall not apply to any article, machine, equipment or other contrivance used exclusively for the processing of food for human consumption.	Rule 472 shall not apply to any equipment used exclusively for the processing of food for human consumption.
Requirements	All gases, vapors and gas-entrained effluent from such an article, machine, equipment or other contrivance are incinerated at temperatures of not less than 1200°F for a period of not less than 0.3 seconds.	All gases, vapors and gas entrained effluents from equipment are incinerated at temperatures of not less than 650°C (1202°F) for a period of not less than 0.3 second.

BAAQMD

- BAAQMD Regulation 12 Rule 2 (Rendering Plants)

	SJVAPCD	BAAQMD
Applicability	Any source operation used for the reduction of animal matter.	Plants whose purpose is the reduction of animal matter, commonly referred to as rendering plants.
Exemption	Rule 4104 shall not apply to any article, machine, equipment or other contrivance used exclusively for the processing of food for human consumption.	No exemptions
Requirements	All gases, vapors and gas-entrained effluent from such an article, machine, equipment or other contrivance are incinerated at temperatures of not less than 1200°F for a period of not less than 0.3 seconds.	All gases, vapors and gas-entrained effluents are incinerated at a temperature of not less than 650°C (1202°F) for a period of not less than 0.3 seconds.

SMAQMD

- SMAQMD Rule 410 (Reduction of Animal Matter)

	SJVAPCD	SMAQMD
Applicability	Any source operation used for the reduction of animal matter.	Odors from animal matter reduction facilities by treatment of gases, vapors and gas-entrained effluents.
Exemption	Rule 4104 shall not apply to any article, machine, equipment or other contrivance used exclusively for the processing of food for human consumption.	Rule 410 shall not apply to any article, machine, equipment or other contrivance used exclusively for the processing of food for human consumption.

	SJVAPCD	SMAQMD
Requirements	All gases, vapors and gas-entrained effluent from such an article, machine, equipment or other contrivance are incinerated at temperatures of not less than 1200°F for a period of not less than 0.3 seconds.	All gases, vapors and gas-entrained effluents from such an article, machine, equipment or other contrivance are incinerated at temperatures of not less than 650°C (1202°F) for a period of not less than 0.3 seconds

VCAPCD

- VCAPCD Rule 58 (Reduction of Animal Matter)

	SJVAPCD	SMAQMD
Applicability	Any source operation used for the reduction of animal matter.	Any article, machine, equipment or other contrivance for the reduction of animal matter.
Exemption	Rule 4104 shall not apply to any article, machine, equipment or other contrivance used exclusively for the processing of food for human consumption.	Rule 58 shall not apply to processing of food for human consumption.
Requirements	All gases, vapors and gas-entrained effluent from such an article, machine, equipment or other contrivance are incinerated at temperatures of not less than 1200°F for a period of not less than 0.3 seconds.	All gases, vapors and gas entrained effluents from such an article, machine, equipment or other contrivance incinerated at temperatures of not less than 1300 degrees Fahrenheit for a period of not less than 0.4 seconds.

ADDITIONAL EMISSION REDUCTION OPPORTUNITIES

Packed Bed Scrubbers

The District evaluated the potential opportunity to reduce emissions if facilities were to replace their thermal oxidizers with packed bed scrubbers. In certain installations, packed bed scrubbers may be more efficient at removing PM from the exhaust and additionally do not generate NOx or SOx emissions. However, determining the scrubber medium may take some experimenting on the part of the facility 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 PM2.5 and are otherwise already required to have a high level of control for emissions, as shown in the above emissions inventory table.

Regenerative Thermal Oxidizers

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

through the District's Best Available Control Technology New Source Review requirements.

EVALUATION FINDINGS

The District has evaluated all potential control technologies and all control technologies achieved in practice in other areas or included in other state implementation plans for the reduction of animal matter. As demonstrated above, Rule 4104 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds RACM, BACM and MSM requirements for this source category.

C.3 Rule 4106 (Particulate Matter Emissions From Prescribed/Hazard Reduction Burning)

Discussion

Adopted in June 2001, Rule 4106 incorporates provisions made necessary by Title 17 of the California Code of Regulations. Recognizing the importance of both prescribed burning and hazard reduction burning, the purpose of Rule 4106 is to permit, regulate, and coordinate the use of prescribed burning and hazard reduction burning while minimizing smoke impacts on the public. Through Rule 4106, 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, reducing health impacts and air quality impacts.

The District works closely with land managers and participates in daily conference calls with Land Management Agencies (LMAs), CARB staff, fire weather meteorologists, and neighboring air districts to discuss potential smoke impacts from wildfires and prescribed burning. 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. Once a prescribed burn is commenced, District staff conducts inspections as needed to ensure the burn is conducted properly and determine if smoke is impacting downwind receptors.

The extreme drought experienced in the San Joaquin Valley and across the western United States has made trees in many regions of California susceptible to epidemic infestations of native bark beetles, which are constrained under normal circumstances by the defense mechanisms of healthy trees. These drought conditions and resulting bark beetle infestations across broad areas have caused vast tree mortality throughout several regions of the state. The scale of this tree die-off is unprecedented in modern history, with the United States Forest Service estimating that there are currently over 129 million dead trees across California. This tree die-off is of such a scale that California has reached an all-time high for fire danger and the potential for devastating wildfires.

Air pollution generated from wildfires poses a significant risk to public health as emissions can routinely overwhelm emission reduction efforts in the San Joaquin Valley and result in periods of excessively high particulate matter and ozone concentrations. Wildfires have the potential to generate tremendous emissions, depending on the acreage burned, fuel loading, and fuel type, and can easily exceed the entire emissions inventory in the Valley from stationary, area, and mobile sources. The length of time it takes for these emissions to occur depends on the severity of the wildfire. In addition to causing elevated PM2.5 concentrations, wildfires also generate and transport ozone precursors. When wildfire emissions are combined with the Valley's common summertime high temperatures and stagnant conditions, the potential for the production of peak ground level ozone is elevated.

Due to the tremendous health and safety risks caused by the tree mortality epidemic, in October 2015, the Governor of California issued a state of emergency proclamation.

The Governor's proclamation includes provisions to expedite the removal of dead and dying hazardous trees. This proclamation helps to identify high hazard zones for wildfire and falling trees, and also orders state and local agencies to take action to enable removal of hazard trees. Building on the emergency proclamation, in May 2018, the Governor issued an Executive Order which directs state agencies to work to reduce the threat of wildfires through improved forest management and restoration practices. The Order specifically directs CARB and local air districts to reduce barriers for prescribed burning projects and increase opportunities for prescribed burns as a means for reducing fuel loads and the threat of wildfires.

The District is committed to working with land managers and other stakeholders to support the expanded use of prescribed burning. District staff maintains a dialogue with the land managers and other stakeholders to craft and advance workable solutions. Every spring, the District holds the Valley Annual Cooperators' Meeting to provide a forum for the District and land management agencies to review the Unified Guidelines and Procedures for Smoke Management document and to discuss current smoke management issues. The land management agencies assess year-in-review/lessons learned, provide an outlook for the upcoming fire season, and share presentations. The District also actively participates in the Interagency Air and Smoke Council (IASC) and Air and Land Managers (ALM) annual meetings. The IASC meeting provides a forum for air regulators, land managers, and fire managers to discuss air quality and smoke management issues in California. The ALM meeting provides a forum for decision makers to gain a better perspective on federal, state and local issues associated with smoke management in California.

Due to the tree mortality epidemic, the need to reduce fuel across the forests through prescribed burning and mechanical vegetative thinning methods is increasingly important. Effective forest management is critical to improve the health of the forests, as well as to prevent catastrophic air quality impacts from wildfires in the region. The District will continue to advocate for more effective forest management, and is committed to working with land management agencies to facilitate the reduction in forest fuel loads through both prescribed burning and mechanical vegetative thinning.

EMISSIONS INVENTORY

POLLUTANT	2013	2017	2019	2020	2022	2023	2024	2025	2026	2028
	Annual Average - Tons per day									
PM2.5	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76
NOx	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
	Winter Average - Tons per day									
PM2.5	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
NOx	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10

SOURCE CATEGORY

Rule 4106 is applicable to all rangeland improvement burning, forest management burning, wildland vegetation management burning, and to hazard reduction burning in the wildland/urban interface within the Valley.

Most prescribed burning is conducted by state and federal land managers on public lands, with additional prescribed burning conducted by a variety of local entities, including utilities and private land owners. 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.[11] This disposal is usually in the form of burning, and as with prescribed burning, burning is only allowed if the District forecasts favorable meteorological and air quality conditions.

HOW DOES DISTRICT RULE 4106 COMPARE WITH FEDERAL AND STATE RULES AND REGULATIONS?

Federal Regulations

There are no EPA CTG, ACT, NSPS, NESHAP, or MACT requirements for this source category.

State Regulations

There are no state regulations applicable to this source category.

HOW DOES DISTRICT RULE 4106 COMPARE TO RULES IN OTHER AIR DISTRICTS?

SCAQMD

- SCAQMD Rule 444 (Open Burning***)*** *(Last amended July 12, 2013)*

The District evaluated the requirements contained within SCAQMD's Rule 444 and found no requirements that were more stringent than those already in Rule 4106.

	SJVAPCD	SCAQMD
Applicability	The provisions of this rule shall apply to all prescribed burning, and to hazard reduction burning in wildland/urban interface.	Agricultural burning, Disposal of Russian thistle, prescribed burning, fire prevention/suppression training, open detonation or use of pyrotechnics, fire hazard removal, disposal of infectious waste, other than hospital waste, research of testing materials, equipment or techniques, disposal of contraband, residential burning, beach burning
Exemptions	N/A	Fire suppression training by fire agencies, open burning to protect crops from freezing (requires emergency burn plan to be submitted), open burning on islands located 15 miles or more from the mainland, fireworks displays, explosives detonation, recreational fires/ceremonial

[11] 100-foot barrier of fire protection required pursuant to California Public Resources Code §4291

	SJVAPCD	SCAQMD
		fires. Food prep fires and fires "for warmth at social gatherings" are allowed.
Requirements	No burning of garbage or green waste is allowed. The District shall allocate burning based on the predicted meteorological conditions and whether the total tonnage to be emitted would allow the volume of smoke and other contaminants to impact smoke sensitive areas, or create or contribute to an exceedance of an ambient air quality standard. Specific requirements for minimizing smoke, using approved ignition devices, and having vegetation be free of dirt, soil, and moisture. **Prescribed Burning** Specific requirements for prescribed burn conductors to have taken a prescribed burning smoke management training class approved by the APCO. Additional prescribed burn requirements detailed by project size. **Permits for Hazard Reduction Burning** No Hazard Reduction Burning shall take place without a permit. A Permit shall be valid only on those days during which burning is not prohibited by the CARB, by the District or other designated agencies. Further administrative requirements and Smoke Management Plan requirements are outlined by project size.	Burning of waste/garbage is prohibited. No burning unless it is a permissive burn day or a marginal burn day on which burning is permitted in the applicable source/receptor area and such burning is not prohibited by the applicable public fire protection agency. Specific requirements for burn authorization requests and permit conditions for each category of burning (similar to SJV).

BAAQMD

- BAAQMD Regulation 5 (Open Burning) (*Last amended June, 19, 2013)*

The District evaluated the requirements contained within BAAQMD's Regulation 5 and found no requirements that were more stringent than those already in Rule 4106.

	SJVAPCD	BAAQMD
Applicability	The provisions of this rule shall apply to all prescribed burning, and to hazard reduction burning in wildland/urban interface.	Open burning in the BAAQMD
Exemption	N/A	Fires set only for cooking of food for human beings; fires burning as safety flares or for the combustion of waste gases; the use of flame cultivation when the burning is performed with LPG or natural gas-fired burners designed and used to kill seedling grass and weeds and the growth is such that the combustion will not continue without the burner; fires set for the purposes of fire training using one gallon or less of

	SJVAPCD	BAAQMD
		flammable liquid per fire; further requirements for conditional exemptions (similar to SJV).
Requirements	No burning of garbage or green waste is allowed. The District shall allocate burning based on the predicted meteorological conditions and whether the total tonnage to be emitted would allow the volume of smoke and other contaminants to impact smoke sensitive areas, or create or contribute to an exceedance of an ambient air quality standard. Specific requirements for minimizing smoke, using approved ignition devices, and having vegetation be free of dirt, soil, and moisture. **Prescribed Burning** Specific requirements for prescribed burn conductors to have taken a prescribed burning smoke management training class approved by the APCO. Additional prescribed burn requirements detailed by project size. **Permits for Hazard Reduction Burning** No Hazard Reduction Burning shall take place without a permit. A Permit shall be valid only on those days during which burning is not prohibited by the CARB, by the District or other designated agencies. Further administrative requirements and Smoke Management Plan requirements are outlined by project size.	Recreational fires allowed on non-curtailment days; on permissive burn days the following fires are allowed with permission from the APCO (specific requirements for each category): disease and pest, crop replacement, orchard pruning and attrition, double cropping stubble, stubble, hazardous materials (hazard reduction burning), fire training, flood debris, irrigation ditches, flood control, range management, forest management, marsh management, contraband, filmmaking, and public exhibition.

SMAQMD

- SMAQMD Rule 501(Agricultural Burning) *(Last amended April 3, 1997)*

Rule 501 applies to the burning of agricultural waste, including forest management and prescribed burning. The District evaluated the requirements contained within SMAQMD's Rule 501 and found no requirements that were more stringent than those already in Rule 4106. Rule 501 was last amended April 3, 1997.

	SJVAPCD	SMAQMD
Applicability	The provisions of this rule shall apply to all prescribed burning, and to hazard reduction burning in wildland/urban interface.	Agricultural burning, including: agricultural waste (trees, prunings, rice straw and stubble, field crop residue) disease prevention, range improvement, wildlife/game habitat, irrigation system management, forest management, wild land vegetation management, paper containers of agricultural chemicals
Exemption	N/A	Similar exemptions as Valley for agricultural operations, including burning of bags used for agricultural chemicals and emergency agricultural burns which would cause economic loss if denied.
Requirements	No burning of garbage or green waste is allowed. The District shall allocate burning based on the predicted meteorological conditions and whether the total tonnage to be emitted would allow the volume of smoke and other contaminants to impact smoke sensitive areas, or create or contribute to an exceedance of an ambient air quality standard. Specific requirements for minimizing smoke, using approved ignition devices, and having vegetation be free of dirt, soil, and moisture. **Prescribed Burning** Specific requirements for prescribed burn conductors to have taken a prescribed burning smoke management training class approved by the APCO. Additional prescribed burn requirements detailed by project size. **Permits for Hazard Reduction Burning** No Hazard Reduction Burning shall take place without a permit. A Permit shall be valid only on those days during which burning is not prohibited by the CARB, by the District or other designated agencies. Further administrative requirements and Smoke Management Plan requirements are outlined by project size.	Permit holder must contact District for permission to burn and ensure that it is not a No Burn day, and must contact the fire protection agency having jurisdiction over the burn location. Specific drying time requirements for different agricultural materials (similar to SJV)

VCAPCD

- VCAPCD Rule 56 (Open Burning) *(Last amended November 11, 2003)*

The District evaluated the requirements contained within VCAPCD's Rule 56 and found no requirements that were more stringent than those already in Rule 4106.

	SJVAPCD	VCAPCD
Applicability	The provisions of this rule shall apply to all prescribed burning, and to hazard reduction burning in wildland/urban interface.	Combustible materials in open outdoor fires, including prescribed burning
Exemption	N/A	This rule shall not apply to open outdoor fires used only for the heating or cooking of food for human consumption or for recreational purposes when such fires are confined to a fireplace or barbecue pit. Flag burning, fire suppression training, fire agency/public officer allowed to set fires to reduce hazards as needed (similar to SJV).
Requirements	No burning of garbage or green waste is allowed. The District shall allocate burning based on the predicted meteorological conditions and whether the total tonnage to be emitted would allow the volume of smoke and other contaminants to impact smoke sensitive areas, or create or contribute to an exceedance of an ambient air quality standard. Specific requirements for minimizing smoke, using approved ignition devices, and having vegetation be free of dirt, soil, and moisture. **Prescribed Burning** Specific requirements for prescribed burn conductors to have taken a prescribed burning smoke management training class approved by the APCO. Additional prescribed burn requirements detailed by project size. **Permits for Hazard Reduction Burning** No Hazard Reduction Burning shall take place without a permit. A Permit shall be valid only on those days during which burning is not prohibited by the CARB, by the District or other designated agencies.	Permit required for open burning, burning only allowed on permissive burn days. Open burning is allowed for the following purposes only: a. The disposal of agricultural wastes in the pursuit of agricultural operations. b. Range improvement burning. c. Wildland vegetation management burning. d. Levee, reservoir or ditch maintenance. e. The disposal of Russian thistle (Salsola kali or tumbleweed). Specific burn times, drying times, and permit conditions also specified (similar to SJV). Drying times not applicable to prescribed burns. Requirements for Smoke Management Plans detailed.

	SJVAPCD	VCAPCD
	Further administrative requirements and Smoke Management Plan requirements are outlined by project size.	

Placer County Air Pollution Control District (PCAPCD)

- PCAPCD Rule 301 (Nonagricultural Burning Smoke Management) *(Last amended February 9, 2012)*

The District evaluated the requirements contained within PCAPCD Rule 301 and found no requirements that were more stringent than those already in Rule 4106.

	SJVAPCD	PCAPCD
Applicability	The provisions of this rule shall apply to all prescribed burning, and to hazard reduction burning in wildland/urban interface.	Fire hazard reduction burning, mechanized burners, fires set or permitted by public officers, and right of way clearing, levee, ditch, and reservoir maintenance, to better manage smoke in order to reduce its effects.
Exemption	N/A	Fire hazard reduction burning, recreational or cooking Fires, flag burning, are exempted. Certain burning categories are exempted from drying time requirements.
Requirements	No burning of garbage or green waste is allowed. The District shall allocate burning based on the predicted meteorological conditions and whether the total tonnage to be emitted would allow the volume of smoke and other contaminants to impact smoke sensitive areas, or create or contribute to an exceedance of an ambient air quality standard. Specific requirements for minimizing smoke, using approved ignition devices, and having vegetation be free of dirt, soil, and moisture. **Prescribed Burning** Specific requirements for prescribed burn conductors to have taken a prescribed burning smoke management training class approved by the APCO. Additional prescribed burn requirements detailed by project size.	Only vegetation originating on the premises which is reasonably free of dirt, soil, and visible surface moisture may be burned. A person shall not ignite or allow open outdoor burning without first obtaining a valid burn permit from the District. No burn permit shall be construed to authorize open outdoor fires for any day during when it is a no-burn day, or open burning is prohibited by a fire protection agency for fire control or prevention. Additional requirements for drying times, approved ignition devices, wind direction, 24 hour burn limit, and administrative requirements (similar to SJV).

	SJVAPCD	PCAPCD
	Permits for Hazard Reduction Burning No Hazard Reduction Burning shall take place without a permit. A Permit shall be valid only on those days during which burning is not prohibited by the CARB, by the District or other designated agencies. Further administrative requirements and Smoke Management Plan requirements are outlined by project size.	

ADDITIONAL EMISSION REDUCTION OPPORTUNITIES

Beyond the review of current regulation and rule requirements, the District performed an extensive review of the feasibility of technologies and measures that have been implemented in practice in other regions and potential new technologies and measures that may be feasible for implementation in the near future.

While there are many factors that need to be evaluated and addressed in the pursuit of minimizing fuel buildup, more effective use of prescribed burning is an area where the District has direct regulatory authority and can take action. The District has long been supportive of fuel reduction efforts including prescribed burns, advocating that reducing fuels in a responsible way will improve the health of the forests and improve future air quality by lessening the severity of wildfires. Despite these efforts, the forest fuel buildup has continued to increase at an alarming rate over the years due to decades of forest mismanagement, with fire danger being at an all-time high due to the recent catastrophic tree mortality from the drought and pest infestation. This long-term buildup of forest fuel poses a significant risk of large-scale wildfires with potential devastating impacts on air quality and public health. This has increased the need and urgency for greater forest fuel reductions. Based on direction received from the District's Governing Board in November 2015, and input from land management agencies, the District has become even more flexible when identifying permissive burn days for prescribed burning, which has assisted in a more rapid reduction of fuels. These efforts will assist in further using prescribed burning as a measure to prevent catastrophic wildfires while simultaneously minimizing health impacts for local residents.

Mechanical Removal of Forest Biomass

Given the catastrophic nature of wildfires, contradictory environmental concerns that preclude the use of mechanized equipment to dispose of fuel supplies need further examination. On one hand there is concern that the transportation and operation of logging equipment can damage wildland ecosystems and impact endangered and threatened species, and that mechanical harvesting of vegetative fuel supplies could lead to overharvesting of the forests. On the other hand, if left unchecked, the fuel buildup can lead to large wildfires that cause the destruction of the very species that were intended to be protected by policies such as those under the federal Wilderness Act, and in turn result in devastating public health impacts due to air pollution. The

District will work with federal land managers and environmental stakeholders to ascertain the wildland areas where ecosystem and species impacts are of less concern, and support mechanical fuel reduction methods as appropriate.

The District analyzed the possibility of mechanical removal as an alternative to prescribed burning, but found that mechanical removal of forest biomass was infeasible as a required alternative to prescribed burning, due to the inaccessibility of mountain terrain and the extreme amount of forest acreage needing biomass management.

However, the District will support the use of mechanical removal where feasible. Fire agencies are procuring and deploying chippers, portable saw mills, masticators and air curtain burners throughout the state, but primarily in the forested land surrounding the Valley. This process has been facilitated by emergency exemptions that have been invoked by CARB to waive the requirements for portable equipment and certain off-road equipment.

Air Curtain Burners

While air curtain burners are capable of being deployed in some areas of the forest and are a viable alternative to reduce emissions from prescribed burning in some cases, these units are limited in their ability to be a large-scale solution to the management of forest biomass. Forest managers face challenges in being able to locate the units in remote areas, and the equipment and staff time necessary to operate the units makes the wide-spread operation of air curtain burners economically infeasible for land management agencies. Additionally, to prevent an accidental fire, air curtain burners must be operated in a cleared area, representing further challenges to the broad deployment of this technology. The vast amount of remote acreage and huge number of diseased or dead trees that must be removed from California forests make it infeasible for air curtain burners to be a regulatory requirement or a large-scale alternative to prescribed burning.

Due to the emissions reductions achieved through the use of air curtain burners, the District will support the deployment of air curtain burners for use where feasible. The use of air curtain burners has been hindered by regulatory hurdles at the federal level. EPA has opined that air curtain burners are subject to the federal New Source Performance Standard for Other Solid Waste Incinerators, which only allows exemptions for emergency or disaster relief for up to 8 weeks. To comply with the requirements beyond the 8-week period, the operator must comply with certain emission limitations and obtain a Title V operating permit which adds cost and complexity to the use of these devices. To provide some administrative relief, the District, along with members of the task force, were able to work with EPA to interpret the regulation as not requiring the Title V permits for at least 30 months after the units begin operation. The exemption from Title V Permitting Requirements for Air Curtain Incinerators was sent by letter from EPA to the California Air Pollution Control Officers Association on February 16, 2017. The District will continue to support the use of air curtain burners as an alternative to prescribed burning where feasible.

District Support of Forest-Specific Biomass Projects

The District will also explore other avenues to encourage and support forest-specific biomass projects, such as the North Fork CDC Biomass Plant project in Madera County. This 2 MW power plant will gasify hazard-reduction forest material, where the gas is then burned in an exhaust-controlled environment that produces very low levels of NOx. This project has been permitted and construction has commenced. The successful operation of this plant will be an important demonstration of gasification technology as a viable alternative to the open burning of forest debris. The operation of this project complements the Governor's October 30, 2015, State of Emergency Proclamation that directs state agencies to implement a number of measures to accelerate the removal of fuel in the state's forests, and which includes extending and expediting power purchase agreements with biomass facilities, seeking additional funding for biomass facilities to help offset higher feedstock costs, and exempting projects under the proclamation from Californai Environmental Quality Act requirements.

Due to the scale of acreage that requires management and due to access issues to remote forest areas, this is not a technologically feasible regulatory alternative to prescribed burning. However, the District will work to support forest-specific biomass projects in an effort to reduce transport emissions created from hauling forest biomass to the Valley floor for further processing.

EVALUATION FINDINGS

The District has evaluated all potential control technologies and all control technologies achieved in practice in other areas or included in other state implementation plans for this source category. As demonstrated above, Rule 4106 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds RACM, BACM, and MSM requirements for this source category. No further emission reduction opportunities were found. Due to extensive forest mortality and the critical need to reduce the risks of catastrophic wildfires through prescribed burning in the region, District staff do not recommend any additional regulatory measures at this time.

As directed by the District's Governing Board in November 2015, District staff will continue to work to facilitate effective use of prescribed burning as a means to reduce the number and severity of future wildfires. The District will continue to work with local, state, and federal land managers and fire suppression agencies in an ongoing effort to identify gaps in land management and fire suppression policies and practices and develop solutions. The District will support federal and state legislation focused on enhancing and preserving funding for land and forest management. Additionally, the District will support and pursue legislative or administrative initiatives to allow for mechanical removal of forest fuel buildup in high-hazard zones.

C.4 Rule 4203 (Incineration of Combustible Refuse)

Discussion

Rule 4203 limits the concentration of particulate matter emissions based on process weight rates, and prohibits the discharge of visible emissions. The rule was originally adopted on May 21, 1992 and subsequently amended for District rule number reorganization on December 17, 1992. The facility subject to this rule currently implements BACT level requirements which require the mitigation of air pollution to the maximum degree achievable using control technologies like baghouses and lime scrubbers.

Emissions Inventory

POLLUTANT	2013	2017	2019	2020	2022	2023	2024	2025	2026	2028
	Annual Average - Tons per day									
PM2.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NOx	0.00	0.00	0.00	0.00	0.00	0.0	0.00	0.00	0.00	0.00
	Winter Average - Tons per day									
PM2.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Source Category

The incineration of combustible refuse source category includes any person, operation, or facility who uses an incinerator or other equipment to dispose of or process combustible refuse by incineration. There is currently one facility in operation in the Valley subject to Rule 4203. This facility uses a baghouse to control particulate emissions and lime slurry dry scrubber for the control of SO2 and acid gas emissions.

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

Federal Regulations

There are no specific federal guidelines for particulate matter concentrations in terms of NSPS, CTG, ACT, MACT, and NESHAP. EPA BACT standards require the use of a fabric filter or baghouse. District BACT standards are as stringent and require the use of natural gas supplemental fuel with a baghouse.

State Regulations

There are no state regulations applicable to this source category.

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

There are no comparable rules for this source category in BAAQMD or in SMAQMD.

SCAQMD

- SCAQMD Rule 473 (Disposal of Solid and Liquid Wastes) (*Adopted May 7, 1976, no amendments)*

SCAQMD Rule 473 regulates the disposal of solid and liquid wastes by requiring the operator to use a multiple-chamber incinerator or in equipment found by SCAQMD to be equally effective for the purpose of air pollution control. The District evaluated the requirements contained within SCAQMD Rule 473 and found no requirements that were more stringent than those already in District Rule 4203.

	SJVAPCD	SCAQMD
Applicability	The provisions of this rule shall apply to any person, operation, facility, incinerator or equipment used to dispose of or process combustible refuse.	Persons who burn combustible refuse in any incinerator except in a multi-chamber incinerator.
Exemption	The provisions of this rule shall not apply to incinerators which have been approved by the governing fire control agency and which are used to dispose of residential rubbish by open burning as permitted by Rule 4103 (Open Burning).	Multi-chamber incinerators
Requirements	- A person shall not discharge into the atmosphere from any incinerator or other equipment used to dispose of or process combustible refuse by burning, having burning rates greater than 100 pounds per hour, particulate matter in excess of 0.10 grain per cubic foot of gas calculated to 12% of carbon dioxide (CO2) at dry standard conditions, except as provided in Section 4.3 of the Rule. - A person shall not discharge into the atmosphere from any incinerator or other equipment used to dispose of or process combustible refuse by burning, having burning rates less than or equal to 100 pounds per hour, particulate matter in excess of 0.30 grain per cubic foot of gas calculated to 12% of carbon dioxide (CO2) at dry standard conditions, except as provided in Section 4.3 of the Rule. - A person shall not discharge into the atmosphere from any incinerator or other equipment used to dispose of combustible refuse by burning, particulate matter in excess of 0.10 pounds per 100 pounds of combustible refuse charged. A person meeting this requirement is not required to meet Sections 4.1 and 4.2 of the Rule. - A person shall not discharge into the atmosphere from any incinerator or other equipment used to dispose of combustible refuse by burning any particles which are individually large enough to be visible while suspended in the atmosphere. - Any carbon dioxide produced by combustion of any liquid or gaseous fuel shall be excluded from the calculation to 12% of carbon dioxide (CO2).	(a) A person shall not burn any combustible refuse in any incinerator except in a multiple-chamber incinerator or in equipment found by the Air Pollution Control Officer to be equally effective for the purpose of air pollution control. (b) A person shall not discharge into the atmosphere from any incinerator or other equipment used to dispose of combustible refuse by burning, having design burning rates greater than 50 kilograms (110 pounds) per hour, except as provided in subsection (d) below, particulate matter in excess of 0.23 gram per cubic meter (0.1 grain per cubic foot) of gas calculated to 12 percent of carbon dioxide (CO2) at standard conditions averaged over a minimum of 15 consecutive minutes and shall not discharge particles which are individually large enough to be visible while suspended in the atmosphere. Any carbon dioxide (CO2) produced by combustion of any liquid or gaseous fuels shall be excluded from the calculation of 12 percent of carbon dioxide (CO2) produced by combustion of any liquid or gaseous fuels shall be excluded from the calculation to 12 percent of carbon dioxide (CO2). (c) A person shall not discharge into the atmosphere from any equipment whatsoever, used to process combustible refuse, except

	SJVAPCD	SCAQMD
		as provided in subsection (d) below, particulate matter in excess of 0.23 gram per cubic meter (0.1 grain per cubic foot) of gas calculated to 12 percent of carbon dioxide (CO2) at standard conditions averaged over a minimum of 15 consecutive minutes. Any carbon dioxide (CO2) produced by combustion of any liquid or gaseous fuels shall be excluded from the calculation to 12 percent of carbon dioxide (CO2). (d) A person shall not discharge into the atmosphere from any incinerator or other equipment used to dispose of combustible refuse by burning, having design burning rates of 50 kilograms (110 pounds) per hour or less, or for which an application for permit was filed before January 1, 1972, particulate matter in excess of 0.69 gram per cubic meter (0.3 grain per cubic foot) of gas calculated to 12 percent of carbon dioxide (CO2) at standard conditions averaged over a minimum of 15 consecutive minutes and shall not discharge particles which are individually large enough to be visible while suspended in the atmosphere. Any carbon dioxide (CO2) produced by combustion of any liquid or gaseous fuels shall be excluded from the calculation to 12 percent of carbon dioxide (CO2).

VCAPCD

- VCAPCD Rule 57 (Incinerators) *(Last amended January 11, 2005)*

VCAPCD Rule 57 is applicable to equipment used for the disposal of solid or liquid combustible refuse by burning in an incinerator or equipment found by VCAPCD to be equally effective for the purpose of air pollution control. The District evaluated the requirements contained within VCAPCD Rule 57 and found no requirements that were more stringent than those already in District Rule 4203.

	SJVAPCD	VCAPCD
Applicability	The provisions of this rule shall apply to any person, operation, facility, incinerator or equipment used to dispose of or process combustible refuse.	This rule applies to equipment used for the disposal of solid or liquid combustible refuse by burning.
Exemption	The provisions of this rule shall not apply to incinerators which have been approved by the governing fire control	This rule shall not apply to: 1. Crematoriums

	SJVAPCD	VCAPCD
	agency and which are used to dispose of residential rubbish by open burning as permitted by Rule 4103 (Open Burning).	2. Process equipment such as ovens used to remove contaminants or components from a part or assembly.
Requirements	- A person shall not discharge into the atmosphere from any incinerator or other equipment used to dispose of or process combustible refuse by burning, having burning rates greater than 100 pounds per hour, particulate matter in excess of 0.10 grain per cubic foot of gas calculated to 12% of carbon dioxide (CO2) at dry standard conditions, except as provided in Section 4.3 of the Rule. - A person shall not discharge into the atmosphere from any incinerator or other equipment used to dispose of or process combustible refuse by burning, having burning rates less than or equal to 100 pounds per hour, particulate matter in excess of 0.30 grain per cubic foot of gas calculated to 12% of carbon dioxide (CO2) at dry standard conditions, except as provided in Section 4.3 of the Rule. - A person shall not discharge into the atmosphere from any incinerator or other equipment used to dispose of combustible refuse by burning, particulate matter in excess of 0.10 pounds per 100 pounds of combustible refuse charged. A person meeting this requirement is not required to meet Sections 4.1 and 4.2 of the Rule. - A person shall not discharge into the atmosphere from any incinerator or other equipment used to dispose of combustible refuse by burning any particles which are individually large enough to be visible while suspended in the atmosphere. - Any carbon dioxide produced by combustion of any liquid or gaseous fuel shall be excluded from the calculation to 12% of carbon dioxide (CO2).	1. No person shall burn solid or liquid combustible refuse in an incinerator except in a multiple chamber incinerator, or in equipment approved by the APCO and the U.S. Environmental Protection Agency to be equally effective for the purpose of air pollution control. 2. No incinerator shall discharge particles individually large enough to be visible while suspended in the atmosphere.

EVALUATION FINDINGS

The District has evaluated all potential control technologies and all control technologies achieved in practice in other areas or included in other state implementation plans for this source category. As demonstrated above, Rule 4203 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds RACM, BACM and MSM requirements for this source category.

C.5 RULE 4204 (COTTON GINS)

DISCUSSION

Cotton ginning is the process of separating the lint from the seed. Cotton gins have been operating within the San Joaquin Valley for decades and have become a highly efficient industry producing millions of bales of cotton. Modern ginning uses pneumatic conveyance, in the form of fans blowing air, which moves the cotton material throughout the ginning process. Particulate matter emissions are the unwanted by-products of this efficient means of transferring massive quantities of cotton material from one process to the next process, such as from the unloading stage to drying and cleaning stages. Since cotton gins use large quantities of air for conveying, cyclones are used for air pollution abatement. PM emissions from cotton ginning facilities occur mostly during a three-month period from October to December.

While the principle function of the cotton gin is to separate lint from seed, the gin must also be able to remove foreign matter, moisture, and other contaminants that significantly reduce the value of the ginned lint. Currently, all cotton gins in the Valley are required to operate using high-efficiency 1D-3D cyclones.

EMISSIONS INVENTORY

POLLUTANT	2013	2017	2019	2020	2022	2023	2024	2025	2026	2028
	Annual Average - Tons per day									
PM2.5	0.22	0.23	0.24	0.24	0.25	0.25	0.25	0.26	0.26	0.27
NOx	0.00	0.00	0.00	0.00	0.00	0.0	0.00	0.00	0.00	0.00
	Winter Average - Tons per day									
PM2.5	0.35	0.36	0.37	0.37	0.38	0.39	0.39	0.40	0.40	0.42
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

SOURCE CATEGORY

Rule 4204 was adopted on February 17, 2005, as part of the District's strategy to reduce PM10 emissions and to attain the federal standards for the 2003 PM10 Plan. Rule 4204 limits particulate matter emissions from cotton ginning operations.

HOW DOES DISTRICT RULE 4204 COMPARE WITH FEDERAL AND STATE RULES AND REGULATIONS?

Federal Regulations

There are no federal CTGs, ACTs, NSPSs, NESHAPs, or MACTs that are specific to cotton gins

No California state regulations have been identified that are applicable to cotton gins. However, the District has identified regulations in other states that have requirements applicable to cotton gins. These include the following regulations:

- New Mexico Administrative Code (NMAC) 20.2.66.1 (Cotton Gins)

- North Carolina Administrative Code (NCAC) Title 15A, Subchapter 2D, Section .0542 (Control of Particulate Emissions from Cotton Ginning Operations)
- South Carolina Air Pollution Control Regulations and Standards (SCAPCR), Regulation 61-62.5, Standard No. 4, Section V (Cotton Gins)
- Oklahoma Department of Environmental Quality (ODEQ), Air Pollution Control, 252:100-23 (Cotton Gins)
- Texas Commission on Environmental Quality (TECQ), Air Quality Standard Permit for Cotton Gin Facilities and Cotton Burr Tub Grinders

New Mexico Administrative Code (NMAC) 20.2.66.1 (Cotton Gins) (*Adopted April 7, 2005*)

The District compared the requirements of District Rule 4204 with the requirements contained within NMAC 20.2.66.1.

	SJVAPCD	NMAC
Applicability	The provisions of this rule shall apply to all cotton ginning facilities within the District.	All persons who intend to construct or modify a cotton ginning facility as defined in this part, except as otherwise provided by this part.
Exemption	Cotton ginning facilities used for research purposes and limited to throughputs of not more than 4,000 pounds of seed cotton processed per day shall be exempt from the requirements of Section 5.0.	None specifically identified.
Requirements	All emission points shall be controlled by 1D-3D cyclones or rotary drum filters. New cyclones or replacement parts of existing 1D-3D cyclones shall have the dimensional characteristics of the Enhanced 1D-3D cyclone, or the 1D-3D with a 2D-2D inlet and an expansion chamber trash outlet.	<u>High Pressure Exhaust:</u> Exhaust shall be controlled by the use of a high efficiency cyclone dust collectors. High-efficiency cyclone dust collector means any cyclone collector of the 2D-2D or 1D-3D configuration. <u>Low Pressure Exhaust:</u> Exhausts shall be controlled by the use of screens with a mesh size of 70 by 70 or finer, or the use of perforated condenser drums with holes not exceeding 0.045 inches in diameter, or with equipment of equivalent or higher design efficiency, as determined by the department.

	Driver-under or pull through trash collection system for load-out purposes shall not load trash into a hopper or trailer unless one or more the following are utilized: • The trash loading area has an enclosure with four sides that are higher than the trash auger; at least two sides shall be solid and the remaining sides shall: have a flexible wind barrier, which extends below the top of the trash trailer sides; or have solid doors that remain shut while trash trailers are being loaded, except as necessary to accommodate trailer movement; or have a combination of flexible wind barriers and solid doors. • A solid-sided trailer is used when there is no enclosure, and the trash auger and opening of the loading device have a flexible shroud that extends just below the top of the trailer's solid sides, or • Fugitive PM10 emissions from load-out areas are reduced by an alternative method, which is approved by the APCO and the EPA. An owner/operator shall not operate a trash conveyance system dumping directly into a pile unless it meets the following requirements: • Both sides of the trash auger shall be equipped with wind barriers that extend, as measured vertically prior to trash pile build-up, one foot above and three feet below the auger or with an alternative control approved by the APCO and the EPA. • After the pile has built up to the height of the trash auger, removing material from the pile shall be performed in such a way as to prevent free-falling trash from the stockpiling system. Dust management plans for facilities are subject to the requirements in District Rules 8011, 8021, 8031, 8041, 8051, 8061, 8071, and 8081.	Permits shall include a fugitive dust management plan that includes the complete enclosure of the burr hoppers, the control of fugitive dust emissions from inside the gin building, the control of fugitive dust emissions from outside the gin building.

	SJVAPCD	NMAC
	Requirements for cotton gin dryers are included in District Rule 4309, *Dryers, Dehydrators, and Ovens*.	Opacity and fuel type limitations for fuel burning equipment.

The NMAC regulation requires the use of 2D-2D or 1D-3D cyclones on the exhaust of high pressure systems only while District Rule 4204 requires all systems to be controlled with 1D-3D cyclones. District Rule 4204 also requires that new cyclones be Enhanced 1D-3D cyclones with high control efficiency. Texas A&M reports tested efficiencies of 97% for 1D-3D cyclones up to 99% for Enhanced 1D-3D cyclones. Therefore, District Rule 4204 requirements result in higher PM control efficiency as compared to NMAC regulation requirements.

The NMAC regulation still allows screened enclosures on low pressure air systems while, as mentioned above, District Rule 4204 requires the use of high efficiency cyclone on all air systems. Therefore, the District rule is significantly more stringent with respect to trash systems.

While NMAC requires burr hoppers to be fully enclosed, District Rule 4204 requires that the trash loading area be an enclosure with four sides higher than the trash auger, which is equivalent to the NMAC requirement. In California cotton gins, all burrs (the hard casing around the cotton fiber) are captured in the trash system. District Rule 4204 is more stringent in this area as well.

Therefore, overall, District Rule 4204 is more stringent than the NMAC 20.2.66.1 regulation applying to cotton gin operations.

North Carolina Administrative Code (NCAC) Title 15A, Subchapter 2D, Section .0542 (Control of Particulate Emissions from Cotton Ginning Operations)
(Amended June 1, 2018)

The District compared the requirements of District Rule 4204 with the requirements contained within NCAC 02D.0542.

	SJVAPCD	NCAC
Applicability	The provisions of this rule shall apply to all cotton ginning facilities within the District.	All existing, new, and modified cotton ginning operations.

	SJVAPCD	NCAC
Exemption	Cotton ginning facilities used for research purposes and limited to throughputs of not more than 4,000 pounds of seed cotton processed per day (equivalent to 4 bales/day at a trash-to-cotton ratio of 1-to-1) shall be exempt from the requirements of Section 5.0.	Existing facilities with a maximum rated capacity of less than 20 bales per hour that do not have cyclones on lint cleaners and battery condensers are not required to add emission control devices to lint cleaning exhausts and/or batter condenser exhausts if emissions from the lint cleaning and/or battery condenser are controlled by fine mesh screens.
Requirements	All emission points shall be controlled by 1D-3D cyclones or rotary drum filters. New cyclones or replacement parts of existing 1D-3D cyclones shall have the dimensional characteristics of the Enhanced 1D-3D cyclone, or the 1D-3D with a 2D-2D inlet and an expansion chamber trash outlet.	<u>High Pressure Exhaust:</u> Control all high pressure exhausts and lint cleaning exhausts with an emission control system that includes: • one or more 1D-3D or 2D-2D cyclones to achieve 95 percent efficiency; or • a device with at least a 95 percent efficiency. <u>Low Pressure Exhaust:</u> Control all low pressure exhausts, except lint cleaning exhausts, with an emission control system that includes: • one or more 1D-3D or 2D-2D cyclones to achieve 90 percent efficiency; or • a device with at least a 90 percent efficiency.
	Driver-under or pull through trash collection system for load-out purposes shall not load trash into a hopper or trailer unless one or more the following are utilized: • The trash loading area has an enclosure with four sides that are higher than the trash auger; at least two sides shall be solid and the remaining sides shall: have a flexible wind barrier, which extends below the top of the trash trailer sides; or have solid doors that remain shut while trash trailers are being loaded, except as necessary to accommodate trailer movement; or have a	Minimize fugitive emissions by designing and maintaining trash systems, the gin yard, and the traffic area according to the guidelines in the regulation.

	SJVAPCD	NCAC
	combination of flexible wind barriers and solid doors. • A solid-sided trailer is used when there is no enclosure, and the trash auger and opening of the loading device have a flexible shroud that extends just below the top of the trailer's solid sides, or • Fugitive PM10 emissions from load-out areas are reduced by an alternative method, which is approved by the APCO and the EPA. An owner/operator shall not operate a trash conveyance system dumping directly into a pile unless it meets the following requirements: • Both sides of the trash auger shall be equipped with wind barriers that extend, as measured vertically prior to trash pile build-up, one foot above and three feet below the auger or with an alternative control approved by the APCO and the EPA. • After the pile has built up to the height of the trash auger, removing material from the pile shall be performed in such a way as to prevent free-falling trash from the stockpiling system. Dust management plans for facilities are subject to the requirements in District Rules 8011, 8021, 8031, 8041, 8051, 8061, 8071, and 8081.	

The NCAC regulation requires the use of 2D-2D or 1D-3D cyclones while District Rule 4204 requires 1D-3D cyclones. District Rule 4204 also requires that new cyclones be Enhanced 1D-3D cyclones with high control efficiency, which exceeds standard 1D-3D cyclones control efficiency. For cyclones controlling exhaust on high pressure systems, the NCAC also specifies a 95% control efficiency. Texas A&M reports tested efficiencies of 97% for 1D-3D cyclones up to 99% for Enhanced 1D-3D cyclones. Therefore, District Rule 4204 requiring the use of 1D-3D cyclones on all systems and also requiring that new cyclones be Enhanced 1D-3D cyclones with PM control efficiency up to 99% exceeds NCAC requirements for high pressure systems with 95% PM control efficiency.

On low pressure systems, the NCAC regulation requires the use of 2D-2D or 1D-3D cyclones and identifies a 90% PM control efficiency. As discussed above, District Rule 4204 requires the use of 1D-3D cyclones or Enhanced 1D-3D cyclones when installing new cyclones. As mentioned, Texas A&M reports tested efficiencies of 97% for 1D-3D cyclones up to 99% for Enhanced 1D-3D cyclones. Therefore, District Rule 4204 requiring the use of 1D-3D cyclones or new Enhanced 1D-3D cyclones with PM control efficiency up to 99% exceeds NCAC requirements for low pressure systems with 90% PM control efficiency.

The NCAC regulation also provides an exemption for operations processing less than 20 bales per hour, which could represent approximately 20,000 bales per season. Since the District rule does not have such exemption (only contains a research-targeted exemption at less than 4 bales/day), District Rule 4204 is more stringent in this area as well.

Therefore, overall, District Rule 4204 is more stringent than the NCAC 02D.0542 regulation applying to cotton gin operations.

South Carolina Air Pollution Control Regulations and Standards (SCAPCR), Regulation 61-62.5, Standard No. 4, Section V (Cotton Gins) (*Amended September 23, 2016*)

The District compared the requirements of District Rule 4204 with the requirements contained within SCAPCR 61-62.5, Std4, Section V.

	SJVAPCD	SCAPCR
Applicability	The provisions of this rule shall apply to all cotton ginning facilities within the District.	All existing, new, and modified cotton ginning operations.

	SJVAPCD	SCAPCR
Exemption	Cotton ginning facilities used for research purposes and limited to throughputs of not more than 4,000 pounds of seed cotton processed per day (equivalent to 4 bales/day at a trash-to-cotton ratio of 1-to-1) shall be exempt from the requirements of Section 5.0.	Existing facilities with a maximum gin stand rated capacity (or documented equipment limitation) of less than twenty (20) bales per hour that do not have cyclones on lint cleaning system exhausts and battery condenser exhausts as of promulgation date of this rule, will not be required to add the emission control devices in paragraph C.2 below to lint cleaning exhausts or battery condenser exhausts if emissions from these exhausts are controlled by fine mesh screens.
Requirements	All emission points shall be controlled by 1D-3D cyclones or rotary drum filters. New cyclones or replacement parts of existing 1D-3D cyclones shall have the dimensional characteristics of the Enhanced 1D-3D cyclone, or the 1D-3D with a 2D-2D inlet and an expansion chamber trash outlet.	Each cotton ginning operation shall install and operate a particulate emission control system on all high and low pressure exhausts and lint cleaning system exhausts that includes one (1) or more 1D-3D or 2D-2D cyclones.
	Driver-under or pull through trash collection system for load-out purposes shall not load trash into a hopper or trailer unless one or more the following are utilized: • The trash loading area has an enclosure with four sides that are higher than the trash auger; at least two sides shall be solid and the remaining sides shall: have a flexible wind barrier, which extends below the top of the trash trailer sides; or have solid doors that remain shut while trash trailers are being loaded, except as necessary to accommodate trailer movement; or have a combination of flexible wind barriers and solid doors. • A solid-sided trailer is used when there is no enclosure, and the trash auger and opening of the loading device	Trash stacker areas shall contain one (1) of the following: • A three (3) sided enclosure with a roof whose sides are high enough above the opening of the dumping device to prevent wind from dispersing dust or debris; or • A device to provide wet suppression at the dump area of the trash cyclone and minimize free fall distance of waste material exiting the trash cyclone.

	SJVAPCD	SCAPCR
	have a flexible shroud that extends just below the top of the trailer's solid sides, or • Fugitive PM10 emissions from load-out areas are reduced by an alternative method, which is approved by the APCO and the EPA. An owner/operator shall not operate a trash conveyance system dumping directly into a pile unless it meets the following requirements: • Both sides of the trash auger shall be equipped with wind barriers that extend, as measured vertically prior to trash pile build-up, one foot above and three feet below the auger or with an alternative control approved by the APCO and the EPA. • After the pile has built up to the height of the trash auger, removing material from the pile shall be performed in such a way as to prevent free-falling trash from the stockpiling system.	
	Dust management plans for facilities are subject to the requirements in District Rules 8011, 8021, 8031, 8041, 8051, 8061, 8071, and 8081.	Minimize fugitive emissions by designing and maintaining trash systems, the gin yard, and the traffic area according to the guidelines in the regulation.

SCAPC Regulation requires the use of 2D-2D or 1D-3D cyclones while District Rule 4204 requires 1D-3D cyclones and also requires that new cyclones be Enhanced 1D-3D cyclones with high control efficiency. Texas A&M reports tested efficiencies of 97% for 1D-3D cyclones up to 99% for Enhanced 1D-3D cyclones. Therefore, District Rule 4204 requirements result in higher PM control efficiency as compared to SCAPC regulation requirements.

The SCAPC regulation also provides an exemption for operations processing less than 20 bales per hour, which could represent approximately 20,000 bales per season. Since the District rule does not have such exemption (only contains a research-targeted

exemption at less than 4 bales/day), District Rule 4204 is more stringent in this area as well.

While the SCAPC regulation requires the trash stacker be contained in a three-sided enclosure, District Rule 4204 requires that the trash loading area be an enclosure with four sides higher than the trash auger. District Rule 4204 is more stringent in this area as well.

Therefore, overall, District Rule 4204 is more stringent than the SCAPC 62.5, Std4, Section V regulation applying to cotton gin operations.

Oklahoma Department of Environmental Quality (ODEQ), Air Pollution Control, 252:100-23 (Cotton Gins) (*Adopted February 17, 2017***)**

The District compared the requirements of District Rule 4204 with the requirements contained within ODEQ 252:100-23.

	SJVAPCD	ODEQ
Applicability	The provisions of this rule shall apply to all cotton ginning facilities within the District.	All existing, new, and modified cotton ginning operations.
Exemption	Cotton ginning facilities used for research purposes and limited to throughputs of not more than 4,000 pounds of seed cotton processed per day (equivalent to 4 bales/day at a trash-to-cotton ratio of 1-to-1) shall be exempt from the requirements of Section 5.0.	No exemption listed.
Requirements	Opacity from cotton gins is limited to less than 20% pursuant to District Rule 4101.	Visible emissions shall not exceed 20% opacity.

	SJVAPCD	ODEQ
	All emission points shall be controlled by 1D-3D cyclones or rotary drum filters. New cyclones or replacement parts of existing 1D-3D cyclones shall have the dimensional characteristics of the Enhanced 1D-3D cyclone, or the 1D-3D with a 2D-2D inlet and an expansion chamber trash outlet.	<u>Low Pressure Exhaust:</u> The use of screens with a mesh size of 70 by 70 or finer (U.S. Sieve), or the use of perforated condenser drums with holes not exceeding 0.045 inches in diameter or equipment of equivalent design efficiency. <u>High Pressure Exhaust:</u> The use of 2D-2D cyclones shall be required for existing gins. Existing gins shall install and use 1D-3D cyclone collectors or equivalent when the capital cost of repair or replacement of the existing 2D-2D cyclone exceeds 50% of the capital cost of a new 1D-3D cyclone. New or modified cotton gins shall utilize a 1D-3D cyclone collector or equipment of equivalent collection efficiency upon commencement of operation.
	Driver-under or pull through trash collection system for load-out purposes shall not load trash into a hopper or trailer unless one or more the following are utilized: • The trash loading area has an enclosure with four sides that are higher than the trash auger; at least two sides shall be solid and the remaining sides shall: have a flexible wind barrier, which extends below the top of the trash trailer sides; or have solid doors that remain shut while trash trailers are being loaded, except as necessary to accommodate trailer movement; or have a combination of flexible wind barriers and solid doors. • A solid-sided trailer is used when there is no enclosure, and the trash auger and opening of the loading device have a flexible shroud that extends just below the top of the trailer's solid sides, or	For emission control during dumping, burr hoppers at existing gin sites located within the corporate city limits of any city or within 300 feet of two or more occupied establishments must be totally enclosed. All new gin sites shall install and use a total enclosure on the burr hopper.

	SJVAPCD	ODEQ
	• Fugitive PM10 emissions from load-out areas are reduced by an alternative method, which is approved by the APCO and the EPA. An owner/operator shall not operate a trash conveyance system dumping directly into a pile unless it meets the following requirements: • Both sides of the trash auger shall be equipped with wind barriers that extend, as measured vertically prior to trash pile build-up, one foot above and three feet below the auger or with an alternative control approved by the APCO and the EPA. • After the pile has built up to the height of the trash auger, removing material from the pile shall be performed in such a way as to prevent free-falling trash from the stockpiling system.	
	Dust management plans for facilities are subject to the requirements in District Rules 8011, 8021, 8031, 8041, 8051, 8061, 8071, and 8081.	Minimize fugitive emissions by designing and maintaining trash systems, the gin yard, and the traffic area according to the guidelines in the regulation.

The ODEQ regulation requires the use of 2D-2D or 1D-3D cyclones on the exhaust of high pressure systems only while District Rule 4204 requires all systems to be controlled with 1D-3D cyclones. District Rule 4204 also requires that new cyclones be Enhanced 1D-3D cyclones with high control efficiency. Texas A&M reports tested efficiencies of 97% for 1D-3D cyclones up to 99% for Enhanced 1D-3D cyclones. Therefore, District Rule 4204 requirements result in higher PM control efficiency as compared to ODEQ regulation requirements.

The ODEQ regulation still allows screened enclosures on low pressure air systems while, as mentioned above, District Rule 4204 requires the use of high efficiency cyclone on all air systems. Therefore, the District rule is significantly more stringent with respect to trash systems.

Therefore, overall, District Rule 4204 is more stringent than the ODEQ 255:100-23 regulation applying to cotton gin operations.

Texas Commission on Environmental Quality (TCEQ), Air Quality Standard Permit for Cotton Gin Facilities and Cotton Burr Tub Grinders[12] (*Adopted April 7, 2010*)

The District compared the requirements of District Rule 4204 with the requirements contained within TCEQ Air Quality Standard Permit for Cotton Gin Facilities and Cotton Burr Tub Grinders.

Rather than requiring the use of high efficiency control device, TCEQ Regulation requires that devices (rotary drum filter, fabric filter, and cyclone collection systems) used to control PM be properly designed and operated. As opposed to TCEQ Regulation, District Rule 4204 requires the use of 1D-3D cyclones but also requires that new cyclones be Enhanced 1D-3D cyclones with high control efficiency which exceeds standard 1D-3D cyclones control efficiency. Texas A&M reports tested efficiencies of 97% for 1D-3D cyclones up to 99% for Enhanced 1D-3D cyclones.

Therefore, District Rule 4204 is more stringent than the TCEQ regulation applying to cotton gin operations.

	SJVAPCD	TCEQ
Applicability	The provisions of this rule shall apply to all cotton ginning facilities within the District.	All existing, new, and modified cotton ginning operations.
Exemption	Cotton ginning facilities used for research purposes and limited to throughputs of not more than 4,000 pounds of seed cotton processed per day (equivalent to 4 bales/day at a trash-to-cotton ratio of 1-to-1) shall be exempt from the requirements of Section 5.0.	Replacement or addition of cotton gin stands where no other equipment change or additions are involved
Requirements	All emission points shall be controlled by 1D-3D cyclones or rotary drum filters. New cyclones or replacement parts of existing 1D-3D cyclones shall have the dimensional characteristics of the Enhanced 1D-3D cyclone, or the 1D-3D with a 2D-2D inlet and an expansion chamber trash outlet.	All rotary drum filter, fabric filter, and cyclone collection systems used to control particulate emissions from the cotton gin facilities authorized by this standard permit shall meet the following requirements, as applicable: • fabric filter and drum filter systems shall be designed to meet an outlet grain loading not to exceed 0.01 grains per dry standard cubic foot (combined front half and back half); • cyclone collectors shall be properly sized high efficiency cyclones with a cone length at least twice the diameter of the cyclone.

[12] https://www.tceq.texas.gov/assets/public/permitting/air/NewSourceReview/ag/cotton_sp_final.pdf

	SJVAPCD	TCEQ
	Driver-under or pull through trash collection system for load-out purposes shall not load trash into a hopper or trailer unless one or more the following are utilized: • The trash loading area has an enclosure with four sides that are higher than the trash auger; at least two sides shall be solid and the remaining sides shall: have a flexible wind barrier, which extends below the top of the trash trailer sides; or have solid doors that remain shut while trash trailers are being loaded, except as necessary to accommodate trailer movement; or have a combination of flexible wind barriers and solid doors. • A solid-sided trailer is used when there is no enclosure, and the trash auger and opening of the loading device have a flexible shroud that extends just below the top of the trailer's solid sides, or • Fugitive PM10 emissions from load-out areas are reduced by an alternative method, which is approved by the APCO and the EPA. An owner/operator shall not operate a trash conveyance system dumping directly into a pile unless it meets the following requirements: • Both sides of the trash auger shall be equipped with wind barriers that extend, as measured vertically prior to trash pile build-up, one foot above and three feet below the auger or with an alternative control approved by the APCO and the EPA. • After the pile has built up to the height of the trash auger, removing material from the pile shall be performed in such a way as to prevent free-falling trash from the stockpiling system.	Fugitive emissions from burr hoppers authorized by this standard permit shall be minimized through the use of appropriate operational practices and/or other control methods to prevent visible emissions from traveling off property during trash dumping operations.

	SJVAPCD	TCEQ
	Requirements for cotton gin dryers are included in District Rule 4309, Dryers, Dehydrators, and Ovens. Requirements for engines are included in District Rule 4702, Internal Combustion Engines.	Fuel type limitations for burners and engines. Emissions and operating hour limits for engines.

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

There are no analogous rules for this source category in SCAQMD, BAAQMD, SMAQMD, and VCAPCD

Additional Emission Reduction Opportunities

Beyond the review of current regulation and rule requirements, the District performed an extensive review of the feasibility of expanding applicability or removal of exemptions for this source category, technologies and measures that have been implemented in practice in other regions, and potential new technologies and measures that may be feasible for implementation in the near future. Based on this exhaustive review, District staff did not find any additional measures currently available or will be available prior to the 2025 attainment deadline date that could improve the effectiveness of this rule.

Research and PM2.5 Fraction

Research was completed in 2013 by the United States Department of Agriculture Agricultural Research Service (USDA-ARS), in partnership with cotton associations, EPA, CARB, and the District to measure actual PM10 and PM2.5 emissions from stack sources and fugitive emissions in and around several ginning facilities. This research provided emission factors for comparison to previous estimations that are included in emission inventories and provided data for both types of cotton gins currently in use in California. The project was designed to measure emissions from facilities with current emissions control technologies in place and to improve emissions estimations by measurement with the highest quality methods and instruments. The project was not designed to evaluate new technologies or measures to further reduce emissions. Results for the seven gins that were sampled for the project indicate the estimated ratio of PM2.5 to PM10 is approximately 16%.[13] This fraction of PM2.5 to PM10 is lower than indicated in the emissions inventory currently being used. Future research will include particle size analysis of EPA Method 17 samples, and modeling to compare model output and ambient sampling data and develop suggested modeling corrections.

Baghouse

Baghouses are not feasible at cotton gin operations because of the requirements for high volume of air, blinding from the fibrous material, temperature excursions across fabric filters, and introduction of moisture during the ginning operation.

A typical cotton ginning operation relies on an air cleaning system handling fibrous materials such as cotton and cotton waste in a cotton gin. This air cleaning system

[13] United States Department of Agriculture, Agricultural Research Service. (2013). *Characterization of Cotton Gin Particulate Matter Emissions.* Obtained from http://buser.okstate.edu/air-quality/cotton-gin/national-study/.

uses high volume of air to move the cotton throughout the ginning operation. Usually, these high volumes of air are much higher than any volumes of air passing through a baghouse. Throughout the various processes of the cotton gin operation air velocities range from 1,500 fpm to 5,000 fpm.[14] Another issue arises when higher-than-average gas volumes and particulate matter impact on bags. This causes bag blinding[15], where the increased velocity allows dust to penetrate into the fabric, and the cleaning system is unable to remove it.

In addition to the high volume of air, the baghouse would also see higher than normal temperature excursions. Excursions above the recommended temperature limit generally shorten bag life considerably. This same effect is obtained when seed cotton is first dried in large driers using heated air to reduce its moisture content, and if the seed cotton requires additional drying, gins will often run it through second or third drier. Excess moisture is common to cotton grown in the more humid regions of the Cotton Belt, while cottons produced in the Southwest can be too dry because of the region's arid climate. Lack of moisture at ginning can also lower the quality of the fiber and contribute to ginning problems. That is why moisture is added with special humidifier that blows warm, humid air through the gin's conveyor pipes. Moisture on the bags tends to alter the adhesion of the dust cake on and within the fabric structure, and "mudding" or blinding of the bags may occur because the cleaning system cannot remove this dust.

1D-3D Cyclones with Expansion Chamber

Currently, all cotton gins in the Valley are required to operate using a 1D-3D cyclone. There are currently 28 such units and 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) exit.[16] The USDA study on PM2.5 emissions from cotton gins discussed above, which provided the District with the PM10/PM2.5 ratio for emissions from cotton gins, did not extend to the expected PM2.5 control efficiencies of control devices at cotton gins; therefore, there is no completed research indicating the effectiveness of reducing PM2.5 by installing an expansion chamber. As noted above, expansion chambers result in a minor increase in efficiency for PM10 emissions control, but PM2.5 is a very small fraction of the overall particulate in these systems and does not respond as well as PM10 to air flow changes such as those induced by an expansion chamber. Therefore, the District does not believe that expansion chambers would be a feasible control for PM2.5.

However, Rule 4204 is predominantly a PM10 control measure and does currently require all new cyclones or replacement parts of existing 1D3D cyclones have the dimensional characteristics of an Enhanced 1D3D cyclone, or a 1D-3D with a 2D-2D

[14] Reference Agriculture Handbook No. 503 – Cotton Ginners Handbook, July 1977, page 59

[15] Blinding (*define*) – A closing of the filter medium pores which results in either a reduced gas flow or an increased pressure drop across the medium.

[16] 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.

inlet and an expansion chamber trash outlet. Therefore, to the extent that PM2.5 may be minimally reduced by expansion chambers, all cyclones on cotton gins in the Valley will eventually be replaced by either an Enhanced 1D-3D cyclone or a 1D-3D cyclone with an expansion chamber under the current PM10-targetted rule.

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 rebuilt cotton gins. Mechanical conveyance reduces emissions from cotton gin trash handling exhaust streams, which are otherwise moved pneumatically. The cotton gin trash handling systems only comprise a fraction of the emissions that are released from the full cotton ginning process.

Newer or rebuilt cotton gins are able to accommodate a mechanical conveyance system since they are able to design the cotton gin around the equipment and space needed. Operators that have installed a mechanical conveyance system for their cotton gin have had to build a lower floor, below the main level containing the major cotton gin equipment, to house the mechanical conveyors. Therefore, as confirmed by industry representatives and equipment manufacturers, it is not technologically feasible to retrofit existing cotton gins with mechanical conveyance systems to replace existing trash handling equipment.

Plenum Chambers

Plenum chambers are in use at three cotton gins in the Valley. Plenum chambers are placed upstream of selected cyclones to remove large trash. No study has been found that demonstrates an increase in PM control efficiency with the utilization of a plenum chamber. Cotton ginning facilities that have installed plenum chambers are generally using those devices to reduce wear and tear on the cyclones, thus prolonging the life of the cyclones, and not for increased PM controls.

EVALUATION FINDINGS

The District has evaluated all potential control technologies and all control technologies achieved in practice in other areas or included in other state implementation plans for cotton gins. As demonstrated above, Rule 4204 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds RACM, BACM and MSM requirements for this source category.

C.6 Rule 4301 (Fuel Burning Equipment)

Discussion

Rule 4301 (Fuel Burning Equipment) has a very broad applicability, as it applies to all types of fuel burning equipment in use in the Valley. Since its early adoption in 1992, it has largely been superseded by several District rules with more stringent requirements for specific types of fuel burning equipment. See the control measure evaluations for Rules 4306, 4307, 4308, 4309, 4320, 4352, and 4703 for more specific information about the individual fuel burning equipment source categories.

Emissions Inventory

The emission inventory is not specific to Rule 4301 as it has been superseded by multiple District rules. See control measures for 4306, 4307, 4308, 4309, 4320, 4352, and 4703 for the individual emissions inventories.

Source Category

The purpose of this rule is to limit emissions of air contaminants from fuel burning equipment by specifying maximum emission rates for SOx, NOx, and PM (identified in the rule as combustion contaminant emissions). As previously mentioned, Rule 4301 has been superseded by more stringent requirements. See control measures for 4306, 4307, 4308, 4309, 4320, 4352, and 4703 for more specific evaluations of the individual fuel burning equipment sources categories.

How does District Rule 4301 compare with federal and state rules and regulations?

Facilities subject to Rule 4301 are subject to various state rules and federal requirements, such as Control Techniques Guidelines, Alternative Control Techniques, New Source Performance Standard, National Emission Standard Hazardous Air Pollutants, and Maximum Achievable Control Technology. However, several District rules have superseded Rule 4301 with more stringent requirements. Comparisons of those District rules to the applicable federal and state rules are discussed within those control measure evaluations.

How does District Rule 4301 compare to rules in other air districts?

Rule 4301 have been superseded by more stringent requirements. See Rules 4306, 4307, 4308, 4309, 4320, 4352, and 4703 for more specific evaluations about the individual fuel burning equipment sources categories.

Additional Emission Reduction Opportunities

Several District rules have superseded Rule 4301 with more stringent requirements. Discussion of feasibility of expanding applicability or removal of exemptions are discussed within those control measure evaluations.

Evaluation Findings

The requirements of Rule 4301 have been superseded by more stringent District rules that meet or exceed RACM, BACM, and MSM level requirements. All units subject to this rule are subject to more specific rules and discussed within those control measure evaluations. See Rules 4306, 4307, 4308, 4309, 4320, 4352, and 4703.

C.7 Rule 4306 and 4320 (Boilers, Process Heaters, and Steam Generators Greater than 5 MMBtu/hr)

Discussion

Rules 4306 and 4320 apply 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 these rules is to limit NOx, carbon monoxide (CO), and particulate matter (PM) 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 NOx emission reduction control measure from the District's ozone and PM10 attainment plans. Since adoption, Rule 4306 has been amended twice.

The most recent Rule 4306 amendment in October 2008 was initially proposed to lower the NOx limit from 9 ppmv to 6 ppmv for units greater than 20 MMBtu/hr. It was determined that the proposed NOx limits could be accomplished by using selective catalytic reduction (SCR) or a combination of SCR, ultra-low NOx burners (ULNBs), flue gas recirculation (FGR), and/or tuning, thus making the lower limit of 6 ppmv 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 already undergone several generations of NOx controls, and consequently, certain applications of SCR may not be cost-effective and/or technologically infeasible because of physical limitations at the facilities. As a result of this public process, the lower NOx 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 NOx controls, based on each operator's individual business situation. These fees are used by the District to achieve cost-effective NOx reductions through District incentive programs, the District's Technology Advancement Program, and other District programs. The previous versions of Rule 4305 and 4306 combined with the implementation of Rule 4320 results in approximately 96% control of NOx emissions from this source category.

Rule 4320 also includes particulate matter control requirements. These requirements are in the form of limits on the sulfur content of fuel burned. During fuel combustion, the sulfur content in the fuel results in sulfur oxide (SOx) emissions. SOx emissions combine with ammonia in the atmosphere to form ammonium sulfate (a particulate). Reducing the sulfur content in the fuel burned results in lower levels of particulate matter generated by the combusting equipment.

The implementation of Rule 4320 does not substitute the requirements of Rule 4306, but enforces requirements supplementary to Rule 4306. As such, this evaluation is applicable to both Rule 4306 and Rule 4320.

EMISSIONS INVENTORY

POLLUTANT	2013	2017	2019	2020	2022	2023	2024	2025	2026	2028
	Annual Average - Tons per day									
PM2.5	1.24	1.15	1.12	1.10	1.06	1.04	1.02	1.01	0.99	0.96
NOX	1.80	1.47	1.39	1.35	1.26	1.22	1.18	1.14	1.10	1.03
	Winter Average - Tons per day									
PM2.5	1.22	1.14	1.10	1.08	1.05	1.03	1.01	0.99	0.98	0.95
NOX	1.75	1.44	1.36	1.31	1.23	1.19	1.15	1.11	1.07	1.01

SOURCE CATEGORY

Facilities with units subject to this rule represent a wide range of industries, including but not limited to electrical utilities, cogeneration, oil and gas production, petroleum refining, manufacturing and industrial processes, food and agricultural processing, and service and commercial facilities.

To recognize, and better regulate, the operational and technical differences between different types of equipment subject to Rules 4306 and 4320, the different equipment types were separated into several major categories, with different rule requirements, including the following:

- Units with a total rated heat input greater than 5.0 MMBtu/hr to 20.0 MMBtu/hr
- Units with a total rated heat input greater than 20.0 MMBtu/hr
- Oilfield steam generators of all ratings and fuel types
- Refinery units of all ratings and fuel types
- Low-use units limited by a Permit to Operate to an annual heat input greater than 1.8 billion Btu/year but less than or equal to 30 billion Btu/year
- Units at a wastewater treatment facility using less than 50% PUC quality fuel
- Small specialty units operated by a small producer

HOW DO DISTRICT RULES 4306 AND 4320 COMPARE WITH FEDERAL AND STATE RULES AND REGULATIONS?

Federal Regulations

There are no EPA CTG requirements for this source category.

Alternative Control Techniques (ACT)

- EPA-453/R-93-034 (ACT Document – NOx emissions from Process Heaters)

The District evaluated the requirements contained within the ACT for NOx Emissions from Process Heaters and found no requirements that were more stringent than those already in Rules 4306 and 4320.

- EPA-453/R-94-022 (ACT Document – NOx Emissions from Industrial/Commercial/Institutional Boilers)

The District evaluated the requirements contained within the ACT for NOx Emissions from Industrial/Commercial/Institutional Boilers and found no requirements that were more stringent than those already in Rules 4306 and 4320.

- EPA-453/R-94-023 (ACT Document – NOx Emissions from Utility Boilers)

The District evaluated the requirements contained within the ACT for NOx Emissions from Utility Boilers and found no requirements that were more stringent than those already in Rules 4306 and 4320.

NSPS

- 40 CFR 60 Subpart D (Standards of Performance for Fossil-Fuel Fired Steam Generators for which Construction Is Commenced After August 17, 1971)

The District evaluated the requirements contained within 40 CFR 60 Subpart D and found no requirements that were more stringent than those already in Rules 4306 and 4320.

- 40 CFR 60 Subpart Db (Standards of Performance for Industrial-Commercial-Institutional Steam Generating Units)

The District evaluated the requirements contained within 40 CFR 60 Subpart Db and found no requirements that were more stringent than those already in Rules 4306 and 4320.

- 40 CFR 60 Subpart Dc (Standards of Performance for Small Industrial- Commercial-Institutional Steam Generating Units)

The District evaluated the requirements contained within 40 CFR 60 Subpart Dc and found no requirements that were more stringent than those already in Rules 4306 and 4320.

- NSPS – 40 CFR Subpart J (Standards of Performance for Petroleum Refineries)

The District evaluated the requirements contained within 40 CFR 60 Subpart J and found no requirements that were more stringent than those already in Rules 4306 and 4320.

- NSPS – 40 CFR Subpart Ja (Standards of Performance for Petroleum Refineries for Which Construction, Reconstruction, or Modification Commenced After May 14, 2007

The District evaluated the requirements contained within 40 CFR 60 Subpart Ja and found no requirements that were more stringent than those already in Rules 4306 and 4320.

NESHAP/ MACT

- 40 CFR 63 Subpart DDDDD (NESHAP for Major Sources: Industrial, Commercial, and Institutional Boilers and Process Heaters)

40 CFR 63 Subpart DDDDD was amended on January 31, 2013 to include new emission limits for PM, CO, and total selective metals (TSM), replace numeric dioxin emission limits with work practice standards, add new subcategories of facilities, and add alternative monitoring approaches for compliance with the PM limit. The PM limit in District Rule 4320 is more stringent for liquid fuels because it only allows liquid fuels to be burned during PUC quality natural gas curtailment periods. It is equivalent to DDDDD for all gasses burned except for gasses exceeding 40 µg/m^3 of mercury.

The District evaluated the requirements contained within the above NESHAP and found no requirements that were more stringent than those already in Rules 4306 and 4320.

State Regulations

There are no state regulations applicable to this source category.

HOW DO DISTRICT RULES 4306 AND 4320 COMPARE TO RULES IN OTHER AIR DISTRICTS?

SCAQMD

- SCAQMD Rule 1146 (Emissions of Nitrogen from Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters) *(Amended November 1, 2013)*

The District evaluated the requirements contained within SCAQMD's Rule 1146 and found no requirements that were more stringent than those already in Rule 4306 and 4320.

	SJVAPCD	SCAQMD
Applicability	Any gaseous fuel or liquid fuel fired boiler, steam generator, or process heater with a total rated heat input greater than 5 million Btu per hour.	Boilers, steam generators, and process heaters of equal to or greater than 5 million Btu per hour rated heat input capacity used in industrial, institutional, and commercial operations.
Exemptions	Units regulated by other District rules such as solid fuel fired units, dryers, glass melting furnaces, kilns, and smelters. Any units while burning any fuel other than PUC quality natural gas that: Burns non-PUC gas no more than 168 cumulative hours in a calendar year plus 48 hours per calendar year for equipment testing; NOx emission do not exceed 150 ppmv.	(1) Boilers used by electric utilities to generate electricity; and (2) Boilers and process heaters with a rated heat input capacity greater than 40 million Btu per hour that are used in petroleum refineries; and (3) Sulfur plant reaction boilers. (4) RECLAIM facilities (NOx emissions only)

	SJVAPCD		SCAQMD
Requirements	Category A Units 5-20 MMBtu/hr Except Categories C through G units	9 ppmv standard 6 ppmv enhanced	9 ppmv Excluding digester and landfill gas fired units, and process heaters.
	Category B Units > 20 MMBtu/hr Except Categories C through G units	7 ppmv standard 5 ppmv enhanced	9 ppmv for units <75 MMBtu/hr Excluding digester and landfill gas fired units, and process heaters. 5 ppmv for units ≥75MMbtu/hr Excluding process heaters.
	Category C.1 Oilfield Steam Generators 5-20 MMBtu/hr	9 ppmv standard 6 ppmv enhanced	9 ppmv standard 5 ppmv enhanced
	Category C.2 Oilfield Steam Generators >20 MMBtu/hr	7 ppmv standard 5 ppmv enhanced	9 ppmv for units <75 MMBtu/hr 5 ppmv for units ≥75MMBtu/hr
	Category C.3 Oilfield Steam Generators fired on less than 50% PUC quality gas	9 ppmv	25 ppmv for landfill gas fired units 15 ppmv for digester gas fired units
	Category D.1 Refinery Units 5-20 MMBtu/hr	9 ppmv standard 6 ppmv enhanced	9 ppmv standard 5 ppmv enhanced
	Category D.2 Refinery Units 20-110 MMBtu/hr	6 ppmv standard 5 ppmv enhanced	9 ppmv for units <75 MMBtu/hr 5 ppmv for units ≥75MMBtu/hr
	Category D.3 Refinery Units >110 MMBtu/hr	5 ppmv	5 ppmv
	Category D.4 Refinery Units fired on less than 50% PUC quality gas	9 ppmv	25 ppmv for landfill gas fired units 15 ppmv for digester gas fired units
	Category E Units with annual heat input >1.8 billion Btu/yr but <30 billion Btu/yr	9 ppmv	For units using 9.0 billion Btu/yr or less, tune up twice a year. For units over that limit, units must meet the following applicable limit: 25 ppmv landfill gas units, 15 ppmv digester gas units, otherwise, for other units: 9 ppmv for units <75 MMBtu/hr, 5 ppmv for units ≥75MMbtu/hr
	Category F Wastewater Treatment Facilities firing on less than 50% PUC quality gas	9 ppmv	15 ppmv for digester gas fired units
	Category G Units operated by a small producer in which the rated heat input of each burner is less than or equal to 5 MMBtu/hr but the total rated heat input of	9 ppmv	9 ppmv

	SJVAPCD		SCAQMD
	all the burners in a unit is rated between 5 MMBtu/hr and 20 MMBtu/hr, and in which the products of combustion do not come in contact with the products of combustion of any other burner.		
	General category in SCAQMD Rule NOTE: This is a general category in SCAQMD's rule that is covered under multiple categories in District Rule 4320	5 ppmv to 9 ppmv (as shown in the above categories)	30 ppmv

BAAQMD

- BAAQMD Regulation 9 Rule 7 (Nitrogen Oxides And Carbon Monoxide from Industrial, Institutional, and Commercial Boilers, Steam Generators, And Process Heaters) *(Amended May 4, 2011)*
- BAAQMD Regulation 9, Rule 10 (Nitrogen Oxides and Carbon Monoxide from Industrial, Institutional and Commercial Boilers, Steam Generators and Process Heaters in Petroleum Refineries) *(Amended May 4, 2011)*
- BAAQMD Regulation 9, Rule 11 (Nitrogen Oxides And Carbon Monoxide from Utility Electric Power Generating Boilers) *(Amended May 17, 2000)*

The District evaluated the requirements contained within BAAQMD Regulation 9 Rule 7, 10, and 11, and found no requirements that were more stringent than those already in Rule 4306 and 4320.

	SJVAPCD	BAAQMD
Applicability	Any gaseous fuel or liquid fuel fired boiler, steam generator, or process heater with a total rated heat input greater than 5 million Btu per hour.	Regulation 9, Rule 7 Industrial, institutional and commercial boilers, steam generators and process heaters. Regulation 9, Rule 10 Boilers, steam generators, and process heaters, including CO boilers, in petroleum refineries. Regulation 9, Rule 11 Electric power generating steam boilers.

	SJVAPCD		BAAQMD
Exemptions	Units regulated by other District rules such as solid fuel fired units, dryers, glass melting furnaces, kilns, and smelters. Any units while burning any fuel other than PUC quality natural gas that: Burns non-PUC gas no more than 168 cumulative hours in a calendar year plus 48 hours per calendar year for equipment testing; NOx emission do not exceed 150 ppmv.		Regulation 9, Rule 7 Units ≤ 2.0 MMBtu/hr fire on NG Units < 1.0 MMBtu/hr any fuel Process heaters for radiant comfort heating Waste heat recovery boilers Kilns, ovens, dryers for baking, heat treating, cooking, calcining, vitrifying Low fuel use Tune Up, Startup and shutdown Regulation 9, Rule 10 Units ≤ 2.0 MMBtu/hr fire on NG Units < 1.0 MMBtu/hr any fuel Waste heat recovery boilers Units that received an ATC prior to January 5, 1994 Low fuel use Regulation 9, Rule 11 Boilers < 250 MMBtu/hr Startup and shutdown Oil-burn readiness testing Units that operate with a capacity factor of less than 4% annually Heat recovery steam generators
Requirements	Category A Units 5-20 MMBtu/hr Except Categories C through G units	9 ppmv standard 6 ppmv enhanced	Regulation 9, Rule 7 15 ppmv
	Category B Units > 20 MMBtu/hr Except Categories C through G units	7 ppmv standard 5 ppmv enhanced	Regulation 9, Rule 7 20-75 MMBtu/hr – 9ppmv >75 MMBtu/hr – 5 ppmv Regulation 9, Rule 11 >1.75 billion Btu/hr – 10 ppmv 1.5 - 1.75 billion Btu/hr – 25 ppmv
	Category C.1 Oilfield Steam Generators 5-20 MMBtu/hr	9 ppmv standard 6 ppmv enhanced	Regulation 9, Rule 7 15 ppmv
	Category C.2 Oilfield Steam Generators >20 MMBtu/hr	7 ppmv standard 5 ppmv enhanced	Regulation 9, Rule 7 20-75 MMBtu/hr – 9ppmv >75 MMBtu/hr – 5 ppmv
	Category C.3 Oilfield Steam Generators fired on less than 50% PUC quality gas	9 ppmv	Regulation 9, Rule 7 30 ppmv
	Category D.1 Refinery Units 5-20 MMBtu/hr	9 ppmv standard 6 ppmv enhanced	Regulation 9, Rule 10 Refinery-wide emission rate not to exceed 0.033 lb per MMBtu (27.25 ppmv) based on an operating day average
	Category D.2 Refinery Units 20-110 MMBtu/hr	6 ppmv standard 5 ppmv enhanced	Regulation 9, Rule 10 Refinery-wide emission rate not to exceed 0.033 lb per MMBtu (27.25 ppmv) based on an operating day average

	SJVAPCD		BAAQMD
	Category D.3 Refinery Units >110 MMBtu/hr	5 ppmv	Regulation 9, Rule 10 Refinery-wide emission rate not to exceed 0.033 lb per MMBtu (27.25 ppmv) based on an operating day average
	Category D.4 Refinery Units fired on less than 50% PUC quality gas	9 ppmv	Regulation 9, Rule 10 Refinery-wide emission rate not to exceed 0.033 lb per MMBtu (27.25 ppmv) based on an operating day average
	Category E Units with annual heat input >1.8 billion Btu/yr but <30 billion Btu/yr	9 ppmv	Regulation 9, Rule 7 For units below 9.0 billion Btu/yr, tune up twice a year or meet 30 ppmv For units exceeding 9 billion Btu/yr, units must meet the following limits: 5-20 MMBtu/hr – 15 ppmv 20-75 MMBtu/hr – 9 ppmv >75 MMBtu/hr – 5 ppmv
	Category F Wastewater Treatment Facilities firing on less than 50% PUC quality gas	9 ppmv	Regulation 9, Rule 7 30 ppmv
	Category G Units operated by a small producer in which the rated heat input of each burner is less than or equal to 5 MMBtu/hr but the total rated heat input of all the burners in a unit is rated between 5 MMBtu/hr and 20 MMBtu/hr, and in which the products of combustion do not come in contact with the products of combustion of any other burner.	9 ppmv	Regulation 9, Rule 7 15 ppmv

SMAQMD

- SMAQMD Rule 411 (NOx from Boilers, Process Heaters and Steam Generators) *(Amended August 23, 2007)*

The District evaluated the requirements contained within SMAQMD's Rule 411 and found no requirements that were more stringent than those already in Rule 4306 and 4320.

	SJVAPCD		SMAQMD
Applicability	Any gaseous fuel or liquid fuel fired boiler, steam generator, or process heater with a total rated heat input greater than 5 million Btu per hour.		Boilers, steam generators and process heaters) fired on gaseous or nongaseous fuels with a rated heat input capacity of 1 million Btu per hour or greater
Exemptions	Units regulated by other District rules such as solid fuel fired units, dryers, glass melting furnaces, kilns, and smelters. Any units while burning any fuel other than PUC quality natural gas that: Burns non-PUC gas no more than 168 cumulative hours in a calendar year plus 48 hours per calendar year for equipment testing; NOx emission do not exceed 150 ppmv.		Electric utility boilers, process heaters, kilns, and furnaces where the products of combustion come into direct contact with the material to be heated, Waste heat recovery boilers. Units with low fuel usage
Requirements	Category A Units 5-20 MMBtu/hr Except Categories C through G units	9 ppmv standard 6 ppmv enhanced	15 ppmv
	Category B Units > 20 MMBtu/hr Except Categories C through G units	7 ppmv standard 5 ppmv enhanced	9 ppmv
	Category C.1 Oilfield Steam Generators 5-20 MMBtu/hr	9 ppmv standard 6 ppmv enhanced	15 ppmv
	Category C.2 Oilfield Steam Generators >20 MMBtu/hr	7 ppmv standard 5 ppmv enhanced	9 ppmv
	Category C.3 Oilfield Steam Generators fired on less than 50% PUC quality gas	9 ppmv	15 ppmv
	Category D.1 Refinery Units 5-20 MMBtu/hr	9 ppmv standard 6 ppmv enhanced	15 ppmv
	Category D.2 Refinery Units 20-110 MMBtu/hr	6 ppmv standard 5 ppmv enhanced	9 ppmv
	Category D.3 Refinery Units >110 MMBtu/hr	5 ppmv	9 ppmv

	SJVAPCD		SMAQMD
	Category D.4 Refinery Units fired on less than 50% PUC quality gas	9 ppmv	15 ppmv
	Category E Units with annual heat input >1.8 billion Btu/yr but <30 billion Btu/yr	9 ppmv	5-20 MMBtu/hr – 15 ppmv <20 MMBtu/hr – 9 ppmv
	Category F Wastewater Treatment Facilities firing on less than 50% PUC quality gas	9 ppmv	15 ppmv
	Category G Units operated by a small producer in which the rated heat input of each burner is less than or equal to 5 MMBtu/hr but the total rated heat input of all the burners in a unit is rated between 5 MMBtu/hr and 20 MMBtu/hr, and in which the products of combustion do not come in contact with the products of combustion of any other burner.	9 ppmv	15 ppmv

VCAPCD

- VCAPCD Rule 74.15 Boilers, Steam Generators and Process Heaters (5 MMBTUs and greater) *(Amended November 8, 1994)*

The District evaluated the requirements contained within VCAPCD's Rule 74.15 and found no requirements that were more stringent than those already in Rule 4306 and 4320.

	SJVAPCD	VCAPCD
Applicability	Any gaseous fuel or liquid fuel fired boiler, steam generator, or process heater with a total rated heat input greater than 5 million Btu per hour.	Boilers, steam generators and process heaters, greater than 5 million Btu per hour used in all industrial, institutional and commercial operations

	SJVAPCD		VCAPCD
Exemptions	Units regulated by other District rules such as solid fuel fired units, dryers, glass melting furnaces, kilns, and smelters. Any units while burning any fuel other than PUC quality natural gas that: Burns non-PUC gas no more than 168 cumulative hours in a calendar year plus 48 hours per calendar year for equipment testing; NOx emission do not exceed 150 ppmv.		Electric utility boilers Water Heaters Units fired on alternate fuel during NG curtailment Emergency standby units Cold Startup
Requirements	Category A Units 5-20 MMBtu/hr Except Categories C through G units	9 ppmv standard 6 ppmv enhanced	40 ppmv
	Category B Units > 20 MMBtu/hr Except Categories C through G units	7 ppmv standard 5 ppmv enhanced	40 ppmv
	Category C.1 Oilfield Steam Generators 5-20 MMBtu/hr	9 ppmv standard 6 ppmv enhanced	40 ppmv
	Category C.2 Oilfield Steam Generators >20 MMBtu/hr	7 ppmv standard 5 ppmv enhanced	40 ppmv
	Category C.3 Oilfield Steam Generators fired on less than 50% PUC quality gas	9 ppmv	40 ppmv
	Category D.1 Refinery Units 5-20 MMBtu/hr	9 ppmv standard 6 ppmv enhanced	40 ppmv
	Category D.2 Refinery Units 20-110 MMBtu/hr	6 ppmv standard 5 ppmv enhanced	40 ppmv
	Category D.3 Refinery Units >110 MMBtu/hr	5 ppmv	40 ppmv
	Category D.4 Refinery Units fired on less than 50% PUC quality gas	9 ppmv	40 ppmv

	SJVAPCD		VCAPCD
	Category E Units with annual heat input >1.8 billion Btu/yr but <30 billion Btu/yr	9 ppmv	1.8 – 9 MMBtu – No NOx Limit 9 – 30 MMBtu – 40 ppmv
	Category F Wastewater Treatment Facilities firing on less than 50% PUC quality gas	9 ppmv	40 ppmv
	Category G Units operated by a small producer in which the rated heat input of each burner is less than or equal to 5 MMBtu/hr but the total rated heat input of all the burners in a unit is rated between 5 MMBtu/hr and 20 MMBtu/hr, and in which the products of combustion do not come in contact with the products of combustion of any other burner.	9 ppmv	40 ppmv

ADDITIONAL 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 NOx and PM emissions from this source category. As part of these regulatory efforts, hundreds of boilers in the Valley have been equipped with the best available NOx and PM control technologies. Even though significant effort has already been made to reduce emissions from this source category, the possibility of further reducing emissions from boilers greater than 5 MMBtu/hr is evaluated in the following discussion.

Clearsign Duplex Burners

The Clearsign Duplex burner employs a ceramic material for the fuel to burn on downstream from the actual burner. This reduces the temperature and length of the flame that results in reduced NOx formation without FGR or SCR add-on controls. The Clearsign technology is relatively new and has been installed or under evaluation at two refineries and one oilfield production facility in the Valley. Based on discussion with the facilities evaluating these technologies, additional work is required from the supplier to further improve the reliability and durability of this technology. Preliminary results indicate that this technology has potential to achieve NOx emissions less than 5 ppmv @ 3% O2. The wide spread viability of this technology is still to be determined.

Ultra Low-NOx Burners

Retrofitting 5 to 20 MMBtu/hr units

A boiler, steam generator or process heater in this size range may be retrofitted with ultra-low NOx burner system to achieve 6 ppmv NOx @ 3% O2. Pursuant to a local vendor, the cost of an ultra-low NOx burner with some form of FGR system would be about $40,000. Retrofitting a boiler may involve upgrades to various systems such as fuel train to comply with up to date codes, and may involve upgrades to air intake fans, as these units require more air for the burner to operate at its optimum level.

Description of Cost	Cost Factor	Cost	Source
Direct Costs			
Purchase equipment costs (PE)			
Burner System	A	40,000	Local Vendor
Instrumentation and controls	0.01 A	400	OAQPS
Sales Taxes	0.08 A	3,232	
Freight	0.05 A	2,000	OAQPS
Purchased equipment cost, PEC		45,632	
Direct installation costs (DI):			
Foundation & supports	0.08 B	--	See footnote
Handling and erection	0.14 B	6,388	OAQPS
Electrical	0.04 B	1,825	OAQPS
Piping	0.02 B	913	OAQPS
Insulation and ductwork:	0.01 B	456	OAQPS
Painting	0.01 B	456	OAQPS
Direct installation costs		10,038	
Site preparation	As required, SP	--	See table footnote
Buildings	As required, Bldg.	--	
Total Direct Costs, DC		55,670	
Indirect Costs (Installation)			
Engineering	0.10 B	4,563	OAQPS
Construction and field expenses	0.05 B	2,282	OAQPS
Contractor fees	0.10 B	4,563	OAQPS
Contingencies	0.03 B	1,369	OAQPS
Start-up	0.02 B	913	OAQPS
Performance test	0.01 B	456	OAQPS
Total Indirect Costs, IC	0.31 B	14,146	
Total Capital Investments (TCI= DC + IC):		**69,816**	
Annualized TCI (10 years @ 10% interest)	0.1627 TCI	**11,359**	
Direct annual costs (DAC)			
Operating and supervisory labor	--	--	See table footnote
Maintenance Costs (labor and material)	--	--	
Electricity Cost:	$0.08848/kWH	--	Not estimated
Indirect Annual Costs (IAC)			
Overhead:	--	--	See table footnote
Insurance:	--	--	See table footnote
Property Tax:	--	--	See table footnote

Description of Cost	Cost Factor	Cost	Source
Administrative:	--	--	See table footnote
Total IAC:			
Total Annual Cost (DAC + IAC)	--	--	
Total annual cost (annualized TCI + Total annual cost)		**$11,359/yr**	

The potential NOx emission reduction for 5 to 20 MMBtu/hr units is determined by taking the difference between the permitted potential emissions and the potential emissions that may be achievable by an ultra-low NOx burner system. Ultra low-NOx burners are expected to achieve 6 ppmv NOx @ 3% O2. Each unit is presumed to be operated for 8,760 hours per year at the maximum rated capacity, unless restricted by annual heat input rate. The total cost for each category is determined by multiplying the number of units and $11,359 a typical annual cost of an ultra-low NOx burner system. Note that most of the units (Category A in Rule 4320 except Category C through G units) are already achieving 9 ppm NOx @ 3% O2 or less emissions.

Type of unit	Number of units	Potential NOx Reductions with ultra-low NOx burner Technology (tons/yr)	Total annualized cost of NOx Reductions with ultra-low NOx burner Technology ($/yr)	Cost-effectiveness ($/ton of emission reduction)
Category A: >5.0 MMBtu/hr to ≤ 20 MMBtu/hr, Except Category C through G units	271*	82.7	$3,078,289/yr	**$37,222/ton**

*Total units = 279 – 8 permitted at 6 ppmv NOx or less emissions = 271 units

Retrofitting > 20 MMBtu/hr units

A boiler, steam generator or process heater in this size range may be retrofitted with ultra-low NOx burner to achieve 5 ppmv NOx @ 3% O2. Pursuant to a local vendor, the average cost of an ultra-low NOx burner with some form of FGR system would be about $150,000. Note that retrofitting a boiler may involve upgrades to various systems such as fuel train to comply with up to date codes, and may involve upgrades to air intake fans, as these units require more air for the burner to operate at its optimum level.

Description of Cost	Cost Factor	Cost	Source
Direct Costs			
Purchase equipment costs (PE)			
Burner System	A	150,000	Local Vendor
Instrumentation and controls	0.01 A	1,500	OAQPS
Sales Taxes	0.08 A	12,120	
Freight	0.05 A	7,500	OAQPS
Purchased equipment cost, PEC		171,120	
Direct installation costs (DI):			
Foundation & supports	0.08 B	--	See footnote
Handling and erection	0.14 B	23,957	OAQPS
Electrical	0.04 B	6,845	OAQPS
Piping	0.02 B	3,422	OAQPS

Description of Cost	Cost Factor	Cost	Source
Insulation and ductwork:	0.01 B	1,711	OAQPS
Painting	0.01 B	1,711	OAQPS
Direct installation costs		37,646	
Site preparation	As required, SP	--	See table footnote
Buildings	As required, Bldg.	--	
Total Direct Costs, DC		208,766	
Indirect Costs (Installation)			
Engineering	0.10 B	17,112	OAQPS
Construction and field expenses	0.05 B	8,556	OAQPS
Contractor fees	0.10 B	17,112	OAQPS
Contingencies	0.03 B	5,134	OAQPS
Start-up	0.02 B	3,422	OAQPS
Performance test	0.01 B	1,711	OAQPS
Total Indirect Costs, IC	0.31 B	53,047	
Total Capital Investments (TCI= DC + IC):		**261,813**	
Annualized TCI (10 years @ 10% interest)	0.1627 TCI	**42,597**	
Direct annual costs (DAC)			
Operating and supervisory labor	--	--	See table footnote
Maintenance Costs (labor and material)	--	--	
Electricity Cost:	$0.08848/kWH	--	Not estimated
Indirect Annual Costs (IAC)			
Overhead:	--	--	See table footnote
Insurance:	--	--	See table footnote
Property Tax:	--	--	See table footnote
Administrative:	--	--	See table footnote
Total IAC:			
Total Annual Cost (DAC + IAC)	--	--	
Total annual cost (annualized TCI + Total annual cost)		**$42,597/yr**	

*The existing foundation and supports will not be replaced; direct annual cost and indirect annual costs are presumed to be same as the existing burner

The potential NOx emission reduction for greater than 20 MMBtu/hr units (Category B in Rule 4320 except Category C through G units) is determined by taking the difference between the permitted potential emissions and the emissions achievable by an ultra-low NOx burner system. Ultra low-NOx burner systems may potentially achieve 5 ppmv NOx @ 3% O2. Each unit is presumed to be operated for 8,760 hours per year at the maximum rated capacity, unless restricted by annual heat input rate. The total cost for each category is determined by multiplying the number of units and $42,597, a typical annual cost of an ultra-low NOx burner system.

Type of unit	Number of units	Potential NOx Reductions with ultra-low NOx burner Technology (tons/yr)	Total annualized cost of NOx Reductions with ultra-low NOx burner Technology ($/yr)	Cost-effectiveness ($/ton of emission reduction)
Category B: >20.0 MMBtu/hr except Category C through G units	190*	123.7	$8,093,430/yr	**$65,428/ton**

**Total units = 221 – 31 with 5 ppmv NOx or less emissions = 190 units*

Oilfield Steam Generators

A steam generator can be retrofitted with ultra-low NOx burner to achieve 5 ppmv NOx @ 3% O2. Note that retrofitting a steam generator may involve upgrades to various systems such as fuel train to comply with up to date codes, and may involve upgrades to air intake fans, as these units require more air for the burner to operate at it's optimum level. As many steam generators are one off built units, they may have different firebox configurations that may not accept the new burner without varrying degrees of modification. Pursuant to a local facility, the cost of retrofitting a steam generator to a 5 ppmv NOx burner would vary between about $450,000 to $1,800,000 depending on the extent of modifications or upgrades that are needed. Another facility has provided a cost estimate for a new 5 ppmv steam generator of $2,000,000.

Most of the steam generators that would need to be retrofit would be 62.5 MMBtu/hr units. Rule 4306 requires the units to meet 15 ppmv NOx. The cost-effectiveness for retrofitting the units from 15 ppm to 5 ppmv is shown below.

{(0.012 lb/MMBtu)(62.5 MMBtu/hr)(8760 hr)(0.80 usage)}/2,000 lb/ton = 2.6 ton NOx

Capital costs $450,000 to $1,800,000 = $72,000 to $288,000 annualized (10 yrs, 10%)

Cost-effectiveness = $27,692 to $110,769 per ton reduction

This variability in cost-effectiveness is expected as the steam generators in the oilfields are highly variable in size, age, and state of repair.

Enhanced Selective Catalytic Reduction (SCR) Equipment

Facilities may add additional catalyst units onto existing systems and use them in series with the existing catalyst. The feasibility issues with additional catalyst include additional ammonia usage and storage. Ammonia is an extremely hazardous chemical so the additional storage and usage may not be appropriate. Existing units also may not have the footprint required for the additional SCR material needed. Extensive reconfiguration of the facility may be required. New facilities would be able to plan for increased SCR catalyst.

Many existing boilers, steam generators, and process heaters are not equipped with SCR. Installation of SCR on existing equipment may require significant modifications to the equipment be able to install SCR within the appropriate temperature range in the

exhaust stream. Additionally, in some instances, the equipment is installed in a setting with other equipment, and there may be challenges regarding the space available to install an SCR catalyst and the requirement ancillary equipment, i.e. ammonia storage and handling equipment. Some boilers greater than 20.0 MMbtu/hr with low NOx burners and SCR were source tested below 5 ppmv NOx to as low as 2 ppmv.

Retrofitting with Selective Catalytic Reduction (SCR) as Potential Control for units between 5-20 MMBtu/hr

SCR technology is predominantly used to reduce NOx emissions from boilers, steam generators and process heaters. Since SCR is post-combustion control, an existing boiler can be retrofitted with this technology. Several units in the Valley are equipped with SCR system. According to information from SCR vendors, the average SCR system cost is $142,500 for units between 5-20 MMBtu/hr. This information is used as the basis to estimate the annualized cost for this control technique.

Description of Cost	Cost Factor	Cost	Source
Direct Costs			
Purchase equipment costs (PE)			
SCR System	A	142,500	SCR vendors
Instrumentation and controls	0.01 A	1,425	OAQPS
Sales Taxes	0.08 A	11,514	
Freight	0.05 A	7,125	OAQPS
Purchased equipment cost, PEC	B = 1.14 A	162,564	
Direct installation costs (DI):			
Foundation & supports	0.08 B	13,005	OAQPS
Handling and erection	0.14 B	22,759	OAQPS
Electrical	0.04 B	6,503	OAQPS
Piping	0.02 B	3,251	OAQPS
Insulation and ductwork:	0.01 B	1,626	OAQPS
Painting	0.01 B	1,626	OAQPS
Direct installation costs	0.30 B	48,770	
Site preparation	As required, SP	--	See table footnote
Buildings	As required, Bldg.	--	
Total Direct Costs, DC	1.30B + SP+ Bldg.	211,334	
Indirect Costs (Installation)			
Engineering	0.10 B	16,256	OAQPS
Construction and field expenses	0.05 B	8,128	OAQPS
Contractor fees	0.10 B	16,256	OAQPS
Contingencies	0.03 B	4,877	OAQPS
Start-up	0.02 B	3,251	OAQPS
Performance test	0.01 B	1,626	OAQPS
Total Indirect Costs, IC	0.31 B	50,394	
Total Capital Investments (TCI= DC + IC):	**1.61 B + SP + Bldg.**	**261,728**	
Annualized TCI (10 years @ 10% interest)	0.1627 TCI	**$42,583/yr**	

Description of Cost	Cost Factor	Cost	Source
Direct Annual Costs (DAC)			
Operating and supervisory labor	--	--	See table footnote
Maintenance Costs (labor and material)	0.015 TCI	3,926	OAQPS
Reagent costs (anhydrous ammonia)		--	Not estimated
Electricity Cost:	$0.08848/kWH	--	Not estimated
Catalyst Replacement:	--	--	Catalyst is presumed to last at least over 10 years
	Total DAC:	3,926	
Indirect Annual Costs (IAC)			
Overhead:	--	--	See table footnote
Insurance:	0.01 TCI	2,617	OAQPS
Property Tax:	--	--	See table footnote
Administrative:	--	--	See table footnote
	Total IAC:	2,617	
Total Annual Cost (DAC + IAC)		6,543	
Total annual cost (Annualized TCI + Total annual cost)		**$49,126/yr**	

*Per EPA's Air Pollution Control Cost Manual (6th Edition), EPA/452/B-02-001 (1/02), operating and supervisory, overhead, administrative costs would be insignificant for an SCR system. In general, SCR does not require site preparation or additional buildings, and property taxes do not apply to capital improvements such as air pollution control equipment.

The potential NOx emission reduction for 5 to 20 MMBtu/hr units (Category A in Rule 4320 except Category C through G units) is determined by taking the difference between the permitted potential emissions and the emissions that could be reliably achievable by an SCR system. Source test results of various units with SCR systems indicate that an SCR can potentially achieve 3.5 ppmv NOx @ 3% O2 for units rated between 5 to 20 MMBtu/hr. Each unit is presumed to be operated for 8,760 hours per year at the maximum rated capacity, unless restricted by annual heat input rate. The total cost for this category is determined by multiplying the number of units and $49,126 a typical annual cost of an SCR system for a 5 to 20 MMBtu/hr unit.

Type of unit	Number of units	Potential NOx Reductions with SCR Technology (tons/yr)	Total annualized cost of NOx Reductions with SCR Technology ($/yr)	Cost-effectiveness ($/ton of emission reduction)
Category A: >5.0 MMBtu/hr to ≤ 20 MMBtu/hr, Except Category C through G units	273*	129.0	13,411,398	**$103,964/ton**

*Total units = 279 - 6 units with SCR systems = 273 units

Retrofitting with Selective Catalytic Reduction (SCR) as Potential Control for units greater than 20 MMBtu/hr

SCR technology is predominantly used to reduce NOx emissions from boilers, steam generators and process heaters. Since SCR is post-combustion control, an existing boiler can be retrofitted with this technology. Several units in the Valley are equipped with SCR system. According to information from SCR vendors, the average SCR

system cost is $210,000 for units between 20 to 95 MMBtu/hr. This information is used as the basis to estimate the annualized cost for this control technique.

Description of Cost	Cost Factor	Cost	Source
Direct Costs			
Purchase equipment costs (PE)			
SCR System	A	210,000	SCR vendors
Instrumentation and controls	0.01 A	2,100	OAQPS
Sales Taxes	0.08 A	16,968	
Freight	0.05 A	10,500	OAQPS
Purchased equipment cost, PEC	B = 1.14 A	239,568	
Direct installation costs (DI):			
Foundation & supports	0.08 B	19,165	OAQPS
Handling and erection	0.14 B	33,540	OAQPS
Electrical	0.04 B	9,583	OAQPS
Piping	0.02 B	4,791	OAQPS
Insulation and ductwork:	0.01 B	2,396	OAQPS
Painting	0.01 B	2,396	OAQPS
Direct installation costs	0.30 B	71,871	
Site preparation	As required, SP	--	See table footnote
Buildings	As required, Bldg.	--	
Total Direct Costs, DC	1.30B + SP+ Bldg.	311,439	
Indirect Costs (Installation)			
Engineering	0.10 B	23,957	OAQPS
Construction and field expenses	0.05 B	11,978	OAQPS
Contractor fees	0.10 B	23,957	OAQPS
Contingencies	0.03 B	7,187	OAQPS
Start-up	0.02 B	4,791	OAQPS
Performance test	0.01 B	2,396	OAQPS
Total Indirect Costs, IC	0.31 B	74,266	
Total Capital Investments (TCI= DC + IC):	**1.61 B + SP + Bldg.**	**385,705**	
Annualized TCI (10 years @ 10% interest)	0.1627 TCI	**62,754**	

Description of Cost	Cost Factor	Cost	Source
Direct Annual Costs (DAC)			
Operating and supervisory labor	--	--	See table footnote
Maintenance Costs (labor and material)	0.015 TCI	5,786	OAQPS
Reagent costs (anhydrous ammonia)		--	Not estimated
Electricity Cost:	$0.08848/kWH	--	Not estimated
Catalyst Replacement:	--	--	Catalyst is presumed to last at least over 10 years
	Total DAC:	5,786	
Indirect Annual Costs (IAC)			
Overhead:	--	--	See table footnote
Insurance:	0.01 TCI	3,857	OAQPS
Property Tax:	--	--	See table footnote
Administrative:	--	--	See table footnote
	Total IAC:	3,857	
Total Annual Cost (DAC + IAC)		9,643	

Description of Cost	Cost Factor	Cost	Source
Total annual cost (Annualized TCI + Total annual cost)		**72,397**	

*Per EPA's Air Pollution Control Cost Manual (6th Edition), EPA/452/B-02-001 (1/02), operating and supervisory, overhead, administrative costs would be insignificant for an SCR system. In general, SCR does not require site preparation or additional buildings, and property taxes do not apply to capital improvements such as air pollution control equipment.

The potential NOx emission reduction for greater 20 MMBtu/hr units (Category B in Rule 4320 except Category C through G units) is determined by taking the difference between the permitted potential emissions and the emissions that could be reliably achievable by an SCR system. Source test results of various units with SCR system indicate that an SCR can reliably achieve 2.5 ppmv NOx @ 3% O2 (or less) emissions for units greater than 20 MMBtu/hr. Each unit is presumed to be operated for 8,760 hours per year at the maximum rated capacity, unless restricted by annual heat input rate. The total cost for this category is determined by multiplying the number of units and $72,397 a typical annual cost of an SCR system for a 5 to 20 MMBtu/hr unit.

Type of unit	Number of units	Potential NOx Reductions with SCR Technology (tons/yr)	Total annualized cost of NOx Reductions with SCR Technology ($/yr)	Cost-effectiveness ($/ton of emission reduction)
Category B: >20.0 MMBtu/hr, except Category C through G units	190*	123.7	13,755,430	**$41,159/ton**

*Total units = 221 - 31 units with SCR systems = 190 units

Oilfield Steam Generators

The temperature required for SCR to work (600-800 F) is higher than the temperature that of oilfield steam generator exhaust(~250 F). The steam generators would have to be cut open to retrofit SCR into the convection section of the steam generator to operate the SCR system at the correct temperature. This would cause insurmountable heat loss, preventing the production of the steam necessary for the oil field operation. Therefore, oilfield facilities do not use SCR on their steam generators.

Some oilfield steam generators now are being proposed with NOx limits of 5 ppmv with burner controls and without SCR. These units have a ULN burner. Some units already installed and operating with ultra low nox burners combined with flue gas recirculation have demonstrated through source tests to achieve NOx emission levels as low as 3.0 ppmv.

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 NOx limits between 1.0 - 3.2 ppmv for loads 4.1 – 13.0 MMBtu/hr. The LTO system utilizes ozone to oxidize and control various pollutants, including NOx. 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 1997[17]. 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 is cost prohibitive without significant subsidies, it will not be considered a feasible opportunity at this time.

EMx

The potential for emissions reductions through EMx, the second generation of the SCONOx technology, that is a post-combustion control that reduces NOx, SOx, 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 SCONOx 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 SCONOx 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 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 per ton reduced 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.

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 are allowed to utilize liquid fuel during natural gas curtailments 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 utilize liquid fuel as a backup only if there is a natural gas curtailment. In fact, as there have been no recent natural gas curtailments in the Valley, actual emissions from the combustion of liquid fuel is likely zero.

[17] (2012). *SCAQMD Best Available Control Technology (BACT) Database*. Diamond Bar, CA: South Coast Air Quality Management District.

The following three technologies were researched as potential opportunities to reduce PM emissions: baghouses, electrostatic precipitators (ESPs), and wet scrubbers. Baghouses 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%[18]. However, baghouses are typically not used with liquid-fired boilers due to the potential clogging of the baghouse[19] and are therefore not a recommended technology due to infeasibility and safety issues.

Currently, there are a several produced gas fired steam generators operating in crude oil production facilities that are required by their permits to operate SOx scrubbers and ESPs (to reduce SOx emissions and visible emissions to burning high sulfur produced gas).

As illustrated below, 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 2018 dollars.

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)

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.[20] For the wet

[18] 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.*
[19] 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.*
[20] 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.

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.[21] 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.

Annual Cost_{ESP} = (Total Capital Cost) x (0.1627) + (Annual Maintenance Cost x 62)
Annual Cost_{ESP} = (\$100,000 x 62) x (0.1627) + (\$2,000 x 62)
Annual Cost_{ESP} = \$1,132,740/year

$\text{Annual Cost}_{scrubber}$ = (Annualized Cost of 1 unit) x (Number of Units) x (Average Flow Rate)
$\text{Annual Cost}_{scrubber}$ = (\$53,650/ sm^3/sec) x (62) x (23.85 sm^3/sec)
$\text{Annual Cost}_{scrubber}$ = \$79,332,255 year

Cost-effectiveness of an ESP and Wet Scrubber

Cost-effectiveness = Annual Cost / Annual Emissions Reductions

$\text{Cost-effectiveness}_{ESP}$ = (\$1,132,740/year) / (0.0198 tons/ year)
$\text{Cost-effectiveness}_{ESP}$ = \$57,209,091/ton of PM

$\text{Cost-effectiveness}_{scrubber}$ = (\$79,332,255/year) / (0.0198 tons/ year)
$\text{Cost-effectiveness}_{scrubber}$ = \$4,006,679,545/ton of PM

Electrification of Oilfield Steam Generators

Currently, there are no electric steam generators capable of meeting the demands of conventional steam generators. One of the largest electric generators produce 4,882 lb/hr @ 135 pounds per square inch gauge (psig). This flow rate is only 1/10 of the rate needed from one conventional steam generator and the pressure rating of 135 psig is far below the needed pressure of 800 – 900 psig.

[21] (2002). *Air Pollution Control Technology Fact Sheet: Spray-Chamber/Spray-Tower Wet Scrubber.* Environmental Protection Agency.

Furthermore, a typical conventional natural gas-fired steam generator is rated (designed) to burn up to 62.5 million Btu/hr of natural gas and consumes approximately 50 million Btu/hr (i.e. 80% firing rate). This will require, on average, 13.75 MW of electricity to replace one conventional steam generator. Therefore, the electricity needs to replace one conventional steam generator with electric steam generation would be the equivalent electricity demand of over 10,000 homes. To replace conventional steam generators operating in the San Joaquin Valley with electric steam generation would require approximately 5,160 MW, which would be the equivalent electricity demand of 3,800,000 homes. The immense amount of power needed to electrify all steam generators in the District would require significant infrastructure upgrades to California's power grid. Therefore, electric steam generators are not feasible at this time.

Solar Powered Oilfield Steam Generation

Emissions from oilfield steam generators that provide steam to reduce the viscosity of oil in thermally enhanced oil recovery operations have been significantly reduced through decades of increasingly stringent rule requirements. Instead of fuel oil, steam generators today are powered by natural gas or field gas which are significantly cleaner. To ensure that all potential emission reduction opportunities are evaluated, the District performed a comprehensive review of solar powered steam generators.

In the Valley, two small pilot projects were conducted to demonstrate the feasibility of solar powered steam generation technologies and found that such technologies were not feasible:

Berry Petroleum Company: This company installed a small pilot test facility designed to use solar energy to pre-heat feed water for the existing natural gas fired steam generators. The system consisted of mirrors in a glass greenhouse (supplied by Glasspoint Solar). The mirrors were designed to focus solar energy onto a pipe carrying water to heat the water. The heated water would then be sent to the input of the steam generators. The facility had a designed heat production of 300 kW. This project operated for a short time and was ultimately shut down based on the following shortcomings:

1) Significant heat loss: The heat losses to the water from the pipe runs from the solar installation to the actual steam generator locations were such that the water delivered to the steam generators was ambient or slightly warmer.
2) Excessively large footprint requirement: The footprint of the solar steam generators needed to provide the thermal output of one 85 MMBtu steam generator would be excessively large.
3) Inconsistent steam quality: The inability of the solar steam generators to consistently generate the quality of steam that is needed for injection that is currently supplied by the steam generators.
4) Unreliable power: The solar steam generators would still need to be supplemented by gas fired steam generators at night and during cloudy days.

Chevron: This company installed a pilot solar thermal steam plant near Coalinga, consisting of 7,600 mirrors that would direct solar energy towards a single solar

collector tower (supplied by Brightsource Energy). The heat collected in the tower would turn water into steam. The installation had a footprint of 100 acres. This system discontinued operation in 2014. Although information from Chevron on their findings on the performance of this project is unavailable, based on news articles[22], the system was excessively costly. A news article referencing the manufacturer's SEC filings stated the company realized a 40 million dollar loss on the project.

Aera Energy: Despite the above-described challenges, Aera Energy is currently in collaboration with Glasspoint Solar to consider the potential installation of a large 770-acre solar steam generation system adjacent to an Aera Energy oil production operation in western Kern County. This system would generate the steam equivalent to approximately 10 gas-fired steam generators. The solar steam generators would still need to be supplemented by gas-fired steam generators at night and during cloudy days.

Based on discussions with Aera Energy, the project relies heavily on solar tax credits, the generation and sale of low carbon fuel standard (LCFS) credits, and the reduction in costs of greenhouse gas allowances for Aera. According to Aera Energy, there is no economic benefit to implementing such technologies. In fact, without the LCFS credits, the cost of steam using this solar technology would be as much as 3 times the current cost. AERA Energy is pursuing this technology to continue its effort in helping lead the industry to cleaner energy. The system proposed would be primarily funded by the solar steam generation equipment manufacturer and outside investors. Aera Energy would commit to purchasing the steam if successfully built.

The project also faces technical challenges, similar to the above pilot projects. Furthermore, the gas-fired steam generators that are required to supplement the system could face difficulty meeting current rule limits due to the need to ramp up and down. There has not been a successful large scale implementation of such technologies. The District is working closely with AERA to facilitate this project.

In summary, solar powered oilfield steam generators are not yet feasible and still face significant technical and economic challenges as outlined below:

- **Costs:** The use of solar steam generation rely on a complex set of funding sources to make the operations economically feasible, including the Federal 30% tax credit, the value of California low-carbon fuel standards credits that may be generated as a result of using solar steam generation to produce oil, and a reduction in the costs for the oil producer of AB32 cap-and-trade credits required for their operations in California. The value of the GHG credits generated varies based on the price of credits on the open market. As the value of the credits is not fixed, the economic viability of a project may change depending on the value

[22] http://www.naturalgasintel.com/articles/103562-potential-for-solar-assisted-eor-in-california-oilfield-still-unfulfilled and https://gigaom.com/2011/10/12/brightsources-solar-steam-project-went-way-over-budget/

of the credits prior to construction and during operation. Even with available credits, the costs continue to be a challenge.

- **Land Availability:** Adequate open land next to the steam injection wells is needed to house the solar collectors. Both the amount of land and the distance of the land to the injection point are important factors. It is estimated that to create the steam needed to replace one steam generator would require 60 acres of solar generation. Finding the required amount of land available next to oilfield operations may be difficult. The solar systems have to be close to the steam injection wells. Otherwise, additional solar capacity will need to be developed to account for the heat loss because of travel distance.

- **Variability of Solar Steam Generation Output:** Solar steam generation plants need sunny days to be able to collect enough energy to make steam. During cloudy days and also during the night, the solar equipment would not make enough steam. Oilfield operators will need to supplement the solar operation with natural gas fired steam generators for when the solar equipment is not producing enough steam. On partly cloudy days, the natural gas steam generators would need to cycle on and off depending on the cloud cover. This may cause operational difficulties as the gas fired steam generators are tuned to operate at constant load. A variable load could cause emissions variability and potentially have emissions higher than that allowed in permit limits and/or District prohibitory rules.

The District will continue to work with operators of boiler, steam generator, process heater to develop, demonstrate, and deploy new emission control technologies. This includes developing innovative strategies to address challenges like the variable load issue for solar steam generators that may cause individual steam generators to exceed current permitted limits. In such situations, a strategy that allows individual units to potentially operate at a higher level as long as the overall operation of the combined units as a whole results in additional emission reductions.

EVALUATION FINDINGS

The District has evaluated all potential control technologies and all control technologies achieved in practice in other areas or included in other state implementation plans for emissions from boilers, steam generators, and process heaters. As demonstrated above, Rules 4306 and 4320 currently have in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds RACM, BACM, and MSM requirements for this source category.

While the District meets or exceeds RACM, BACM, and MSM requirements for this source category, given the enormity of reductions needed to demonstrate attainment with the latest PM2.5 standards, the District will work with affected operators to further reduce NOx emissions from boilers, steam generators, and process heaters to the extent that such controls are technologically and economically feasible. Technologies with the potential to further reduce emissions include the latest generation of ultra-low NOx burners, SCR, and ultra-low NOx burners combined with SCR. As demonstrated

above, some of these technologies may not be cost-effective or feasible at this time. Therefore, the potential measures include lowering the emission limits for the class and category and lowering the more stringent Advanced Emission Reduction Option (AERO) limit further as follows:

- Boilers and process heaters >5.0 MMBtu/hr to ≤ 20 MMBtu/hr
  - Lower current emissions limitations of 6 ppmv (enhanced) and 9 ppmv (standard) to a new limitation as low as 2.5 ppmv, with Advanced Emission Reduction Option to allow for advanced technology development and deployment
- Boilers and process heaters > 20 MMBtu/hr
  - Lower current emissions limitations of 5 ppmv (enhanced) and 7 ppmv (standard) to a new limitation as low as 2 ppmv, with Advanced Emission Reduction Option to allow for advanced technology development and deployment
- Oil field steam generators >5.0 MMBtu/hr to ≤ 20 MMBtu/hr
  - Lower current emissions limitations of 6 ppmv (enhanced) and 9 ppmv (standard) to a new limitation as low as 3.5 ppmv, with Advanced Emission Reduction Option to allow for advanced technology development and deployment
- Oil field steam generators > 20 MMBtu/hr
  - Lower current emissions limitations of 5 ppmv (enhanced) and 7 ppmv (standard) to a new limitation as low as 2 ppmv, with Advanced Emission Reduction Option to allow for advanced technology development and deployment
- Oil field steam generators < 50% PUC quality gas
  - Lower current emissions limitations of 12 ppmv (enhanced initial) and 9 ppmv (enhanced final) to a new limitation as low as 3.5 ppmv, with Advanced Emission Reduction Option to allow for advanced technology development and deployment
- Petroleum refinery boilers/process heaters >5.0 MMBtu/hr to ≤ 20 MMBtu/hr
  - Lower current emissions limitations of 9 ppmv to a new limitation as low as 3 ppmv, with Advanced Emission Reduction Option to allow for advanced technology development and deployment
- Petroleum refinery boilers/process heaters >20 MMBtu/hr to ≤ 110 MMBtu/hr
  - Lower current emissions limitations of 6 ppmv to a new limitation as low as 3 ppmv, with Advanced Emission Reduction Option to allow for advanced technology development and deployment
- Petroleum refinery boilers/process heaters >110 MMBtu/hr
  - Lower current emissions limitations of 5 ppmv to a new limitation as low as 3 ppmv, with Advanced Emission Reduction Option to allow for advanced technology development and deployment
- Petroleum refinery boilers/process heaters < 50% PUC quality gas
  - Lower current emissions limitations of 9 ppmv to a new limitation as low as 3 ppmv, with Advanced Emission Reduction Option to allow for advanced technology development and deployment

C.8 Rule 4307 (Emissions From Boilers Steam Generators And Process Heaters-2.0 MMBtu/Hr To 5.0 MMBtu/Hr)

Discussion

The purpose of Rule 4307 (Boilers, Steam Generators, and Process Heaters – 2.0 MMBtu/hr to 5.0 MMBtu/hr) is to limit emissions of NOx, CO, sulfur dioxide (SO2), and PM from units subject to this rule.

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 smaller size. Since adoption, the rule has been amended three times. The October 2008 amendments strengthened the rule by removing some exemptions, imposing NOx limits of 9 or 12 ppmv for new and replacement units, and adding a menu-approach for particulate matter control that also encompasses SOx controls. The rule was amended again in 2011 to specifically incorporate tree nut pasteurizers as a separate type of unit. EPA published a direct final approval of the 2011 amendments to Rule 4307 on February 12, 2015, and deemed this rule as being at least as stringent as established RACT requirements.[23] NOx emissions have been controlled by over 84% for units in this source category.

Emission Inventory

POLLUTANT	2013	2017	2019	2020	2022	2023	2024	2025	2026	2028
	Annual Average - Tons per day									
PM2.5	0.31	0.29	0.28	0.28	0.27	0.26	0.26	0.25	0.25	0.24
NOX	0.45	0.37	0.35	0.34	0.32	0.31	0.30	0.29	0.28	0.26
	Winter Average - Tons per day									
PM2.5	0.31	0.29	0.28	0.27	0.26	0.26	0.25	0.25	0.25	0.24
NOX	0.44	0.36	0.34	0.33	0.31	0.30	0.29	0.28	0.27	0.25

Source Category

This source category includes 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. Based on District data, there are currently 642 active units subject to Rule 4307 requirements[24] permitted with Permits to Operate (PTOs) or Permit-Exempt Equipment Registration (PEER); with the majority of them being PEER units. Facilities with units subject to this rule represent a wide range of industries, including but not limited to, medical facilities, educational institutions, office buildings, prisons, military facilities, hotels, and industrial facilities.

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

Federal Regulations

[23] 80 FR 7803-7805
[24] Data based SJVAPCD permit data retrieved on November 17, 2016 and August 23, 2018

Emissions from this source category are lower than the BACM significance thresholds. The federal Clean Air Act does not require a control measure evaluation for this source category to satisfy BACM requirements. However, the District conducted a full control measure evaluation for this source category to ensure all feasible opportunities to reduce emissions and expedite attainment are pursued.

There are no EPA CTG or NSPS requirements for this source category.

Alternative Control Techniques* (*ACT)

- EPA–453/R-93-034 (Alternative Control Techniques Document–NOx Emissions from Process Heaters)

The District evaluated the requirements contained within the ACT for NOx Emissions from Process Heaters and found no requirements that were more stringent than those already in Rule 4307.

- EPA–453/R-94-022 (Alternative Control Techniques Document–NOx Emissions from Industrial/Commercial/Institutional Boilers)

The District evaluated the requirements contained within the ACT for NOx Emissions from Industrial/Commercial/Institutional Boilers and found no requirements that were more stringent than those already in Rule 4307.

- EPA–453/R-94-023 (Alternative Control Techniques Document–NOx Emissions from Utility Boilers)

The District evaluated the requirements contained within the ACT for NOx Emissions from Utility Boilers and found no requirements that were more stringent than those already in Rule 4307.

NESHAP/ MACT

- 40 CFR 63 Subpart DDDDD (NESHAP for Major Sources: Industrial, Commercial, and Institutional Boilers and Process Heaters)

40 CFR 63 Subpart DDDDD was amended on January 31, 2013 to include new emission limits for PM, CO, and total selective metals (TSM), replace numeric dioxin emission limits with work practice standards, add new subcategories of facilities, and add alternative monitoring approaches for compliance with the PM limit. The PM limits in 40 CFR 63 Subpart DDDDD would not apply to Rule 4307 sources. Subpart DDDDD contains alternative requirements for units less than 10 MMBtu/hr and requires tuning every 2-5 years.

The District evaluated the requirements contained within 40 CFR 63 Subpart DDDDD and found no requirements that were more stringent than those already in Rule 4307.

State Regulations

There are no state regulations applicable to this source category.

HOW DOES DISTRICT RULE 4307 COMPARE TO RULES IN OTHER AIR DISTRICTS?

BAAQMD

- BAAQMD Regulation 9, Rule 6 (Nitrogen Oxide Emissions From Natural Gas-Fired Boilers and Water Heaters) *(Last amended November 7, 2007)*
  BAAQMD Regulation 9 Rule 6 regulates NOx and CO emissions from natural gas fired boilers and water heaters. The District compared the emission limits in District Rule 4307 and BAAQMD's Regulation 9 Rule 6 and concluded that NOx requirements in the District rule are at least equivalent or more stringent than the BAAQMD rule limits for similarly rated units.

- Regulation 9 Rule 7 (Nitrogen Oxides and Carbon Monoxide From Industrial and Commercial Boilers, Steam Generators and Process Heaters) *(Last amended May 4, 2011)*
  BAAQMD Regulation 9 Rule 7 regulates NOx and CO emissions from industrial and commercial boilers, steam generators and process heaters. The District compared the emission limits in District Rule 4307 and BAAQMD's Regulation 9 Rule 7 and concluded that NOx requirements in the District rule are at least equivalent or more stringent than the BAAQMD rule limits for similarly rated units.

- Regulation 9, Rule 10 (Nitrogen Oxides and Carbon Monoxide From Boilers, Steam Generators and Process Heaters in Petroleum Refineries) *(Last amended October 16, 2013)*
  BAAQMD Regulation 9 Rule 10 regulates NOx and CO emissions from boilers, steam generators and process heaters in petroleum refineries. The District compared the remission limits in District Rule 4307 to the requirements contained within BAAQMD's Regulation 9 Rule 10 and found that NOx requirements in the District rule are on an emission-unit by emission-unit basis, whereas, the emission limits in BAAQMD rule is on a refinery-wide basis, and therefore, cannot be compared.

SCAQMD

- Rule 1146.1 (Emissions of Oxides of Nitrogen from Small Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters) *(Last amended November 1, 2013)*
  SCAQMD Rule 1146.1 regulates NOx and CO emissions from small industrial, institutional, and commercial boilers, steam generators, and process heaters. The District compared the emission limits in District Rule 4307 with SCAQMD Rule 1146.1and concluded that NOx requirements in the District rule are at least equivalent or more stringent than the SCAQMD rule limits for similarly rated units.

- Rule 1146.2 (Emissions of Oxides of Nitrogen from Large Water Heaters and Small Boilers and Process Heaters) *(Last amended May 5, 2006)*
  SCAQMD Rule 1146.2 regulates NOx and CO emissions from large water heaters and small boilers and process heaters. The District compared the emission limits in District Rule 4307 with SCAQMD Rule 1146.2 and concluded that NOx requirements in the District rule are more stringent than the SCAQMD rule limits for 2.0 MMBtu/hr

boilers and process heaters.

- Rule 1109 (Emissions of Oxides of Nitrogen from Boilers and Process Heaters in Petroleum Refineries) *(Last amended August 5, 1988)*
  SCAQMD Rule 1146.2 regulates NOx and CO emissions from large water heaters and small boilers and process heaters. The units subject to Rule 4307 would not be subject to requirements of SCAQMD Rule 1109. Therefore, no further analysis is required.

SMAQMD

- Rule 411 (NOx from Boilers, Process Heaters and Steam Generators) *(August 23, 2007)*
  SMAQMD Rule 411 regulates NOx and CO emissions from boilers, process heaters and steam generators. The District compared the emission limits in District Rule 4307 with SMAQMD Rule 411 and concluded that NOx requirements in District Rule 4307 are at least as stringent or more stringent than the SCAQMD rule limits for similarly rated units.

VCAPCD

- Rule 74.15.1 (Boilers, Steam Generators, and Process Heaters) *(Last amended June 23, 2015)*
  VCAPCD Rule 74.15.1 regulates NOx and CO emissions from boilers, steam generators, and process heaters. The District compared the emission limits in District Rule 4307 with VCAPCD and concluded that NOx requirements in the District rule are equivalent to that of the VCAPCD rule limits for similarly rated units.

	SJVAPCD	BAAQMD Reg 9 Rule 6
Applicability	Rule applies to any gaseous fuel or liquid fuel fired boilers, steam generators and process heaters rated ≥2.0 MMBtu/hr to ≤5.0 MMBtu/hr	Rule applies to natural gas fired water heaters and boilers, and limits only NOx emissions
Exemptions	• Solid fuel fired units • Dryers and glass melting furnaces • Kilns, humidifiers, and smelters where the products of combustion come into direct contact with the material to be heated • Unfired or fired waste heat recovery boilers that are used to recover or augment heat from the exhaust of combustion turbines or internal combustion engines • Burning other fuel during PUC quality natural gas curtailment as long as other fuel not be burned for more than 168 hour/year plus 48 hour/year for equipment testing and NOx emissions shall not exceed 150 ppmv or 0.215 lb/MMBtu	• Natural gas-fired boilers and water heaters rated at > 2 MMBtu/hr • Natural gas-fired water heaters used in recreational vehicles. • Water heaters using a fuel other than natural gas. • Natural gas-fired pool/spa heater with <0.4 MMBtu/hr used exclusively to heat swimming pools, hot tubs or spas
Requirements*	**NOx emission limits:** Existing units limited to 1.8 billion Btu/yr • Install & maintain non-resettable fuel flow meter; AND • Tune-in the unit twice per calendar year, OR • Operate and maintain the stack O_2 concentrations at 3% by vol. or less, OR • Certify unit to comply with 30 ppmv NOx (gaseous fuel) when annual limit is exceeded; if unit is replaced then comply with limits of New and Replacement units (see below). Existing atmospheric units in oilfield or refinery; each glycol reboiler; or each unit with heat input > 1.8 to < 5 billion Btu/yr: • 30 ppmv NOx (gaseous fuel) New and Replacement units: • 12 ppmv NOx (atmospheric units) • 9 ppmv NOx (non-atmospheric units) **Particulate matter control requirements:** • Use PUC quality natural gas, propane, butane, LPG or a combination of such gases, OR • Limit fuel sulfur content to no more than 5 grains/100 scf of gas; OR • Install and operate control system that reduces SO2 emissions at least 95% by wt., or limit exhaust SO2 concentration to ≤ 9 ppmv @ 3% O_2; AND • Liquid fuel shall be used only during a PUC quality natural gas curtailment period provided the fuel does not contain 15 ppm sulfur	**NOx emission limits:** Natural gas-fired boilers and water heaters: • 20 ng-NOx/J of heat output or 30 ppm NOx for units >0.4 MMBtu/hr to 2 MMBtu/hr manufactured after Jan 1, 2008 • 14 ng-NOx/J of heat output or 20 ppm NOx for units >0.4 MMBtu/hr to 2 MMBtu/hr manufactured after Jan 1, 2013 **Particulate matter control requirements:** None

*Unless otherwise stated, all ppmv values are on a dry basis and corrected to 3% stack oxygen by volume.

	SJVAPCD Rule 4307	BAAQMD Reg 9 Rule 7
Applicability	Rule applies to any gaseous fuel or liquid fuel fired boilers, steam generators and process heaters rated ≥2.0 MMBtu/hr to ≤5.0 MMBtu/hr	Rule applies to any industrial, institutional and commercial boilers, steam generator and process.
Exemptions	• Solid fuel fired units • Dryers and glass melting furnaces • Kilns, humidifiers, and smelters where the products of combustion come into direct contact with the material to be heated • Unfired or fired waste heat recovery boilers that are used to recover or augment heat from the exhaust of combustion turbines or internal combustion engines • Burning other fuel during PUC quality natural gas curtailment as long as other fuel not be burned for more than 168 hour/year plus 48 hour/year for equipment testing and NOx emissions shall not exceed 150 ppmv or 0.215 lb/MMBtu	• Units ≤ 2MMBtu/hr if fired exclusively on natural gas, LPG, or any combination thereof • Units <1MMBtu/hr with any fuel • Units used in petroleum refineries • Boilers used by public electric utilities or qualifying small power production facilities • Waste heat recovery boilers used to recover sensible heat from the exhaust of combustion turbines or reciprocating internal combustion engines • Kilns, ovens, and furnaces used for drying, baking, heat treating, cooking, calcining or vitrifying • Process heater used to heat thermal fluid for radiant comfort heating
Requirements*	**NOx emission limits:** Existing units limited to 1.8 billion Btu/yr • Install & maintain non-resettable fuel flow meter; AND • Tune-in the unit twice per calendar year, OR • Operate and maintain the stack O_2 concentrations at 3% by vol. or less, OR • Certify unit to comply with 30 ppmv NOx (gaseous fuel) when annual limit is exceeded; if unit is replaced then comply with limits of New and Replacement units (see below). Existing atmospheric units in oilfield or refinery; each glycol reboiler; or each unit with heat input > 1.8 to < 5 billion Btu/yr: • 30 ppmv NOx (gaseous fuel) New and Replacement units: • 12 ppmv NOx (atmospheric units) • 9 ppmv NOx (non-atmospheric units) **Particulate matter control requirements:** • Use PUC quality natural gas, propane, butane, LPG or a combination of such gases, OR • Limit fuel sulfur content to no more than 5 grains/100 scf of gas; OR • Install and operate control system that reduces SO2 emissions at least 95% by wt., or limit exhaust SO2 concentration to ≤ 9 ppmv @ 3% O_2; AND • Liquid fuel shall be used only during a PUC quality natural gas curtailment period provided the fuel does not contain 15 ppm sulfur	**NOx and CO emission limits:** Units with <10% of its annual maximum heat capacity in 12 consecutive months: • Install & maintain non-resettable fuel flow meter; AND • Tune-in the unit at least once per calendar year, OR • Comply with applicable NOx and CO limits (see below) Units >2 MMBtu/hr to 5 MMBtu/hr: • 30 ppm NOx (gaseous fuels, landfill gas, or digester gas) • 40 ppmv NOx (no-gaseous fuels) • Heat input weighted average limit for NOx (multiple fuels) **Particulate matter control requirements:** None

*Unless otherwise stated, all ppmv values are on a dry basis and corrected to 3% stack oxygen by volume.

	SJVAPCD Rule 4307	BAAQMD Reg 9 Rule 10
Applicability	Rule applies to any gaseous fuel or liquid fuel fired boilers, steam generators and process heaters rated ≥2.0 MMBtu/hr to ≤5.0 MMBtu/hr	Rule applies to boilers, steam generator and process heaters, including CO boilers, in petroleum refineries
Exemptions	• Solid fuel fired units • Dryers and glass melting furnaces • Kilns, humidifiers, and smelters where the products of combustion come into direct contact with the material to be heated • Unfired or fired waste heat recovery boilers that are used to recover or augment heat from the exhaust of combustion turbines or internal combustion engines • Burning other fuel during PUC quality natural gas curtailment as long as other fuel not be burned for more than 168 hour/year plus 48 hour/year for equipment testing and NOx emissions shall not exceed 150 ppmv or 0.215 lb/MMBtu	• Units < 2MMBtu/hr if fired exclusively on natural gas, LPG, or any combination thereof • Units <1MMBtu/hr with any fuel • Waste heat recovery boilers used to recover sensible heat from the exhaust of combustion turbines or reciprocating internal combustion engines • Waste heat recovery boilers recovering sensible heat from exhaust of combustion turbines or reciprocating IC engines • Units processing H2S process flue gas in sulfur recovery plants and their tail-gas treating units, or sulfuric acid manufacturing plants • Units on non-gaseous fuel when natural gas is unavailable for use • Units including CO boilers that receive ATC subject to BACT for NOx on or after 1/5/1994.
Requirements*	**NOx emission limits:** <u>Existing units limited to 1.8 billion Btu/yr</u> • Install & maintain non-resettable fuel flow meter; AND • Tune-in the unit twice per calendar year, OR • Operate and maintain the stack O_2 concentrations at 3% by vol. or less, OR • Certify unit to comply with 30 ppmv NOx (gaseous fuel) when annual limit is exceeded; if unit is replaced then comply with limits of New and Replacement units (see below). <u>Existing atmospheric units in oilfield or refinery; each glycol reboiler; or each unit with heat input > 1.8 to < 5 billion Btu/yr:</u> • 30 ppmv NOx (gaseous fuel) <u>New and Replacement units</u>: • 12 ppmv NOx (atmospheric units) • 9 ppmv NOx (non-atmospheric units) **Particulate matter control requirements:** • Use PUC quality natural gas, propane, butane, LPG or a combination of such gases, OR • Limit fuel sulfur content to no more than 5 grains/100 scf of gas; OR • Install and operate control system that reduces SO2 emissions at least 95% by wt., or limit exhaust SO2 concentration to ≤ 9 ppmv @ 3% O_2; AND • Liquid fuel shall be used only during a PUC quality natural gas curtailment period provided the fuel does not contain 15 ppm sulfur	**NOx and CO emission limits:** <u>Small unit(<10 MMBtu/hr) requirements</u>: Meet at least one of the following: • Operate in a manner that maintains stack O2≤3% by vol. on dry basis; OR • Tune at least once every 12 months, or within 2 weeks of unit startup if not operated in the last 12 months; OR • Meet applicable limits - 0.033 lb-NOx/MMBtu; 0.2 lb-NOx/MMBtu for CO boilers <u>Refinery-wide* NOx limit</u>: 0.033 lb-NOx/MMBtu of heat input, based on an operating day average <u>Federal refinery-wide NOx limit</u> • 0.20 lb-NOx/MMBtu based on an operating day average (except CO boilers), except during startup, shutdown or curtailed operation <u>Final NOx limit for CO boilers</u> • 150 ppm NOx except during startup and shutdown for <u>non-partial-burn CO boiler,</u> except during startup, shutdown or curtailed operation • 125 ppmv NOx except during startup and shutdown for <u>partial-burn CO boiler,</u> except during startup, shutdown or curtailed operation *Refinery-wide limit is defined as the ratio of the total mass of discharge into the atmosphere of nitrogen oxides, in pounds, to the sum of the actual heat input, in million BTU, calculated over a twenty-four (24) hour operating day. **Particulate matter control requirements:** None

*Unless otherwise stated, all ppmv values are on a dry basis and corrected to 3% stack oxygen by volume.

	SJVAPCD Rule 4307	SCAQMD Rule 1146.1
Applicability	Rule applies to any gaseous fuel or liquid fuel fired boilers, steam generators and process heaters rated ≥2.0 MMBtu/hr to ≤5.0 MMBtu/hr	Rule applies to boilers, steam generator and process heaters >2 MMBtu/hr to <5 MMBtu/hr with the exception of RECLAIM facilities (NOx emissions only)
Exemptions	• Solid fuel fired units • Dryers and glass melting furnaces • Kilns, humidifiers, and smelters where the products of combustion come into direct contact with the material to be heated • Unfired or fired waste heat recovery boilers that are used to recover or augment heat from the exhaust of combustion turbines or internal combustion engines • Burning other fuel during PUC quality natural gas curtailment as long as other fuel not be burned for more than 168 hour/year plus 48 hour/year for equipment testing and NOx emissions shall not exceed 150 ppmv or 0.215 lb/MMBtu	• None
Requirements*	**NOx emission limits:** Existing units limited to 1.8 billion Btu/yr • Install & maintain non-resettable fuel flow meter; AND • Tune-in the unit twice per calendar year, OR • Operate and maintain the stack O_2 concentrations at 3% by vol. or less, OR • Certify unit to comply with 30 ppmv NOx and 400 ppmv CO (gaseous fuel) when annual limit is exceeded; if unit is replaced then comply with limits of New and Replacement units (see below). Existing atmospheric units in oilfield or refinery; each glycol reboiler; or each unit with heat input > 1.8 to < 5 billion Btu/yr: • 30 ppmv NOx (gaseous fuel) New and Replacement units: • 12 ppmv NOx (atmospheric units) • 9 ppmv NOx (non-atmospheric units) **Particulate matter control requirements:** • Use PUC quality natural gas, propane, butane, LPG or a combination of such gases, OR • Limit fuel sulfur content to no more than 5 grains/100 scf of gas; OR • Install and operate control system that reduces SO2 emissions at least 95% by wt., or limit exhaust SO2 concentration to ≤ 9 ppmv @ 3% O_2; AND • Liquid fuel shall be used only during a PUC quality natural gas curtailment period provided the fuel does not contain 15 ppm sulfur	**NOx emission limits:** Existing units (in operation prior to 9/5/08) limited to ≤1.8 billion Btu/yr • Operate and maintain stack O_2 concentrations at 3% by vol. or less for any 15-consecutive-minute averaging period, OR • Tune-in the unit twice per calendar year, OR • Comply with all applicable NOx requirements within 18 months after exceeding the annual limit (see limits below) Existing units in operation prior to 9/8/08 • 30 ppmv NOx or for natural gas-fired units 0.037 lb-NOx/MMBtu New and Replacement units: • 9 ppmv NOx for natural gas fired units • 12 ppmv NOx for natural gas-fired atmospheric units • 15 ppmv NOx for digester gas fired units • 25 ppmv NOx for landfill gas fired units • Weight average limit for multi-fuel units (e.g., units using both natural gas and digester gas, etc.); AND Note: natural gas units installed or modified prior to 9/5/08 complying with 12 ppmv NOx or less may defer compliance until units burner replacement **Particulate matter control requirements:** None

*Unless otherwise stated, all ppmv values are on a dry basis and corrected to 3% stack oxygen by volume.

	SJVAPCD Rule 4307	SCAQMD Rule 1146.2
Applicability	Rule applies to any gaseous fuel or liquid fuel fired boilers, steam generators and process heaters rated ≥2.0 MMBtu/hr to ≤5.0 MMBtu/hr	Rule applies to natural gas-fired water heaters, boilers, and process heaters rated at ≤2.0 MMBtu/hr
Exemptions	• Solid fuel fired units • Dryers and glass melting furnaces • Kilns, humidifiers, and smelters where the products of combustion come into direct contact with the material to be heated • Unfired or fired waste heat recovery boilers that are used to recover or augment heat from the exhaust of combustion turbines or internal combustion engines • Burning other fuel during PUC quality natural gas curtailment as long as other fuel not be burned for more than 168 hour/year plus 48 hour/year for equipment testing and NOx emissions shall not exceed 150 ppmv or 0.215 lb/MMBtu	• Units used in recreational vehicles. • Units subject to SCAQMD Rule 1121 (control of nitrogen oxides from residential type, natural gas-fired water heaters) – Rule 1121 applies to units rated at <0.075 MMBtu/hr • The provision of paragraph (c)(3), (c)(4) and (c)(5) shall not apply to: - Any residential unit* - Units with >0.4 & ≤2 MMBtu/hr, demonstrated to use less than 9,000 therms (i.e., 9 billion Btu/yr during every calendar year • Not applicable to units located at RECLAIM facilities Note: *Residential units >1 to ≤2 MMBtu/hr manufactured before 1/1/92 that does not meet 30 ppm NOx and 400 ppm CO; or residential units >1 to ≤2 MMBtu/hr more than 15 years old from date of manufacturing, manufactured on and after 1/1/92, and that does not meet 30 ppm NOx and 400 ppm CO; or residential units >0.4 to ≤1 MMBtu/hr more than 15 years old from data of manufacturing, manufactured on and after 1/1/92, and that does not meet 30 ppm NOx and 400
Requirements*	**NOx emission limits:** <u>Existing units limited to 1.8 billion Btu/yr</u> • Install & maintain non-resettable fuel flow meter; AND • Tune-in the unit twice per calendar year, OR • Operate and maintain the stack O_2 concentrations at 3% by vol. or less, OR • Certify unit to comply with 30 ppmv NOx (gaseous fuel) when annual limit is exceeded; if unit is replaced then comply with limits of New and Replacement units (see below). <u>Existing atmospheric units in oilfield or refinery; each glycol reboiler; or each unit with heat input > 1.8 to < 5 billion Btu/yr:</u> • 30 ppmv NOx (gaseous fuel) <u>New and Replacement units</u>: • **12 ppmv NOx (atmospheric units)** • **9 ppmv NOx (non-atmospheric units)** **Particulate matter control requirements:** • Use PUC quality natural gas, propane, butane, LPG or a combination of such gases, OR • Limit fuel sulfur content to no more than 5 grains/100 scf of gas; OR • Install and operate control system that reduces SO2 emissions at least 95% by wt., or limit exhaust SO2 concentration to ≤ 9 ppmv @ 3% O_2; AND • Liquid fuel shall be used only during a PUC quality natural gas curtailment period provided the fuel does not contain 15 ppm sulfur	**NOx emission limits:** <u>Units >0.4 to ≤2 MMBtu/hr</u>: • **14 ng-NOx/J or 20 ppm NOx (On or after 1/1/2010)** <u>Units >1 to ≤2 MMBtu/hr</u>: • 30 ppmv NOx (on and after 7/1/2002 for units manufactured prior to 1/1/92, requirement is not applicable to units demonstrated to use <9 billion Btu/yr) • 30 ppmv NOx (on and after 1/1/2006 for units more than 15 year old, requirement is not applicable to units demonstrated to use <9 billion Btu/yr) **Particulate matter control requirements:** None

*Unless otherwise stated, all ppmv values are on a dry basis and corrected to 3% stack oxygen by volume.

	SJVAPCD Rule 4307	SCAQMD Rule 1109
Applicability	Rule applies to any gaseous fuel or liquid fuel fired boilers, steam generators and process heaters rated ≥2.0 MMBtu/hr to ≤5.0 MMBtu/hr	Rule applies to boilers and process heater in petroleum refineries
Exemptions	• Solid fuel fired units • Dryers and glass melting furnaces • Kilns, humidifiers, and smelters where the products of combustion come into direct contact with the material to be heated • Unfired or fired waste heat recovery boilers that are used to recover or augment heat from the exhaust of combustion turbines or internal combustion engines • Burning other fuel during PUC quality natural gas curtailment as long as other fuel not be burned for more than 168 hour/year plus 48 hour/year for equipment testing and NOx emissions shall not exceed 150 ppmv or 0.215 lb/MMBtu	The requirements shall not apply to: • Boilers or process heater with maximum rated capacity ≤ 40 MMBtu/hr. • Sulfur plant reaction boilers. • Upon approval by the Executive Officer, units which are operated with a total heat input in a 12 month period of less than 10% of the maximum rated capacity for that period.
Requirements*	**NOx emission limits:** <u>Existing units limited to 1.8 billion Btu/yr</u> • Install & maintain non-resettable fuel flow meter; AND • Tune-in the unit twice per calendar year, OR • Operate and maintain the stack O_2 concentrations at 3% by vol. or less, OR • Certify unit to comply with 30 ppmv NOx (gaseous fuel) when annual limit is exceeded; if unit is replaced then comply with limits of New and Replacement units (see below). <u>Existing atmospheric units in oilfield or refinery; each glycol reboiler; or each unit with heat input > 1.8 to < 5 billion Btu/yr:</u> • 30 ppmv NOx (gaseous fuel) <u>New and Replacement units</u>: • 12 ppmv NOx (atmospheric units) • 9 ppmv NOx (non-atmospheric units) **Particulate matter control requirements:** • Use PUC quality natural gas, propane, butane, LPG or a combination of such gases, OR • Limit fuel sulfur content to no more than 5 grains/100 scf of gas; OR • Install and operate control system that reduces SO2 emissions at least 95% by wt., or limit exhaust SO2 concentration to ≤ 9 ppmv @ 3% O_2; AND • Liquid fuel shall be used only during a PUC quality natural gas curtailment period provided the fuel does not contain 15 ppm sulfur	**NOx limit:** 0.03 lb-NOx/MMBtu Note that boilers or process heater with maximum rated capacity ≤ 40 MMBtu/hr would be exempt from the requirements in Rule 1109. **Particulate matter control requirements:** None

*Unless otherwise stated, all ppmv values are on a dry basis and corrected to 3% stack oxygen by volume.

	SJVAPCD Rule 4307	SMAQMD Rule 411
Applicability	Rule applies to any gaseous fuel or liquid fuel fired boilers, steam generators and process heaters rated ≥2.0 MMBtu/hr to ≤5.0 MMBtu/hr	Applicable to boilers, steam generators, and process heaters fired on gaseous or non-gaseous fuels with a rated capacity ≥1 MMBtu/hr
Exemptions	• Solid fuel fired units • Dryers and glass melting furnaces • Kilns, humidifiers, and smelters where the products of combustion come into direct contact with the material to be heated • Unfired or fired waste heat recovery boilers that are used to recover or augment heat from the exhaust of combustion turbines or internal combustion engines • Burning other fuel during PUC quality natural gas curtailment as long as other fuel not be burned for more than 168 hour/year plus 48 hour/year for equipment testing and NOx emissions shall not exceed 150 ppmv or 0.215 lb/MMBtu	• Electric utility boilers • Process heater, kilns and furnaces, where products of combustion come in direct contact with the material to be heated. • Waste heat recovery boilers. • Low fuel usage exemption (e.g., 40,000 therms/yr for 1 to <2.5 MMBtu/hr) • Standing pilot flame burners (heat input 5 MMBtu/hr or less and NOx emissions 30 ppmv or less).
Requirements*	**NOx emission limits:** Existing units limited to 1.8 billion Btu/yr • Install & maintain non-resettable fuel flow meter; AND • Tune-in the unit twice per calendar year, OR • Operate and maintain the stack O_2 concentrations at 3% by vol. or less, OR • Certify unit to comply with 30 ppmv NOx (gaseous fuel) when annual limit is exceeded; if unit is replaced then comply with limits of New and Replacement units (see below). Existing atmospheric units in oilfield or refinery; each glycol reboiler; or each unit with heat input > 1.8 to < 5 billion Btu/yr: • 30 ppmv NOx (gaseous fuel) New and Replacement units: • 12 ppmv NOx (atmospheric units) • 9 ppmv NOx (non-atmospheric units) **Particulate matter control requirements:** • Use PUC quality natural gas, propane, butane, LPG or a combination of such gases, OR • Limit fuel sulfur content to no more than 5 grains/100 scf of gas; OR • Install and operate control system that reduces SO2 emissions at least 95% by wt., or limit exhaust SO2 concentration to ≤ 9 ppmv @ 3% O_2; AND • Liquid fuel shall be used only during a PUC quality natural gas curtailment period provided the fuel does not contain 15 ppm sulfur	**NOx emission limits** ***Gaseous fuels:*** Units ≥1 to <5 MMBtu/hr: • 30 ppm NOx (gaseous fuel) Units ≥ 5 to ≤ 20 MMBtu/hr: • 15 ppm NOx Gas fired reformer furnaces • 30 ppm NOx Units ≥5 MMBtu/hr fired on landfill gas or combination of landfill and natural gas: • 15 ppm NOx Load following units ≥5 MMBtu/hr • 15 ppm NOx ***Non-gaseous fuels:*** Units ≥1 MMBtu/hr • 40 ppmv NOx

*Unless otherwise stated, all ppmv values are on a dry basis and corrected to 3% stack oxygen by volume.

	SJVAPCD Rule 4307	VCAPCD Rule 74.15.1
Applicability	Rule applies to any gaseous fuel or liquid fuel fired boilers, steam generators and process heaters rated ≥2.0 MMBtu/hr to ≤5.0 MMBtu/hr	Rule applies to any gaseous fuel or liquid fuel fired boiler, steam generator, or process heaters with a rated heat input capacity ≥1 MMBtu/hr and <5 MMBtu/hr
Exemptions	• Solid fuel fired units • Dryers and glass melting furnaces • Kilns, humidifiers, and smelters where the products of combustion come into direct contact with the material to be heated • Unfired or fired waste heat recovery boilers that are used to recover or augment heat from the exhaust of combustion turbines or internal combustion engines • Burning other fuel during PUC quality natural gas curtailment as long as other fuel not be burned for more than 168 hour/year plus 48 hour/year for equipment testing and NOx emissions shall not exceed 150 ppmv or 0.215 lb/MMBtu	• The requirements shall not apply when a unit is operated on alternative fuel during natural gas curtailment period. Alternative fuel use shall not exceed the period of natural gas curtailment. Alternative fuel use is required to maintain the alternate fuel system, and in this case use shall not exceed 50 hours/year. • Portable oil well dewaxing process heater is not subject to 30 ppmv NOx, if annual heat input rate is less than 2.8 billion Btu.
Requirements*	**NOx emission limits:** Existing units limited to 1.8 billion Btu/yr • Install & maintain non-resettable fuel flow meter; AND • Tune-in the unit twice per calendar year, OR • Operate and maintain the stack O_2 concentrations at 3% by vol. or less, OR • Certify unit to comply with 30 ppmv NOx (gaseous fuel) when annual limit is exceeded; if unit is replaced then comply with limits of New and Replacement units (see below). Existing atmospheric units in oilfield or refinery; each glycol reboiler; or each unit with heat input > 1.8 to < 5 billion Btu/yr: • 30 ppmv NOx (gaseous fuel) New and Replacement units: • 12 ppmv NOx (atmospheric units) • 9 ppmv NOx (non-atmospheric units) **Particulate matter control requirements:** • Use PUC quality natural gas, propane, butane, LPG or a combination of such gases, OR • Limit fuel sulfur content to no more than 5 grains/100 scf of gas; OR • Install and operate control system that reduces SO2 emissions at least 95% by wt., or limit exhaust SO2 concentration to ≤ 9 ppmv @ 3% O_2; AND • Liquid fuel shall be used only during a PUC quality natural gas curtailment period provided the fuel does not contain 15 ppm sulfur	**NOx emission limits** Units with heat input rate ≥1.8 billion Btu/yr: • 30 ppm NOx, Units ≥ 1 to ≤ 2 MMBtu/hr: • 20 ppm NOx, (natural gas-fired) Units > 2 to < 5 MMBtu/hr: • 12 ppm NOx (natural gas, atmospheric) • 9 ppm NOx (natural gas, pressurized) • 25 ppm NOx (landfill gas) • 15 ppm NOx (biogas) • 20 ppm NOx (LPG) • 15 ppm NOx (Produced oilfield gas, atmospheric) • 12 ppm NOx (Produced oilfield gas, pressurized) Units ≥0.3 billion Btu/yr and <1.8 billion Btu/yr: Comply with one of the following: • Units shall be tuned every 6 months or after 750 hours of operation, but in no case less than once per calendar year; OR • The unit shall comply with the emission and testing requirements **Particulate matter control requirements:** None

*Unless otherwise stated, all ppmv values are on a dry basis and corrected to 3% stack oxygen by volume.

ADDITIONAL 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 SOx and PM2.5 emissions. The following potential control techniques are evaluated to achieve further reductions:

Retrofitting with Selective Catalytic Reduction (SCR) as Potential Control

SCR technology is predominantly used to reduce NOx emissions from boilers, steam generators and process heaters. Since SCR is post-combustion control, an existing boiler can be retrofitted with this technology. In fact, two small boilers (each rated at 4.98 MMBtu/hr) in the Valley were equipped with SCR system. According to information from one of the facilities, the SCR system cost was $97,500 for the 4.98 MMBtu/hr boiler. This information is used as a basis to estimate the annualized cost for this control technique.

Description of Cost	Cost Factor	Cost	Source
Direct Costs			
Purchase equipment costs (PE)			
SCR System	A	97,500	District facility
Instrumentation and controls	0.01 A	975	OAQPS
Sales Taxes	0.08 A	7,878	
Freight	0.05 A	4,875	OAQPS
Purchased equipment cost, PEC	B = 1.14 A	111,228	
Direct installation costs (DI):			
Foundation & supports	0.08 B	8,898	OAQPS
Handling and erection	0.14 B	15,572	OAQPS
Electrical	0.04 B	4,449	OAQPS
Piping	0.02 B	2,225	OAQPS
Insulation and ductwork:	0.01 B	1,112	OAQPS
Painting	0.01 B	1,112	OAQPS
Direct installation costs	0.30 B	33,368	
Site preparation	As required, SP	--	See table footnote
Buildings	As required, Bldg.	--	
Total Direct Costs, DC	1.30B + SP+ Bldg.	144,596	
Indirect Costs (Installation)			
Engineering	0.10 B	11,123	OAQPS
Construction and field expenses	0.05 B	5,561	OAQPS
Contractor fees	0.10 B	11,123	OAQPS
Contingencies	0.03 B	3,337	OAQPS
Start-up	0.02 B	2,225	OAQPS
Performance test	0.01 B	1,112	OAQPS
Total Indirect Costs, IC	0.31 B	34,481	
Total Capital Investments (TCI= DC + IC):	**1.61 B + SP + Bldg.**	**179,077**	
Annualized TCI (10 years @ 10% interest)	0.1627 TCI	**29,136**	

Description of Cost	Cost Factor	Cost	Source
Direct Annual Costs (DAC)			
Operating and supervisory labor	--	--	See table footnote
Maintenance Costs (labor and material)	0.015 TCI	2,686	OAQPS
Reagent costs (anhydrous ammonia)		--	Not estimated
Electricity Cost:	$0.08848/kWH	--	Not estimated
Catalyst Replacement:	--	--	Catalyst is presumed to last at least over 10 years
	Total DAC:	2,686	
Indirect Annual Costs (IAC)			
Overhead:	--	--	See table footnote
Insurance:	0.01 TCI	1,791	OAQPS
Property Tax:	--	--	See table footnote
Administrative:	--	--	See table footnote
	Total IAC:	1,791	
Total Annual Cost (DAC + IAC)		4,477	
Total annual cost (Annualized TCI + Total annual cost)		**33,613**	

*Per EPA's Air Pollution Control Cost Manual (6th Edition), EPA/452/B-02-001 (1/02), operating and supervisory, overhead, administrative costs would be insignificant for an SCR system. In general, SCR does not require site preparation or additional buildings, and property taxes do not apply to capital improvements such as air pollution control equipment.

The potential NOx emission reduction for each category is determined by taking the difference between the potential emissions and the emissions that could be reliably achievable by an SCR system. SCR is expected to reliably achieve 5 ppmv NOx @ 3% O2. The total cost for each category is determined by multiplying the number of units and $33,613 a typical annual cost of an SCR system.

Type of unit	Number of units	Potential NOx Reductions with SCR Technology (tons/yr)	Total annualized cost of NOx Reductions with SCR Technology ($/yr)	Cost-effectiveness ($/ton of emission reduction)
New and replacement unit (atmospheric), 12 ppm NOx	18	4.3	605,034	**$140,706/ton**
New and replacement units (non atmospheric), 9 ppmv NOx	116	28.5	3,899,108	**$136,811/ton**
Existing units (gaseous fuel), 30 ppmv NOx	273	43.6	9,176,349	**$210,467/ton**
Existing units (gaseous fuel), Low-use, ≤1.8 billion Btu/yr	214	5.4	7,193,182	**$1,332,070/ton**
Existing units – Liquid fuel	2*	--	--	**--**
Existing units - Liquid fuel ≤5 billion Btu/yr	3**	--	--	**--**
Miscellaneous others, various NOx levels (15-27.2 ppmv NOx)	16	6.6	537,808	**$81,486/ton**

*Units are mounted on a nitrogen delivery trucks and are operated intermittently to vaporize nitrogen gas. **Three PEERs were identified originally (two PEERs were cancelled, one is in dormant is dormant non operation status). The cost-effectiveness analysis is not performed for these units.

Retrofit with Ultra low-NOx burner

A boiler, steam generator or process heater can be retrofitted with ultra-low NOx burner to reliably achieve 9 ppmv NOx @ 3% O2. Pursuant to a local vendor, the cost of an

ultra-low NOx burner would be about $40,000. However, it is important to note that retrofitting an existing boiler may not always be feasible and if feasible, boiler may involve upgrades to various systems such as fuel train to comply with up to date codes, and upgrades to air intake fans, as these units require more air for the burner to operate at its optimum level. These additional items can add considerable costs to the retrofit, which are not included below.

Description of Cost	Cost Factor	Cost	Source
Direct Costs			
Purchase equipment costs (PE)			
Burner System	A	40,000	Local Vendor
Instrumentation and controls	0.01 A	300	OAQPS
Sales Taxes	0.08 A	2,424	
Freight	0.05 A	1,500	OAQPS
Purchased equipment cost, PEC		34,224	
Direct installation costs (DI):			
Foundation & supports	0.08 B	--	See footnote
Handling and erection	0.14 B	4,791	OAQPS
Electrical	0.04 B	1,369	OAQPS
Piping	0.02 B	684	OAQPS
Insulation and ductwork:	0.01 B	342	OAQPS
Painting	0.01 B	342	OAQPS
Direct installation costs		7,528	
Site preparation	As required, SP	--	See table footnote
Buildings	As required, Bldg.	--	
Total Direct Costs, DC		51,752	
Indirect Costs (Installation)			
Engineering	0.10 B	3,422	OAQPS
Construction and field expenses	0.05 B	1,711	OAQPS
Contractor fees	0.10 B	3,422	OAQPS
Contingencies	0.03 B	1,027	OAQPS
Start-up	0.02 B	684	OAQPS
Performance test	0.01 B	342	OAQPS
Total Indirect Costs, IC	0.31 B	10,608	
Total Capital Investments (TCI= DC + IC):		**62,360**	
Annualized TCI (10 years @ 10% interest)	0.1627 TCI	**10,146**	
Direct annual costs (DAC)			
Operating and supervisory labor	--	--	See table footnote
Maintenance Costs (labor and material)	--	--	
Electricity Cost:	$0.08848/kWH	--	Not estimated
Indirect Annual Costs (IAC)			
Overhead:	--	--	See table footnote
Insurance:	--	--	See table footnote
Property Tax:	--	--	See table footnote
Administrative:	--	--	See table footnote
Total IAC:			
Total Annual Cost (DAC + IAC)	--	--	
Total annual cost (annualized TCI + Total annual cost)		**10,146**	

*The existing foundation and supports will not be replaced; direct annual cost and indirect annual costs are presumed to be same as the existing burner

The potential NOx emission reduction for each category is determined by taking the difference between the potential emissions and the emissions that could be reliably achievable by an ultra-low NOx burner system. Ultra low-NOx burner is expected to reliably achieve 9 ppmv NOx @ 3% O2. Each unit is presumed to be operated for 8,760 hours per year at the maximum rated capacity. The total cost for each category is determined by multiplying the number of units and $8,519 a typical annual cost of an ultra-low NOx burner system.

Type of unit	Number of units	Potential NOx Reductions with ultra-low NOx burner Technology (tons/yr)	Total annualized cost of NOx Reductions with SCR Technology ($/yr)	Cost-effectiveness ($/ton of emission reduction)
New and replacement unit (atmospheric), 12 ppm NOx	18	0.9	153,342	**$172,585/ton**
New and replacement units (non atmospheric), 9 ppmv NOx	116	Not needed, units are already equipped with 9 ppmv burner		
Existing units (gaseous fuel), 30 ppmv NOx	273	97.1	2,769,858	**$28,525/ton**
Existing units (gaseous fuel), Low-use, ≤1.8 billion Btu/yr	214	17.5	1,823,066	**$104,000/ton**
Existing units – Liquid fuel	2*	See Footnote below		
Existing units - Liquid fuel ≤5 billion Btu/yr	3**	See Footnote below		
Miscellaneous others, various NOx levels (15-27.2 ppmv NOx)	16	3.3	136,304	**$40,822/ton**

*Units are mounted on a nitrogen delivery truck and are operated intermittently to vaporize nitrogen gas. **Three PEERs were identified originally (two PEERs were cancelled, one is in dormant is dormant non operation status). The cost-effectiveness analysis is not performed for these units.

Replacing an older unit

Replacement of an older boiler in many cases may be the only way to reduce NOx emissions. The new units can reliably achieve 9 ppmv NOx @ 3% O2. The cost of these units depend on the heat input rate, use of unit (steam, hot water, etc.), control system, heat recovery systems (economizer etc.). Per local vendor, cost of a steam boiler rated at 5.0 MMBtu/hr (300 psi) with gas train, control system and economizer would be $122,000. Note that 94% of the unit are greater than 2.0 MMBtu/hr; therefore, it is reasonable to use this cost data for cost-effectiveness analysis.

Description of Cost	Cost Factor	Cost	Source
Direct Costs			
Purchase equipment costs (PE)			
Burner System	A	122,000	Local Vendor
Instrumentation and controls	--	--	Included in the above price
Sales Taxes	0.08 A	9,760	
Freight	0.05 A	6,100	OAQPS
Purchased equipment cost, PEC		137,860	
Direct installation costs (DI):			
Foundation & supports	0.08 B	11,029	See footnote
Handling and erection	0.14 B	19,300	OAQPS
Electrical	0.04 B	5,514	OAQPS
Piping	0.02 B	2,757	OAQPS
Insulation and ductwork:	0.01 B	1,379	OAQPS
Painting	0.01 B	1,379	OAQPS
Direct installation costs		41,358	
Site preparation	As required, SP	--	See table footnote
Buildings	As required, Bldg.	--	
Total Direct Costs, DC		179,218	
Indirect Costs (Installation)			
Engineering	0.10 B	13,786	OAQPS
Construction and field expenses	0.05 B	6,893	OAQPS
Contractor fees	0.10 B	13,786	OAQPS
Contingencies	0.03 B	4,136	OAQPS
Start-up	0.02 B	2,757	OAQPS
Performance test	0.01 B	1,379	OAQPS
Total Indirect Costs, IC	0.31 B	42,737	
Total Capital Investments (TCI= DC + IC):		**221,955**	
Annualized TCI (10 years @ 10% interest)	0.1627 TCI	**36,112**	
Direct annual costs (DAC)			
Operating and supervisory labor	--	--	See table footnote
Maintenance Costs (labor and material)	--	--	
Electricity Cost:	$0.08848/kWH	--	Not estimated
Indirect Annual Costs (IAC)			
Overhead:	--	--	See table footnote
Insurance:	--	--	See table footnote
Property Tax:	--	--	See table footnote
Administrative:	--	--	See table footnote
Total IAC:			
Total Annual Cost (DAC + IAC)	--	--	
Total annual cost (annualized TCI + Total annual cost)		**36,112**	

*Direct annual cost and indirect annual costs are presumed to be same as the existing unit

The potential NOx emission reduction for each category is determined by taking the difference between the potential emissions and the emissions that could be reliably achievable by the use of a new unit equipped with ultra-low NOx burner system. Ultra low-NOx burner is expected to reliably achieve 9 ppmv NOx @ 3% O2. Each unit is presumed to be operated for 8,760 hours per year at the maximum rated capacity. The

total cost for each category is determined by multiplying the number of units and $36,112 a typical annual cost of a unit with an ultra-low NOx burner system.

Type of unit	Number of units	Potential NOx Reductions with new unit equipped with ultra-low NOx burner Technology (tons/yr)	Total annualized cost of NOx Reductions with new unit equipped with ultra-low NOx burner Technology ($/yr)	Cost-effectiveness ($/ton of emission reduction)
New and replacement unit (atmospheric), 12 ppm NOx	18	0.9	650,034	**$731,588/ton**
New and replacement units (non atmospheric), 9 ppmv NOx	116	Not needed, units are already equipped with 9 ppmv burner		
Existing units (gaseous fuel), 30 ppmv NOx	273	125.1	9,858,576	**78,776/ton**
Existing units (gaseous fuel), Low-use, ≤1.8 billion Btu/yr	214	17.5	7,727,968	**$440,855/ton**
Existing units – Liquid fuel	2*	--	--	**--**
Existing units - Liquid fuel ≤5 billion Btu/yr	3**	--	--	**--**
Miscellaneous others, various NOx levels (15-27.2 ppmv NOx)	16	3.3	577,792	**$175,088/ton**

*Units are mounted on a nitrogen delivery truck and are operated intermittently to vaporize nitrogen gas. **Three PEERs were identified originally (two PEERs were cancelled, one is in dormant is dormant non operation status). The cost-effectiveness analysis is not performed for these units.

EMx as Potential Control

The District researched post-combustion controls such as EMx, the second generation of the SCONOx technology that reduces NOx, SOx, CO, and VOC emissions. Per EmeraChem, manufacturer/vendor of the technology, this technology has not been achieved in practice (AIP) for natural gas fired boilers. SCONOx and EMx systems have only been utilized by power plants for the control of turbine emissions. The cost of EMx system would be anywhere from 3 to 5 million or even up to 8 million in some cases for large power plant installations. Moreover, EMx system is ideal for new installation, and become extremely challenging and sometimes nearly impossible to retrofit an existing unit. In fact, cost-effectiveness analyses conducted by the District for the installation of SCONOx/EMx units on large power plant turbine installations within the Valley have shown that this technology is not cost-effective. Given the high cost-effectiveness demonstrated for turbines and lack of demonstrated practice with boilers, this technology is not feasible or cost-effective for reducing emissions from this category.

PM2.5 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 became even more strictly limited, the feasibility of reducing PM emissions through adding PM2.5 limits for units using liquid fuel is explored as part of the District's comprehensive control measure evaluation.

There are 19 permitted units in the Valley (2-5 MMBtu/hr) that are capable to burn diesel fuel; 17 of the 19 units were installed at healthcare and correctional facilities, 2 units were installed on a nitrogen gas delivery trucks. The units at healthcare and correctional facilities are primarily operated on natural gas, but they're required to have diesel as backup fuel, in case there is interruption in natural gas supply. The total potential emissions from these units while operating on diesel fuel are 0.233 tons/year (0.000061 tons per day) of total PM.

The following three technologies were evaluated as potential control options for reducing PM emissions: baghouses, electrostatic precipitators (ESPs), and wet scrubbers. Baghouses 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%.[25] 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.[26]

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 $_{(ESP)}$ = 0.233 tons/year x 0.99
Potential Emissions Reductions $_{(ESP)}$ = 0.231 tons/ year (tpy)

[25] 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.* Retrieved from http://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0CB8QFjAA&url=http%3A%2F%2Fwww.nescaum.org%2Fdocuments%2Fici-boilers-20081118-final.pdf%2F&ei=7nfvVIivFai1sAT07IHIAg&usg=AFQjCNFBdQn7MVAibSTZIbHV7-ojXkVlXQ&bvm=bv.86956481,d.cWc.

[26] 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.* Retrieved from http://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0CB8QFjAA&url=http%3A%2F%2Fwww.nescaum.org%2Fdocuments%2Fici-boilers-20081118-final.pdf%2F&ei=7nfvVIivFai1sAT07IHIAg&usg=AFQjCNFBdQn7MVAibSTZIbHV7-ojXkVlXQ&bvm=bv.86956481,d.cWc.

Potential Emissions Reductions $_{(scrubber)}$ = (Total PM Emissions) x (Control Efficiency)
Potential Emissions Reductions $_{(scrubber)}$ = 0. 233 tons/year x 0.99
Potential Emissions Reductions $_{(scrubber)}$ = 0.231 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.[27] 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.[28] The following assumptions were made for this cost-effectiveness analysis:

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 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.

Annual Cost $_{(ESP)}$ = (Total Capital Cost) x (0.1627) + (Annual Maintenance Cost)
Annual Cost $_{(ESP)}$ = ($95,000 x 19) x (0.1627) + ($1,500 x 19)
Annual Cost $_{(ESP)}$ = $322,174/year

Annual Cost $_{(scrubber)}$ = (Annualized Cost of 1 unit) x (Number of Units) x (Average Flow Rate)
Annual Cost $_{(scrubber)}$ = ($53,650/ sm^3/sec) x (19) x (23.85 sm^3/sec)
Annual Cost $_{(scrubber)}$ = $24,311,498/ year

Cost-effectiveness of an ESP and Wet Scrubber

Cost-effectiveness = Annual Cost / Annual Emissions Reductions

Cost-effectiveness $_{(ESP)}$ = ($322,174/year) / (0.231 tons/ year)
Cost-effectiveness $_{(ESP)}$ = $1,394,693/ton of PM

[27] 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.
[28] EPA. (2002). *Air Pollution Control Technology Fact Sheet: Spray-Chamber/Spray-Tower Wet Scrubber.* Retrieved from http://www.epa.gov/ttncatc1/dir1/fsprytwr.pdf.

Cost-effectiveness $_{(scrubber)}$ = ($24,311,498/year) / (0.231 tons/ year)
Cost-effectiveness $_{(scrubber)}$ = $105,244,580/ton 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.

EVALUATION FINDINGS

The District has evaluated all potential control technologies and all control technologies achieved in practice in other areas or included in other state implementation plans for Boilers, Steam Generators, and Process Heaters in the 2.0 MMBtu/hr to 5.0 MMBtu/hr size range. As demonstrated above, Rule 4307 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds RACM, BACM, and MSM requirements for this source category.

C.9 Rule 4308 (Emissions from Small Boilers, Steam Generators, and Process Heaters- 0.075 MMBtu/hr to less than 2.0 MMBtu/hr)

Discussion

The purpose of this rule is to limit NOx and CO emissions from units within this source category. As a point of sale rule, Rule 4308 achieves emissions reductions as units subject to the rule are replaced over time. This point-of-sale approach allows the District to achieve NOx emission reductions without forcing immediate replacement of existing units to comply with rule requirements and thus placing an undo financial burden on the consumer. This rule has resulted in more than 93% control of emissions from this source category.

Rule 4308 was adopted on October 20, 2005 to establish NOx emissions limits for units that were previously exempt from District regulations because of their small size. The rule was amended in December 2009 to lower the NOx emissions limits to 20 ppmv for units fired on natural gas, with the exception of instantaneous water heaters and pool heaters greater than or equal to 0.075 MMBtu/hr but less than or equal to 0.4 MMBtu/hr. In 2013, the rule was amended to lower the NOx emission limit for instantaneous water heaters 0.075 MMBtu/hr to 0.4 MMBtu/hr to 20 ppmv. EPA published a direct final approval the 2013 amendments to Rule 4308 on February 12, 2015.[29]

Emissions Inventory

POLLUTANT	2013	2017	2019	2020	2022	2023	2024	2025	2026	2028
	Annual Average - Tons per day									
PM2.5	0.59	0.55	0.53	0.52	0.51	0.50	0.49	0.48	0.47	0.46
NOx	0.86	0.70	0.67	0.64	0.60	0.58	0.56	0.54	0.52	0.49
	Winter Average - Tons per day									
PM2.5	0.58	0.54	0.53	0.52	0.50	0.49	0.48	0.47	0.47	0.45
NOx	0.84	0.69	0.65	0.63	0.59	0.57	0.55	0.53	0.51	0.48

Source Category

This source category includes 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. Units subject to Rule 4308 are used in a wide variety of settings including, but not limited to, apartment buildings, large homes, small businesses, commercial buildings, manufacturing facilities, government facilities, restaurants, hotels, hospitals, educational institutions, and religious organizations. Affected persons include water heater manufacturers, plumbing wholesalers, supply stores, plumbers, contractors, and end-users.

[29] 80 FR 7803-7805

HOW DOES DISTRICT RULE 4308 COMPARE WITH FEDERAL AND STATE RULES AND REGULATIONS?

Federal Regulations

There are no EPA CTG, NSPS, NESHAP, or MACT requirements for boilers, steam generators, and process heaters of such small size.

Alternative Control Techniques (*ACT)*

ACTs address potential emission control techniques for units with the potential to emit more than 25 tons of NOx per year. No units covered by District Rule 4308 have the potential to emit 25 tons per year and therefor ACTs are not directly applicable to this source category. However, ACTs do discuss various control technologies, and so the District has examined them, as follows:

- EPA – 453/R-93-034 (Alternative Control Techniques Document—NOx Emissions from Process Heaters)

The District evaluated the ACT for NOx Emissions from Process Heaters and found no applicable control requirements. As such, Rule 4308 is more stringent.

- EPA – 453/R-94-022 (Alternative Control Techniques Document—NOx Emissions from Industrial/Commercial/ Institutional Boilers)

The District evaluated the ACT for NOx Emissions from Industrial/Commercial/Institutional Boilers and found no applicable control techniques that were more stringent than those already in Rule 4308.

- EPA – 453/R-94-023 (Alternative Control Techniques Document—NOx Emissions from Utility Boilers)

The District evaluated the ACT for NOx Emissions from Utility Boilers and found no applicable control techniques that were more stringent than those already in Rule 4308.

State Regulations

There are no state regulations that apply to this source category.

HOW DOES DISTRICT RULE 4308 COMPARE TO RULES IN OTHER AIR DISTRICTS?

South Coast AQMD

- SCAQMD Rule 1146.2 Emissions of Oxides of Nitrogen From Large Water Heaters and Small Boilers and Process Heaters *(Last Amended May 5, 2006)*

SCAQMD Rule 1146.2 regulates NOx emissions from large water heaters and small boilers and process heaters. The District compared the emission limits in District Rule 4308 with SCAQMD Rule 1146.2 and concluded that NOx limits in the DIstrict rule are equivalent to the NOx limits in the SCAQMD rule for similarly rated units.

	SJVAPCD Rule 4308	SCAQMD 1146.2
Applicability	Applicable to boilers, steam generators and process heaters with rated heat input capacity of ≥0.075 MMBtu/hr and <2 MMBtu/hr	Applicable to natural gas-fired water heaters, boilers and process heaters with rated heat input capacity of ≤2 MMBtu/hr
Exemptions	• Units installed in manufactured homes. • Units installed in recreational vehicles. • Hot water pressure washers.	• Units used in recreational vehicles. • Units subject to SCAQMD Rule 1121 (control of nitrogen oxides from residential type, natural gas-fired water heaters) – Rule 1121 applies to units rated at <0.075 MMBtu/hr • The provision of paragraph (c)(3), (c)(4) and (c)(5) shall not apply to: - Any residential unit* - Units with >0.4 & ≤2 MMBtu/hr, demonstrated to use less than 9,000 therms during every calendar year • Not applicable to units located at RECLAIM facilities Note: *Residential units >1 to ≤2 MMBtu/hr manufactured before 1/1/92 that does not meet 30 ppm NOx and; or residential units >1 to ≤2 MMBtu/hr more than 15 years old from date of manufacturing, manufactured on and after 1/1/92, and that does not meet 30 ppm NOx and 400 ppm CO; or residential units >0.4 to ≤1 MMBtu/hr more than 15 years old from data of manufacturing, manufactured on and after 1/1/92, and that does not meet 30 ppm NOx.
Requirements*	1. Units ≥0.075 to ≤0.4 MMBtu/hr (except, instantaneous water heater and pool heaters below): • PUC gas - 20 ppmv NOx (0.024 lb/MMBtu); • Non-PUC or liquid – 77 ppmv NOx (0.093 lb/MMBtu) 2. Units >0.4 to <2.0 MMBtu/hr (except, instantaneous water heater and pool heaters below): • PUC gas – 20 ppmv NOx (0.024 lb/MMBtu) • Non-PUC or liquid – 30 ppmv (0.036 lb/MMBtu) 3. Instantaneous water heaters ≥0.075 to ≤0.4 MMBtu/hr: • PUC gas – 20 ppmv (0.024 lb/MMBtu)	Units ≥0.4 to ≤2 MMBtu/hr: • 14 ng-NOx/J of heat output or 20 ppmv NOx (or less) Units (excluding pool heaters) ≤0.4 MMBtu/hr: • 14 ng-NOx/J of heat output or 20 ppmv NOx (or less)

	SJVAPCD Rule 4308	SCAQMD 1146.2
	• Non-PUC or liquid – 77 ppmv (0.093 lb/MMBtu) 4. Instantaneous water heaters >0.4 to <2.0 MMBtu/hr: • PUC gas – 20 ppmv (0.024 lb/MMBtu) • Non-PUC or liquid – 77 ppmv (0.093 lb/MMBtu) 5. Pool heaters ≥0.075 to ≤0.4 MMBtu/hr: • PUC gas – 55 ppmv (0.068 lb/MMBtu) • Non-PUC or liquid – 77 ppmv (0.093 lb/MMBtu) 6. Pool heaters >0.4 to <2.0 MMBtu/hr: • PUC gas – 20 ppmv (0.068 lb/MMBtu) • Non-PUC or liquid – 30 ppmv (0.036 lb/MMBtu)	

BAAQMD

- BAAQMD Regulation 9, Rule 6 Nitrogen Oxide Emissions From Natural Gas-Fired Boilers and Water Heaters *(Last Amended November 7, 2007)*

BAAQMD Regulation 9 Rule 6 regulates NOx and CO emissions from natural gas fired boilers and water heaters. The District compared the emission limits in District Rule 4308 and BAAQMD's Regulation 9 Rule 6 and concluded that NOx emission limits in the District rule are equivalent to the BAAQMD rule limits for similarly rated units.

	SJVAPCD Rule 4308	BAAQMD Reg 9 Rule 6
Applicability	Applicable to boilers, steam generators and process heaters with rated heat input capacity of ≥0.075 MMBtu/hr and <2 MMBtu/hr	Rule applies to natural gas fired water heaters and boilers, and limits only NOx emissions
Exemptions	• Units installed in manufactured homes. • Units installed in recreational vehicles. • Hot water pressure washers.	• Natural gas-fired boilers and water heaters rated at > 2 MMBtu/hr • Natural gas-fired water heaters used in recreational vehicles. • Water heaters using a fuel other than natural gas. • Natural gas-fired pool/spa heater with <0.4 MMBtu/hr used exclusively to heat swimming pools, hot tubs or spas

	SJVAPCD Rule 4308	BAAQMD Reg 9 Rule 6
Requirements*	1. Units ≥0.075 to ≤0.4 MMBtu/hr (except, instantaneous water heater and pool heaters below): • PUC gas - 20 ppmv (0.024 lb/MMBtu); • Non-PUC or liquid – 77 ppmv (0.093 lb/MMBtu) 2. Units >0.4 to <2.0 MMBtu/hr (except, instantaneous water heater and pool heaters below): • PUC gas – 20 ppmv (0.024 lb/MMBtu) • Non-PUC or liquid – 30 ppmv (0.036 lb/MMBtu) 3. Instantaneous water heaters ≥0.075 to ≤0.4 MMBtu/hr: • PUC gas – 20 ppmv (0.024 lb/MMBtu) • Non-PUC or liquid – 77 ppmv (0.093 lb/MMBtu) 4. Instantaneous water heaters >0.4 to <2.0 MMBtu/hr: • PUC gas – 20 ppmv (0.024 lb/MMBtu) • Non-PUC or liquid – 77 ppmv (0.093 lb/MMBtu) 5. Pool heaters ≥0.075 to ≤0.4 MMBtu/hr: • PUC gas – 55 ppmv (0.068 lb/MMBtu) • Non-PUC or liquid – 77 ppmv (0.093 lb/MMBtu) 6. Pool heaters >0.4 to <2.0 MMBtu/hr: • PUC gas – 20 ppmv (0.068 lb/MMBtu) • Non-PUC or liquid – 30 ppmv (0.036 lb/MMBtu)	Natural gas-fired storage tank water heaters ≤0.075 MMBtu/hr: • 40 ng-NOx/J of heat output for units manufactured after July 1, 1992 • 10 ng-NOx/J* of heat output for 50 gal or less units manufactured after Jan 1, 2009; • 10 ng-NOx/J* of heat output for > 50 gal units manufactured after Jan 1, 2010; • 10 ng-NOx/J** of heat output for units manufactured after Jan 1, 2011; Notes: *The limit shall not apply to direct-vent, power-vent, power direct-vent water storage tanks heater and water heaters used for mobile homes. **This limit dos not apply to water heater used for mobile homes. Natural gas-fired boilers and water heaters >0.075 MMBtu/hr to ≤2 MMBtu/hr: • 40 ng-NOx/J of heat output for units >0.075 MMBtu/hr to 0.4 MMBtu/hr manufactured after Jan 1, 2008 • 14 ng-NOx/J of heat output for units >0.075 MMBtu/hr to 0.4 MMBtu/hr manufactured after Jan 1, 2013 • 20 ng-NOx/J of heat output or 30 ppm NOx for units >0.4 MMBtu/hr to 2 MMBtu/hr manufactured after Jan 1, 2008 • 14 ng-NOx/J of heat output or 20 ppm NOx for units >0.4 MMBtu/hr to 2 MMBtu/hr manufactured after Jan 1, 2013 Natural gas-fired mobile home water heaters: • 40 ng-NOx/J of heat output for units manufactured after Jan 1, 2008 Natural gas-fired pool/spa heaters: • 40 ng-NOx/J of heat output or 55 ppmv for units >0.4 MMBtu/hr to 2.0 MMBtu/hr manufactured after Jan 1, 2008 • 14 ng-NOx/J of heat output or 20 ppmv for units >0.4 MMBtu/hr to 2.0 MMBtu/hr manufactured after Jan 1, 2013

- BAAQMD Regulation 9, Rule 7 Nitrogen Oxides and Carbon Monoxide From Industrial, Institutional and Commercial Boilers, Steam Generators and Process Heaters *(Last Amended May 4, 2011)*

BAAQMD Regulation 9 Rule 7 regulates NOx and CO emissions from industrial and commercial boilers, steam generators and process heaters. The District compared the emission limits in District Rule 4308 and BAAQMD's Regulation 9 Rule 7 (see Table 2) and concluded NOx emission limits in the District rule are equivalent to the BAAQMD rule limits for similarly rated units.

	SJVAPCD Rule 4308	BAAQMD Reg 9 Rule 7
Applicability	Applicable to boilers, steam generators and process heaters with rated heat input capacity of ≥0.075 MMBtu/hr and <2 MMBtu/hr	Rule applies to any industrial, institutional and commercial boilers, steam generator and process.
Exemptions	• Units installed in manufactured homes. • Units installed in recreational vehicles. • Hot water pressure washers.	• Units ≤ 2MMBtu/hr if fired exclusively on natural gas, LPG, or any combination thereof • Units <1MMBtu/hr with any fuel • Units used in petroleum refineries • Boilers used by public electric utilities or qualifying small power production facilities • Waste heat recovery boilers used to recover sensible heat from the exhaust of combustion turbines or reciprocating internal combustion engines • Kilns, ovens, and furnaces used for drying, baking, heat treating, cooking, calcining or vitrifying • Process heater used to heat thermal fluid for radiant comfort heating

	SJVAPCD Rule 4308	BAAQMD Reg 9 Rule 7
Requirements*	1. Units ≥0.075 to ≤0.4 MMBtu/hr (except, instantaneous water heater and pool heaters below): • PUC gas - 20 ppmv (0.024 lb/MMBtu); • Non-PUC or liquid – 77 ppmv (0.093 lb/MMBtu) 2. Units >0.4 to <2.0 MMBtu/hr (except, instantaneous water heater and pool heaters below): • PUC gas – 20 ppmv (0.024 lb/MMBtu) • Non-PUC or liquid – 30 ppmv (0.036 lb/MMBtu) 3. Instantaneous water heaters ≥0.075 to ≤0.4 MMBtu/hr: • PUC gas – 20 ppmv (0.024 lb/MMBtu) • Non-PUC or liquid – 77 ppmv (0.093 lb/MMBtu) 4. Instantaneous water heaters >0.4 to <2.0 MMBtu/hr: • PUC gas – 20 ppmv (0.024 lb/MMBtu) • Non-PUC or liquid – 77 ppmv (0.093 lb/MMBtu) 5. Pool heaters ≥0.075 to ≤0.4 MMBtu/hr: • PUC gas – 55 ppmv (0.068 lb/MMBtu) • Non-PUC or liquid – 77 ppmv (0.093 lb/MMBtu) 6. Pool heaters >0.4 to <2.0 MMBtu/hr: • PUC gas – 20 ppmv (0.068 lb/MMBtu) • Non-PUC or liquid – 30 ppmv (0.036 lb/MMBtu)	Landfill or digester gas fired units ≥1 MMBtu/hr: • 30 ppm NOx Non-gaseous fuel fired units ≥1 MMBtu/hr: • 40 ppm NOx Multiple fuel fired units ≥1 MMBtu/hr: • Heat input weighted average limit for NOx Note that requirements for units with heat input rate > 2 MMBtu/hr are not listed, as these requirements are irrelevant for the purpose of Rule 4308, which applies to units with heat input rate of ≥0.075 MMBtu/hr and <2 MMBtu/hr

- BAAQMD Regulation 9, Rule 10 Nitrogen Oxides and Carbon Monoxide From Boilers, Steam Generators and Process Heaters in Petroleum Refineries *(Last Amended October 16, 2013)*

BAAQMD Regulation 9 Rule 10 regulates NOx and CO emissions from boilers, steam generators and process heaters in petroleum refineries. The District compared the remission limits in District Rule 4308 to the requirements contained within BAAQMD's Regulation 9 Rule 10 and found that NOx requirements in the District rule are on an emission-unit by emission-unit basis, whereas the emission limits in BAAQMD rule is on a refinery-wide basis, and therefore cannot be compared.

	SJVAPCD Rule 4308	BAAQMD Reg 9 Rule 10
Applicability	Applicable to boilers, steam generators and process heaters with rated heat input capacity of ≥0.075 MMBtu/hr and <2 MMBtu/hr	Rule applies to boilers, steam generator and process heaters, in petroleum refineries
Exemptions	• Units installed in manufactured homes. • Units installed in recreational vehicles. • Hot water pressure washers.	• Units < 2MMBtu/hr if fired exclusively on natural gas, LPG, or any combination thereof • Units <1MMBtu/hr with any fuel • Waste heat recovery boilers used to recover sensible heat from the exhaust of combustion turbines or reciprocating internal combustion engines • Waste heat recovery boilers recovering sensible heat from exhaust of combustion turbines or reciprocating IC engines • Units processing H2S process flue gas in sulfur recovery plants and their tail-gas treating units, or sulfuric acid manufacturing plants • Units on non-gaseous fuel when natural gas is unavailable for use • Units including CO boilers that receive ATC subject to BACT for NOx on or after 1/5/1994.
Requirements*	1. Units ≥0.075 to ≤0.4 MMBtu/hr (except, instantaneous water heater and pool heaters below): • PUC gas - 20 ppmv (0.024 lb/MMBtu); • Non-PUC or liquid – 77 ppmv (0.093 lb/MMBtu) 2. Units >0.4 to <2.0 MMBtu/hr (except, instantaneous water heater and pool heaters below): • PUC gas – 20 ppmv (0.024 lb/MMBtu) • Non-PUC or liquid – 30 ppmv (0.036 lb/MMBtu) 3. Instantaneous water heaters ≥0.075 to ≤0.4 MMBtu/hr: • PUC gas – 20 ppmv (0.024 lb/MMBtu) • Non-PUC or liquid – 77 ppmv (0.093 lb/MMBtu) 4. Instantaneous water heaters >0.4 to <2.0 MMBtu/hr: • PUC gas – 20 ppmv (0.024 lb/MMBtu) • Non-PUC or liquid – 77 ppmv (0.093 lb/MMBtu)	Small unit(<10 MMBtu/hr) requirements: Meet at least one of the following: • Operate in a manner that maintains stack O2≤3% by vol. on dry basis; OR • Tune at least once every 12 months, or within 2 weeks of unit startup if not operated in the last 12 months; OR • Meet applicable limits - 0.033 lb-NOx/MMBtu; 0.2 lb-NOx/MMBtu for CO boilers Refinery-wide* NOx limit: 0.033 lb-NOx/MMBtu of heat input, based on an operating day average Federal refinery-wide NOx limit • 0.20 lb-NOx/MMBtu based on an operating day average (except CO boilers), except during startup, shutdown or curtailed operation Final NOx limit for CO boilers • 150 ppm NOx except during startup and shutdown for non-partial-burn CO boiler • 125 ppmv NOx except during startup and shutdown for partial-burn CO boiler *Refinery-wide limit is defined as the ratio of the total mass of discharge into the

	SJVAPCD Rule 4308	BAAQMD Reg 9 Rule 10
	5. Pool heaters ≥0.075 to ≤0.4 MMBtu/hr: • PUC gas – 55 ppmv (0.068 lb/MMBtu) • Non-PUC or liquid – 77 ppmv (0.093 lb/MMBtu) 6. Pool heaters >0.4 to <2.0 MMBtu/hr: • PUC gas – 20 ppmv (0.068 lb/MMBtu) • Non-PUC or liquid – 30 ppmv (0.036 lb/MMBtu)	atmosphere of nitrogen oxides, in pounds, to the sum of the actual heat input, in million BTU, calculated over a twenty-four (24) hour operating day.

SMAQMD

- SMAQMD Rule 411 NOx From Boilers, Process Heaters, and Steam Generators *(Last Amended August 23, 2007)*

SMAQMD Rule 411 regulates NOx and CO emissions from boilers, process heaters and steam generators. The District compared the emission limits in District Rule 4308 with SMAQMD Rule 411 and concluded that NOx emission limits in the District rule are more stringent than the NOx limits in SMAQMD rule for similar rated units.

	SJVAPCD Rule 4308	SMAQMD Rule 411
Applicability	Applicable to boilers, steam generators and process heaters with rated heat input capacity of ≥0.075 MMBtu/hr and <2 MMBtu/hr	Applicable to boilers, steam generators, and process heaters fired on gaseous or non-gaseous fuels with a rated capacity ≥1 MMBtu/hr
Exemptions	• Units installed in manufactured homes. • Units installed in recreational vehicles. • Hot water pressure washers.	• Electric utility boilers • Process heater, kilns and furnaces, where products of combustion come in direct contact with the material to be heated. • Waste heat recovery boilers. • Low fuel usage exemption (e.g., 40,000 therms/yr for 1 to <2.5 MMBtu/hr) • Standing pilot flame burners (heat input 5 MMBtu/hr or less and NOx emissions 30 ppmv or less).
Requirements*	1. Units ≥0.075 to ≤0.4 MMBtu/hr (except, instantaneous water heater and pool heaters below): • PUC gas - 20 ppmv (0.024 lb/MMBtu); • Non-PUC or liquid – 77 ppmv (0.093 lb/MMBtu) 2. Units >0.4 to <2.0 MMBtu/hr (except, instantaneous water heater and pool heaters below):	**Gaseous fuels:** Units ≥1 to <5 MMBtu/hr: • 30 ppm NOx **Non-gaseous fuels:** Units ≥1 MMBtu/hr • 40 ppmv NOx

	SJVAPCD Rule 4308	SMAQMD Rule 411
	• PUC gas – 20 ppmv (0.024 lb/MMBtu) • Non-PUC or liquid – 30 ppmv (0.036 lb/MMBtu) 3. Instantaneous water heaters ≥0.075 to ≤0.4 MMBtu/hr: • PUC gas – 20 ppmv (0.024 lb/MMBtu) • Non-PUC or liquid – 77 ppmv (0.093 lb/MMBtu) 4. Instantaneous water heaters >0.4 to <2.0 MMBtu/hr: • PUC gas – 20 ppmv (0.024 lb/MMBtu) • Non-PUC or liquid – 77 ppmv (0.093 lb/MMBtu) 5. Pool heaters ≥0.075 to ≤0.4 MMBtu/hr: • PUC gas – 55 ppmv (0.068 lb/MMBtu) • Non-PUC or liquid – 77 ppmv (0.093 lb/MMBtu) 6. Pool heaters >0.4 to <2.0 MMBtu/hr: • PUC gas – 20 ppmv (0.068 lb/MMBtu) • Non-PUC or liquid – 30 ppmv (0.036 lb/MMBtu)	

- SMAQMD Rule 414 Water Heaters, Boilers and Process Heaters Rated Less than 1 MMBtu/hr *(Last Amended March 25, 2010)*

SMAQMD Rule 414 regulates NOx and CO emissions from boilers, process heaters and steam generators. The District compared the emission limits in District Rule 4308 with SMAQMD Rule 414 and concluded that for gaseous fuels, NOx emission limits in the District rule are equivalent to the NOx limits in SMAQMD rule for similar rated units.

	SJVAPCD Rule 4308	SMAQMD Rule 414
Applicability	Applicable to boilers, steam generators and process heaters with rated heat input capacity of ≥0.075 MMBtu/hr and <2 MMBtu/hr	Applicable to boilers, steam generators, and process heaters fired on gaseous or non-gaseous fuels with a rated capacity of <1 MMBtu/hr
Exemptions	• Units installed in manufactured homes. • Units installed in recreational vehicles. • Hot water pressure washers.	• Water heaters in recreational vehicles • Pool/spa heater with a heat input rate <0.075 MMBtu/hr. • Water heaters, boilers and process heater fired on LPG fuel.
Requirements*	1. Units ≥0.075 to ≤0.4 MMBtu/hr (except,	Units <0.075 MMBtu/hr:

	SJVAPCD Rule 4308	SMAQMD Rule 414
	instantaneous water heater and pool heaters below): • PUC gas - 20 ppmv (0.024 lb/MMBtu); • Non-PUC or liquid – 77 ppmv (0.093 lb/MMBtu) 2. Units >0.4 to <2.0 MMBtu/hr (except, instantaneous water heater and pool heaters below): • PUC gas – 20 ppmv (0.024 lb/MMBtu) • Non-PUC or liquid – 30 ppmv (0.036 lb/MMBtu) 3. Instantaneous water heaters ≥0.075 to ≤0.4 MMBtu/hr: • PUC gas – 20 ppmv (0.024 lb/MMBtu) • Non-PUC or liquid – 77 ppmv (0.093 lb/MMBtu) 4. Instantaneous water heaters >0.4 to <2.0 MMBtu/hr: • PUC gas – 20 ppmv (0.024 lb/MMBtu) • Non-PUC or liquid – 77 ppmv (0.093 lb/MMBtu) 5. Pool heaters ≥0.075 to ≤0.4 MMBtu/hr: • PUC gas – 55 ppmv (0.068 lb/MMBtu) • Non-PUC or liquid – 77 ppmv (0.093 lb/MMBtu) 6. Pool heaters >0.4 to <2.0 MMBtu/hr: • PUC gas – 20 ppmv (0.068 lb/MMBtu) • Non-PUC or liquid – 30 ppmv (0.036 lb/MMBtu)	• 40 ng/J of heat output or 55 ppm NOx for mobile home units • 10 ng/J of heat output or 15 ppm NOx for all other units Units ≥ 0.075 to <0.4 MMBtu/hr: • 40 ng/J of heat output or 55 ppm NOx for pool/spa units • 14 ng/J of heat output or 20 ppm NOx for all other units Units ≥ 0.4 to <1 MMBtu/hr: • 14 ng/J of heat output or 20 ppm NOx

VCAPCD

- VCAPCD Rule 74.11.1 – Large Water Heaters and Small Boilers *(Last Amended September 11, 2012)*

VCAPCD Rule 74.11.1 regulates NOx and CO emissions from boilers, steam generators, and process heaters. The District compared the emission limits in District Rule 4308 with VCAPCD and concluded that NOx emission limits in the District rule are equivalent to the NOx limits in VCAPCD rule for similar rated units.

	SJVAPCD Rule 4308	VCAPCD Rule 74.11.1
Applicability	Applicable to boilers, steam generators and process heaters with rated heat input capacity of ≥0.075 MMBtu/hr and <2 MMBtu/hr	Applicable to natural gas-fired water heater, boiler, steam generator or process heater with a rated heat input capacity ≥0.075 BTU/hr and < 1 MMBtu/hr
Exemptions	• Units installed in manufactured homes. • Units installed in recreational vehicles. • Hot water pressure washers.	• None
Requirements*	1. Units ≥0.075 to ≤0.4 MMBtu/hr (except, instantaneous water heater and pool heaters below): • PUC gas - 20 ppmv (0.024 lb/MMBtu); • Non-PUC or liquid – 77 ppmv (0.093 lb/MMBtu) 2. Units >0.4 to <2.0 MMBtu/hr (except, instantaneous water heater and pool heaters below): • PUC gas – 20 ppmv (0.024 lb/MMBtu) • Non-PUC or liquid – 30 ppmv (0.036 lb/MMBtu) 3. Instantaneous water heaters ≥0.075 to ≤0.4 MMBtu/hr: • PUC gas – 20 ppmv (0.024 lb/MMBtu) • Non-PUC or liquid – 77 ppmv (0.093 lb/MMBtu) 4. Instantaneous water heaters >0.4 to <2.0 MMBtu/hr: • PUC gas – 20 ppmv (0.024 lb/MMBtu) • Non-PUC or liquid – 77 ppmv (0.093 lb/MMBtu) 5. Pool heaters ≥0.075 to ≤0.4 MMBtu/hr: • PUC gas – 55 ppmv (0.068 lb/MMBtu) • Non-PUC or liquid – 77 ppmv (0.093 lb/MMBtu) 6. Pool heaters >0.4 to <2.0 MMBtu/hr: • PUC gas – 20 ppmv (0.068 lb/MMBtu) • Non-PUC or liquid – 30 ppmv (0.036 lb/MMBtu)	Units ≥ 0.075 to ≤0.4 MMBtu/hr: • 40 ng/J of heat output (93 lb/billion Btu), or 55 ppm NOx for units designed to heat swimming pools, hot tubs or spas. • 14 ng/J of heat output or 20 ppm NOx for all other units Units > 0.4 to <1 MMBtu/hr: • 14 ng/J of heat output or 20 ppm NOx for all units

- VCAPCD Rule 74.15.1 – Boilers, Steam Generators, and Process Heaters *(Last Amended June 23, 2015)*

VCAPCD Rule 74.15.1 regulates NOx and CO emissions from boilers, steam generators, and process heaters. The District compared the emission limits in District Rule 4308 with VCAPCD and concluded that the NOx emission limits in the District rule are equivalent to the NOx limits in VCAPCD rule for similar rated units.

	SJVAPCD Rule 4308	VCAPCD Rule 74.15.1
Applicability	Applicable to boilers, steam generators and process heaters with rated heat input capacity of ≥0.075 MMBtu/hr and <2 MMBtu/hr	Rule applies to any gaseous fuel or liquid fuel fired boiler, steam generator, or process heaters with a rated heat input capacity ≥1 MMBtu/hr and <5 MMBtu/hr
Exemptions	• Units installed in manufactured homes. • Units installed in recreational vehicles. • Hot water pressure washers.	• The requirements shall not apply when a unit is operated on alternative fuel during natural gas curtailment period. Alternative fuel use shall not exceed the period of natural gas curtailment. Alternative fuel use is required to maintain the alternate fuel system, and in this case use shall not exceed 50 hours/year. • Portable oil well dewaxing process heater is not subject to 30 ppmv NOx, if annual heat input rate is less than 2.8 billion Btu.
Requirements*	1. Units ≥0.075 to ≤0.4 MMBtu/hr (except, instantaneous water heater and pool heaters below): • PUC gas - 20 ppmv (0.024 lb/MMBtu); • Non-PUC or liquid – 77 ppmv (0.093 lb/MMBtu) 2. Units >0.4 to <2.0 MMBtu/hr (except, instantaneous water heater and pool heaters below): • PUC gas – 20 ppmv (0.024 lb/MMBtu) • Non-PUC or liquid – 30 ppmv (0.036 lb/MMBtu) 3. Instantaneous water heaters ≥0.075 to ≤0.4 MMBtu/hr: • PUC gas – 20 ppmv (0.024 lb/MMBtu) • Non-PUC or liquid – 77 ppmv (0.093 lb/MMBtu) 4. Instantaneous water heaters >0.4 to <2.0 MMBtu/hr: • PUC gas – 20 ppmv (0.024 lb/MMBtu) • Non-PUC or liquid – 77 ppmv (0.093 lb/MMBtu)	Units with heat input rate ≥1.8 billion Btu/yr: • 30 ppm NOx Units ≥ 1 to ≤ 2 MMBtu/hr: • 20 ppm NOx (natural gas-fired) Units ≥0.3 billion Btu/yr and <1.8 billion Btu/yr: Comply with one of the following: • Units shall be tuned every 6 months or after 750 hours of operation, but in no case less than once per calendar year; OR • The unit shall comply with the emission and testing requirements

	SJVAPCD Rule 4308	VCAPCD Rule 74.15.1
	5. Pool heaters ≥0.075 to ≤0.4 MMBtu/hr: • PUC gas – 55 ppmv (0.068 lb/MMBtu) • Non-PUC or liquid – 77 ppmv (0.093 lb/MMBtu) 6. Pool heaters >0.4 to <2.0 MMBtu/hr: • PUC gas – 20 ppmv (0.068 lb/MMBtu) • Non-PUC or liquid – 30 ppmv (0.036 lb/MMBtu)	

ADDITIONAL EMISSION REDUCTION OPPORTUNITIES

Use of a Selective Catalytic Reduction system

SCR is a post combustion technology. Presuming units between 0.075 to <2 MMBtu/hr can be equipped with SCR system. The total annualized cost of deploying such technology would be at least $33,613 per year[30].

Assuming an SCR system reliably reduces NOx emissions from 20 ppmv @ 3% O_2 to 5 ppmv @ 3% O_2 for a 1.99 MMBtu/hr unit that operates 8,760 hours per year, the potential reductions would be 310 lb/year[31] (0.155 tons-NOx/yr).

The cost of achieving these potential NOx reductions would be at least $216,858/ton of emissions reduced. As such, this technology is not cost-effective for reducing emissions from this category.

Use of ultra-low NOx burner technology

Ultra low NOx burners can reliably achieve at least 9 ppmv NOx @ 3% O_2 and are available for units rated between 2-5 MMBtu/hr. Presuming that this technology is also available for small size boilers for a given application, a unit may be equipped with an ultra-low NOx burner system. Per local vendor, cost of a 2 MMBtu/hr boiler would be $35,000 for hot water boiler. The cost-effectiveness analysis is included below for this technology.

Description of Cost	Cost Factor	Cost	Source
Direct Costs			
Purchase equipment costs (PE)			
Burner System	A	35,000	Local Vendor
Instrumentation and controls	0.01 A	350	OAQPS
Sales Taxes	0.08 A	2,828	
Freight	0.05 A	1,750	OAQPS
Purchased equipment cost, PEC		39,928	
Direct installation costs (DI):			

[30] See Rule 4307 draft control measure analysis. Note that there is no significant price difference for an SCR system on 2-5 MMBtu/hr unit or smaller units.

[31] Potential NOx reduction = (0.024 – 0.0062) lb-NOx/MMBtu x 1.99 MMBtu/hr x 8,760 hr/yr = 310 lb-NOx/yr

Description of Cost	Cost Factor	Cost	Source
Foundation & supports	0.08 B	3,194	See footnote
Handling and erection	0.14 B	5,590	OAQPS
Electrical	0.04 B	1,597	OAQPS
Piping	0.02 B	799	OAQPS
Insulation and ductwork:	0.01 B	399	OAQPS
Painting	0.01 B	399	OAQPS
Direct installation costs		51,906	
Site preparation	As required, SP	--	See table footnote
Buildings	As required, Bldg.	--	
Total Direct Costs, DC		51,906	

Description of Cost	Cost Factor	Cost	Source
Indirect Costs (Installation)			
Engineering	0.10 B	3,993	OAQPS
Construction and field expenses	0.05 B	1,996	OAQPS
Contractor fees	0.10 B	3,993	OAQPS
Contingencies	0.03 B	1,198	OAQPS
Start-up	0.02 B	799	OAQPS
Performance test	0.01 B	399	OAQPS
Total Indirect Costs, IC	0.31 B	12,378	
Total Capital Investments (TCI= DC + IC):		**64,284**	
Annualized TCI (10 years @ 10% interest)	0.1627 TCI	**10,459**	
Direct annual costs (DAC)			
Operating and supervisory labor	--	--	See table footnote
Maintenance Costs (labor and material)	--	--	
Electricity Cost:	$0.08848/kWH	--	Not estimated
Indirect Annual Costs (IAC)			
Overhead:	--	--	See table footnote
Insurance:	--	--	See table footnote
Property Tax:	--	--	See table footnote
Administrative:	--	--	See table footnote
Total IAC:			
Total Annual Cost (DAC + IAC)	--	--	
Total annual cost (annualized TCI + Total annual cost)		**10,459**	

*Direct annual cost and indirect annual costs are presumed insignificant for new units and will likely be same when existing unit is being replaced

Assuming an ultra-low NOx burner system reliably reduces NOx emissions from 20 ppmv @ 3% O_2 to 9 ppmv @ 3% O_2 for a 1.99 MMBtu/hr unit that operates 8,760 hours per year, the potential reductions would be 227 lb/year[32] (0.114 tons-NOx/yr).

The cost of achieving these potential NOx reductions would be at least $91,746/ton of emissions reduced. As such, this technology is not cost-effective for reducing emissions from this category.

[32] Potential NOx reduction = (0.024 – 0.011) lb-NOx/MMBtu x 1.99 MMBtu/hr x 8,760 hr/yr = 227 lb-NOx/yr

EMx as Potential Control

The District researched post-combustion controls such as EMx, the second generation of the SCONOx technology that reduces NOx, SOx, CO, and VOC emissions. Per EmeraChem, manufacturer/vendor of the technology, this technology has not been achieved in practice (AIP) for natural gas fired boilers. SCONOx and EMx systems have only been utilized by power plants for the control of turbine emissions. The cost of EMx system would be anywhere from 3 to 5 million or even up to 8 million in some cases for large power plant installations. Moreover, the EMx system is ideal for new installation, and become extremely challenging and sometimes nearly impossible to retrofit an existing unit. In fact, cost-effectiveness analyses conducted by the District for the installation of SCONOx/EMx units on large power plant turbine installations within the Valley have shown that this technology is not cost-effective. Given the high cost-effectiveness demonstrated for turbines and lack of demonstrated practice with boilers, especially very small boilers such as those covered by this rule, this technology is not feasible or cost-effective for reducing emissions from this category.

PM2.5 Limits for Alternative Fuels

The majority of units 0.075 to less than 2 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. The feasibility of reducing PM emissions through adding PM2.5 limits for units using liquid fuel is explored as part of the District's comprehensive control measure evaluation.

The following three technologies were evaluated as potential control options for reducing PM emissions: baghouses, electrostatic precipitators (ESPs), and wet scrubbers. Baghouses 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%.[33] 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.[34] Furthermore, the District is unaware of installations of these types of controls on the small boilers covered by this regulation, generally due to the extraordinary cost associated with doing so. See below for cost and cost-effectiveness calculations.

[33] 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.* Retrieved from http://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0CB8QFjAA&url=http%3A%2F%2Fwww.nescaum.org%2Fdocuments%2Fici-boilers-20081118-final.pdf%2F&ei=7nfvVIivFai1sAT07IHIAg&usg=AFQjCNFBdQn7MVAibSTZIbHV7-ojXkVlXQ&bvm=bv.86956481,d.cWc.

[34] 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.* Retrieved from http://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0CB8QFjAA&url=http%3A%2F%2Fwww.nescaum.org%2Fdocuments%2Fici-boilers-20081118-final.pdf%2F&ei=7nfvVIivFai1sAT07IHIAg&usg=AFQjCNFBdQn7MVAibSTZIbHV7-ojXkVlXQ&bvm=bv.86956481,d.cWc.

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 combustion EF = 0.024 lb/MMBtu, based on maximum permitted EF for boilers 2-5 MMBtu/hr with option to use diesel fuel during natural gas curtailment.
3. Max rating of burner = 1.99 MMBtu/hr and assumed to operate 8,760 hours/yr.
4. The PM control efficiency of an ESP is 99%.
5. The PM control efficiency of a scrubber is 99%.
6. Due to lack of units in the Valley, the analysis is based on one known unit.

Potential Emissions Reductions $_{(ESP)}$ = (PM Emissions) x (Control Efficiency)
Potential Emissions Reductions $_{(ESP)}$ = (0.024 lb-PM/MMBtu x 1.99 MMBtu/yr x 8,760 hr/yr x ton/2,000 lb) tons/year X 0.99
Potential Emissions Reductions $_{(ESP)}$ = 0.209 tons/yr x 0.99

Potential Emissions Reductions $_{(ESP)}$ = 0.207 tons/ year (tpy)

Potential Emissions Reductions $_{(scrubber)}$ = (PM Emissions) x (Control Efficiency)
Potential Emissions Reductions $_{(scrubber)}$ = 0.209 tons/year x 0.99
Potential Emissions Reductions $_{(scrubber)}$ = 0.207tons/ 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.[35] 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.[36] The following assumptions were made for this cost-effectiveness analysis:

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 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.

[35] 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.
[36] EPA. (2002). *Air Pollution Control Technology Fact Sheet: Spray-Chamber/Spray-Tower Wet Scrubber.* Retrieved from http://www.epa.gov/ttncatc1/dir1/fsprytwr.pdf.

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 1) x (0.1627) + ($1,500 x 1)
Annual Cost $_{(ESP)}$ = $16,957/year

Annual Cost $_{(scrubber)}$ = (Annualized Cost of 1 unit) x (Number of Units) x (Average Flow Rate)
Annual Cost $_{(scrubber)}$ = ($53,650/ sm^3/sec) x (1) x (23.85 sm^3/sec)
Annual Cost $_{(scrubber)}$ = $1,279,553/ year

Cost-effectiveness of an ESP and Wet Scrubber

Cost-effectiveness = Annual Cost / Annual Emissions Reductions

Cost-effectiveness $_{(ESP)}$ = ($16,957/year) / (0.207 tons/ year)
Cost-effectiveness $_{(ESP)}$ = $81,918/ton of PM

Cost-effectiveness $_{(scrubber)}$ = ($1,279,553/year) / (0.207 tons/ year)
Cost-effectiveness $_{(scrubber)}$ = $6,181,413/ton 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 increase the cost even more.

Mobile Home Exemption
The District evaluated the possibility of removing the exemption for water heaters used in mobile homes because multiple air districts do not exempt these sources in their analogous rules. 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 units 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 contained in SCAQMD and SMAQMD rules.

BAAQMD Rule Regulation 9 Rule 6 regulates all units less than 2 MMBtu/hr, essentially combining the requirements of District Rules 4308 and 4902.

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 such units are not available and do not exist in this size range.

Recreational Vehicle Exemption

The District evaluated the potential opportunity to remove the exemption for recreational vehicles (RVs). Stakeholder input indicates that there are very few units in RVs that fall under the size category subject to this rule. Most units in RVs are 12 gallons, which is significantly smaller than the 80 gallon size of a typical 0.075 MMBtu/hr unit.[37] Also, RV units are typically not used on a frequent basis and thus are small contributors to the NOx emissions of this source category. Other 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 units within this size range and the intermittent use of units in RVs.

EVALUATION FINDINGS

The District has evaluated all potential control technologies and all control technologies achieved in practice in other areas or included in other state implementation plans for the small boilers addressed by this rule. As demonstrated above, Rule 4308 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds RACM, BACM, and MSM requirements for this source category.

[37] SJVAPCD. (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)*.

C.10 Rule 4309 (Emissions from Dryers, Dehydrators, and Ovens)

Discussion

Rule 4309 (Dryers, Dehydrators, and Ovens) was adopted on December 15, 2005 to limit NOx and CO emissions from dryers, dehydrators, or ovens fired on gaseous, liquid, or gaseous and liquid fuel sequentially that have a total rated heat input for the unit of 5.0 MMBtu/hr. The rule limits NOx emissions to between 3.5-12 ppmvd for four categories of equipment. The adoption of Rule 4309 has considerably reduced NOx and PM emissions from this source category, reducing the emissions inventory for NOx from dryers, dehydrators, and ovens from 1.93 tpd in 2005 to 0.22 tpd in 2016. 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 and technology investments already made to reduce emissions from this source category, there are little remaining opportunities for obtaining additional emissions reductions.

Emissions Inventory

POLLUTANT	2013	2017	2019	2020	2022	2023	2024	2025	2026	2028
	Annual Average - Tons per day									
PM2.5	0.87	0.97	1.02	1.04	1.07	1.09	1.11	1.13	1.15	1.20
NOx	0.20	0.23	0.24	0.25	0.25	0.26	0.26	0.27	0.27	0.28
	Winter Average - Tons per day									
PM2.5	0.82	0.92	0.96	0.98	1.01	1.03	1.05	1.07	1.09	1.13
NOx	0.18	0.20	0.21	0.22	0.22	0.23	0.23	0.24	0.24	0.25

Source Category

This source category includes 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 (MMBtu/hr) or greater. There are currently 120 units subject to this rule, ranging in size from 5.0 MMBtu/hr to 200 MMBtu/hr. Dryers, dehydrators, and ovens are utilized in a broad range of industries and can be grouped as: dehydrators; asphalt and concrete plants; milk, cheese, and dairy processing; and other processes. Dryers, dehydrators, and ovens are operated either seasonally or year-round depending on the industry type and the unit's purpose within the process.

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

Federal Regulations

There are no EPA CTG, NSPS, NESHAP, or MACT requirements applicable for this source category.

Alternative Control Techniques (ACT)

EPA – 453/R-94-004 (Alternative Control Techniques Document–NOx Emissions from Cement Manufacturing)

The District evaluated the requirements contained within the ACT for NOx Emissions from Cement Manufacturing and found no applicable requirements that would be more stringent than those already in Rule 4309.

State Regulations

There are no state regulations applicable to this source category.

HOW DOES DISTRICT RULE 4309 COMPARE TO RULES IN OTHER AIR DISTRICTS?

There are no analogous rules for this source category in the BAAQMD

SCAQMD

- South Coast AQMD Rule 1147 (NOx Reductions from Miscellaneous Sources) *(Last amended July 7, 2017)*

SCAQMD Rule 1147 establishes emission limits based on the process temperature, whereas District Rule 4309 does not consider the process temperature and instead establishes emissions limits based on the equipment categories. Where the rules can be compared, the District rule is more stringent in several categories, such as liquid fueled units, high temperature applications, evaporators, fryers, etc. In other categories, the NOx limits under the SCAQMD rule vary from 3.3 to 6.5 ppmv at 19% O2 with an average of 4.9 ppmv, while District Rule 4309 limits NOx emissions from 3.5 to 5.3 ppmv with most categories limited to 4.3 ppmv at 19% O2, independent of the process temperature. Therefore, overall, District Rule 4309 is as stringent as SCAQMD Rule 1147.

	SJVAPCD Rule 4309	SCAQMD Rule 1147
Applicability	Rule applies 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 MMBtu/hr or greater.	Rule applies to manufacturers, distributors, retailers, installers, owners, and operators of ovens, dryers, dehydrators, heaters, kilns, calciners, furnaces, crematories, incinerators, heated pots, cookers, roasters, fryers, closed and open heated tanks and evaporators, distillation units, afterburners, degassing units, vapor incinerators, catalytic or thermal oxidizers, soil and water remediation units and other combustion equipment with nitrogen oxide emissions that require a District permit and are not specifically required to comply with a nitrogen oxide emission limit by other District Regulation XI rules. This rule does not apply to solid fuel-fired combustion equipment, internal combustion engines, turbines, food ovens, charbroilers, boilers, water heaters, thermal fluid heaters, enclosed process heaters and other combustion equipment subject to nitrogen oxide limits of other District Regulation XI rules.
Exemptions		
Rule 4309 Exemption Categories:	Sections of the Rule	
Column-type or tower dryers used	Section 4.1.1	No such exemptions stated in the rule.

<table>
<tr><th></th><th>SJVAPCD Rule 4309</th><th colspan="4">SCAQMD Rule 1147</th></tr>
<tr><td>to dry grains, or tree nuts.</td><td></td><td colspan="4" rowspan="4"></td></tr>
<tr><td>Units to pre-condition onions or garlic prior to dehydration</td><td>Section 4.1.2</td></tr>
<tr><td>Smokehouses or units used for roasting</td><td>Section 4.1.3</td></tr>
<tr><td>Units used to dry lint cotton or cotton at cotton gins</td><td>Section 4.1.6</td></tr>
<tr><td>Units to bake or fry food for human consumption</td><td>Section 4.1.4</td><td colspan="4">SC Rule 1147 Exempts existing fryers installed and operated within specified dates as stated in Section (g)(6). New fryers installed after January 1, 2014 are subject to Table 1 emission limit of 60 ppmvd @3% O2 (or 6.5 ppmvd @ 19% O2).

In-use food ovens, including ovens, dryers, smokers, and dry roasters, are exempt from Rule 1147 but subject to Rule 1153.1 with the following limits:
Units operating ≤ 500° F, 40 ppmvd, (4.3 ppmvd @ 19% O2), or 0.042 lb/MMBtu
Units operating > 500° F, 60 ppmvd, (6.5 ppmvd @ 19% O2), or 0.073 lb/MMBtu</td></tr>
<tr><td>Charbroilers</td><td>Section 4.1.5 – Exempt from rule</td><td colspan="4">Section (g)(2) - Exempt from rule</td></tr>
<tr><td>Requirements</td><td></td><td colspan="4"></td></tr>
<tr><td>Rule 4309 Equipment Categories:</td><td></td><td colspan="4"></td></tr>
<tr><td rowspan="2">Gaseous Fuel-Fired Equipment</td><td>No process temperature</td><td colspan="4">Process Temperature</td></tr>
<tr><td></td><td></td><td>≤ 800° F</td><td>> 800° F and < 1200°F</td><td>≥ 1200 ° F</td></tr>
<tr><td>Dehydrators</td><td>-</td><td>Oven, Dehydrator, Dryer, Heater, Kiln, Calciner, Cooker, Roaster, Furnace, or Heated Storage Tank</td><td colspan="2">30 ppmvd (3.3 ppmvd @ 19% O2) or 0.036 lb/MMBtu (not specific to dehydrators)</td><td>60 ppmvd (6.5 ppmvd @ 19% O2) or 0.073 lb/MMBtu (not specific to dehydrators)</td></tr>
<tr><td>Asphalt/Concrete Plants</td><td>4.3 ppmvd @ 19 %O2</td><td>Asphalt Manufacturing Operation</td><td colspan="2">40 ppmvd (4.3 ppmvd @ 19% O2)</td><td>No requirement</td></tr>
<tr><td>Milk, Cheese and Dairy Processing (<20 MMBtu/hr)</td><td>3.5 ppmvd @ 19% O2 (equates to 0.04 lb/MMBtu)</td><td colspan="4" rowspan="2">No such category</td></tr>
<tr><td>Milk, Cheese and Dairy Processing (≥20 MMBtu/hr)</td><td>5.3 ppmvd @ 19% O2 (equates to 0.061 lb/MMBtu)</td></tr>
<tr><td>Other processes not described above</td><td>4.3 ppmvd @ 19% O2 (equates to 0.049 lb/MMBtu)</td><td>Afterburner, Degassing Unit, Remediation Unit, Thermal Oxidizer,</td><td colspan="3">60 ppmvd (6.5 ppmvd @ 19% O2) or 0.073 lb/MMBtu</td></tr>
</table>

	SJVAPCD Rule 4309	SCAQMD Rule 1147		
		Catalytic Oxidizer or Vapor Incinerator[1]		
		Burn-off Furnace, Burnout Oven, Incinerator or Crematory with or without Integrated Afterburner		
		Evaporator, Fryer, Heated Process Tank, or Parts Washer	60 ppmvd (6.5 ppmvd @ 19% O2) or 0.073 lb/MMBtu	No requirement
		Metal Heat Treating, Metal Melting Furnace, Metal Pot, or Tar Pot	60 ppmvd (6.5 ppmvd @ 19% O2) or 0.073 lb/MMBtu	
		Oven, Dehydrator, Dryer, Heater, Kiln, Crematory, Incinerator, Calciner, Cooker, Roaster, Furnace, or Heated Storage Tank	30 ppmvd (3.3 ppmvd @ 19% O2) or 0.036 lb/MMBtu	60 ppmvd (6.5 ppmvd @ 19% O2) or 0.073 lb/MMBtu
		Make-Up Air Heater or other Air Heater located outside of building with temperature controlled zone inside building	30 ppmvd (3.3 ppmvd @ 19% O2) or 0.036 lb/MMBtu	No requirement
		Tenter Frame or Fabric or Carpet Dryer	30 ppmvd (3.3 ppmvd @ 19% O2) or 0.036 lb/MMBtu	No requirement
		Other Unit or Process Temperature	30 ppmvd (3.3 ppmvd @ 19% O2) or 0.036 lb/MMBtu	60 ppmvd (6.5 ppmvd @ 19% O2) or 0.073 lb/MMBtu
Liquid Fuel-Fired Equipment		≤ 800° F	>800° F and <1200° F	≥ 1200 ° F
All liquid fuel-fired Units	Varies from 3.5 ppmvd @ 19% O2 to 12 ppmvd @ 19% O2	40 ppmvd (4.3 ppmvd @ 19% O2) or 0.053 lb/MMBtu		60 ppmvd (6.5 ppmvd @ 19% O2) or 0.073 lb/MMBtu

[1.] Emission limit applies to burners in units fueled by 100% natural gas that are used to incinerate air toxics, VOCs, or other vapors; or to heat a unit. The emission limit applies solely when burning 100% fuel and not when the burner is incinerating air toxics, VOCs, or other vapors. The unit shall be tested or certified to meet the emission limit while fueled with natural gas.

SMAQMD

- SMAQMD Rule 419 (NOx from Miscellaneous Combustion Units) *(Adopted July 26, 2018)*

SMAQMD Rule 419 only applies to miscellaneous combustion units located at major stationary sources of NOx. Currently the District has 30 permitted dehydrators, with 60% of these units (18 units) located at non major source of NOx that would not be subject to

SMAQMD Rule 419. For other units subject to District rule 4309, there are 90 permitted units with 70 located at non-major sources of NOx that would not be subject to SMAQMD Rule 419.

For units located at major sources of NOx, SM Rule 419 establishes emission limits based on the process temperature and does not consider the equipment categories, whereas District Rule 4309 does not consider the process temperature and instead establishes emissions limits based on the equipment categories. Under SMAQMD's Rule 419, the NOx limits vary from 3.3 to 6.5 ppmv at 19% O2 with an average of 4.9 ppmv, while District Rule 4309 limits NOx emissions from 3.5 to 5.3 ppmv with most categories limited to 4.3 ppmv at 19% O2, independent of the process temperature.

In conclusion, the vast the majority of the permitted units in the San Joaquin Valley subject to District rule 4309 are located at non-Major Sources of NOx would be exempt from NOx limits under SM Rule 419. Units located at Major Sources of NOx in the Valley are subject to District Rule 4309 NOx limits which are equivalent to those NOx limits under SM rule 419. Therefore, overall, District Rule 4309 is as stringent as SMAQMD Rule 419.

<table>
<tr><th></th><th>SJVAPCD Rule 4309</th><th colspan="2">SMAQMD Rule 419</th></tr>
<tr><td>Applicability</td><td>Rule applies to 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 MMBtu/hr or greater.</td><td colspan="2">This rule applies to any miscellaneous combustion unit with a total rated heat input capacity of 2 million Btu per hour or greater located at a major stationary source of NOx.</td></tr>
<tr><td>Exemptions</td><td></td><td colspan="2"></td></tr>
<tr><td>Rule 4309 Exemption Categories:</td><td>Sections of the Rule</td><td colspan="2"></td></tr>
<tr><td>Column-type or tower dryers used to dry grains, or tree nuts.</td><td>Section 4.1.1</td><td colspan="2" rowspan="4">No such exemption stated in the rule.</td></tr>
<tr><td>Units to pre-condition onions or garlic prior to dehydration</td><td>Section 4.1.2</td></tr>
<tr><td>Charbroilers</td><td>Section 4.1.5</td></tr>
<tr><td>Units used to dry lint cotton or cotton at cotton gins</td><td>Section 4.1.6</td></tr>
<tr><td>Smokehouses or units used for roasting</td><td>Section 4.1.3</td><td colspan="2">Smokehouses are not listed among exempt categories.
Whereas, rule exempts roasters.</td></tr>
<tr><td>Units to bake or fry food for human consumption</td><td>Section 4.1.4</td><td colspan="2">Section 114.4 exempts cooking units which are used for food preparation for human consumption.</td></tr>
<tr><td>Requirements</td><td></td><td colspan="2"></td></tr>
<tr><td>Rule 4309 Equipment Categories:</td><td></td><td colspan="2"></td></tr>
<tr><td></td><td>No process temperature</td><td colspan="2">Process Temperature</td></tr>
<tr><td>Gaseous Fuel-Fired Equipment</td><td></td><td>< 1200° F</td><td>≥ 1200° F</td></tr>
<tr><td>Dehydrators</td><td>-</td><td rowspan="3">For units located at a major stationary source of NOx</td><td rowspan="3">For units located at a major stationary source of NOx</td></tr>
<tr><td>Asphalt/Concrete Plants</td><td>4.3 ppmvd @ 19% O2
(equates to 0.0492 lb/MMBtu)</td></tr>
<tr><td>Milk, Cheese and Dairy Processing
(<20 MMBtu/hr)</td><td>3.5 ppmvd @ 19% O2
(equates to 0.04 lb/MMBtu)</td></tr>
</table>

	SJVAPCD Rule 4309	SMAQMD Rule 419	
Milk, Cheese and Dairy Processing (≥20 MMBtu/hr)	5.3 ppmvd @ 19% O2 (equates to 0.061 lb/MMBtu)	30 ppmvd (equates to 3.3 ppmvd @ 19% O2) or 0.036 lb/MMBtu	60 ppmvd (equates to 6.5 ppmvd @ 19% O2) or 0.073 lb/MMBtu
Other processes not described above	4.3 ppmvd @ 19% O2 equates to 0.0492 lb/MMBtu		
Liquid Fuel-Fired Equipment			
All liquid fuel-fired Units	Varies from 3.5 ppmvd @ 19% O2 to 12 ppmvd @ 19% O2	For units located at a major stationary source of NOx 40 ppmvd (equates to 4.3 ppmvd @ 19% O2) or 0.053 lb/MMBtu	For units located at a major stationary source of NOx 60 ppmvd (equates to 6.5 ppmvd @ 19% O2) or 0.073 lb/MMBtu

VCAPCD

- VCAPCD Rule 74.34 (NOx Reductions from Miscellaneous Sources) *(Adopted December 13, 2016)*

VCAPCD Rule 74.34 establishes emission limits based on the process temperature whereas District Rule 4309 does not consider the process temperature and instead establishes emissions limits based on the equipment categories. Where the rules can be compared, the District rule is more stringent in several categories, such as metal heat treatment, metal melting furnace, kiln, etc. In other categories, the NOx limits under the VCAPCD rule vary from 3.3 to 6.5 ppmv at 19% O2 with an average of 4.9 ppmv, while District Rule 4309 limits NOx emissions from 3.5 to 5.3 ppmv with most categories limited to 4.3 ppmv at 19% O2, independent of the process temperature. Therefore, overall, District Rule 4309 is as stringent as VCAPCD Rule 74.34.

	SJVAPCD Rule 4309	VCAPCD Rule 74.34
Applicability	Rule applies to 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 MMBtu/hr or greater.	This rule applies to dryers, furnaces, heaters, incinerators, kilns, ovens, and duct burners. This rule applies to any unit where the total rated heat input for the unit is 5 million BTU per hour or greater.
Exemptions		
Rule 4309 Exemption Categories:	Sections of the Rule	
Column-type or tower dryers used to dry grains, or tree nuts.	Section 4.1.1	No such exemption stated in the rule.
Units to pre-condition onions or garlic prior to dehydration	Section 4.1.2	
Smokehouses or units used for roasting	Section 4.1.3	
Units to bake or fry food for human consumption	Section 4.1.4	
Charbroilers	Section 4.1.5	
Units used to dry lint cotton or cotton at cotton gins	Section 4.1.6	

<table>
<tr><th></th><th>SJVAPCD Rule 4309</th><th colspan="3">VCAPCD Rule 74.34</th></tr>
<tr><td>Requirements</td><td></td><td colspan="3"></td></tr>
<tr><td>Rule 4309 Equipment Categories:</td><td></td><td colspan="3"></td></tr>
<tr><td>Dehydrators</td><td>-</td><td colspan="3">Dehydrators are not subject to this rule as they are not listed under applicability of the rule.</td></tr>
<tr><td>Asphalt/Concrete Plants</td><td>4.3 ppmvd @ 19% O2 (equates to 0.0492 lb/MMBtu)</td><td colspan="3">40 ppmvd (equates to 4.3 ppmvd @ 19% O2) or 0.048 lb/MMBtu</td></tr>
<tr><td>Milk, Cheese and Dairy Processing (<20 MMBtu/hr)</td><td>3.5 ppmvd @ 19% O2 (equates to 0.04 lb/MMBtu)</td><td colspan="3" rowspan="2">Equipment not listed, so it would be subject to emission limits of other processes (the last category listed below)</td></tr>
<tr><td>Milk, Cheese and Dairy Processing (≥20 MMBtu/hr)</td><td>5.3 ppmvd @ 19% O2 (equates to 0.061 lb/MMBtu)</td></tr>
<tr><td rowspan="7">Other processes not described above</td><td rowspan="7">4.3 ppmvd @ 19% O2 equates to 0.0492 lb/MMBtu</td><td>Sand and Gravel Processing (dryers)</td><td rowspan="2">40 ppmvd (equates to 4.3 ppmvd @ 19% O2) or 0.048 lb/MMBtu</td><td></td></tr>
<tr><td>Paper Products Manufacturing (Hot Air Furnace, Duct Burner, Paper Dryer)</td></tr>
<tr><td>Metal Heat Treatment/Metal Melting Furnace</td><td>60 ppmvd (equates to 6.5 ppmvd @ 19% O2) or 0.072 lb/MMBtu</td><td></td></tr>
<tr><td>Kiln</td><td>80 ppmvd (equates to 8.7 ppmvd @ 19% O2) or 0.096 lb/MMBtu</td><td></td></tr>
<tr><td rowspan="2"></td><td colspan="2">Process Temperature</td></tr>
<tr><td>< 1200° F</td><td>≥ 1200° F</td></tr>
<tr><td>Oven, Dryer (besides asphalt, sand or paper dryer), Heater, Incinerator, Other Furnaces, or Other Duct Burner (Not listed above in Table 1)</td><td>30 ppmvd (equates to 3.3 ppmvd @ 19% O2) or 0.036 lb/MMBtu</td><td>60 ppmvd (equates to 6.5 ppmvd @ 19% O2) or 0.072 lb/MMBtu</td></tr>
</table>

ADDITIONAL EMISSION REDUCTION OPPORTUNITIES

Asphalt Plants

PUC-quality natural gas fuel is the lowest emitting fuel for asphalt plants, and is generally required for new facilities in the District, BAAQMD, and SCAQMD, where natural gas is available. There are currently ten asphalt plants in the Valley that do not utilize PUC-quality natural gas because these facilities are physically too far removed from natural gas lines to use natural gas. Eight 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 fuel oil #2; however, none of the facilities operate full time and their combined actual NOx emissions are 0.006 tons per day, an insignificant contributor to the inventory.

Dehydrators

Dehydrators in the Valley are used to process a very large variety of products such as onions, garlic, tomatoes, various fruits and vegetable. There are very specific operational and technical limitations associated with dehydrator operations depending on the type of product processed. More specifically, the District has determined that requiring low-NO_X burners is not feasible for vegetable dehydration operations due to product quality issues. For instance, low NOx burners inherently emit higher CO which causes dried garlic and onion to turn pink, negatively affecting product quality/value. The District will continue to evaluate the feasibility and cost-effectiveness of low-NOx burners for potential additional emission reduction opportunities.

EVALUATION FINDINGS

The District has evaluated all potential control technologies and all control technologies achieved in practice in other areas or included in other state implementation plans for dryers, dehydrators, and ovens. As demonstrated above, Rule 4309 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds RACM, BACM and MSM requirements for this source category.

C.11 RULE 4311 (EMISSIONS FROM FLARES)

DISCUSSION

Rule 4311 was adopted in June 2002 to reduce VOC, NOx, and SOx emissions from operations involving the use of flares. Amendments were adopted on June 15, 2006 and June 18, 2009. The June 2009 amendment incorporated requirements for flare minimization plans and increased the stringency of existing requirements for sulfur emissions. In addition to Rule 4311 requirements, any new flare is subject to New Source Review (NSR) requirements (District Rule 2201) including Best Available Control Technology (BACT) requirements which would require implementation of even more stringent controls regardless of Rule 4311 requirements when applicable.

In 2017, flaring activities in the Valley emitted 0.57 tpd of NOx emissions and 0.16 tpd of PM2.5, representing 0.27% of the winter average NOx emissions and 0.28% of the winter average PM2.5 emissions in the Valley. Despite this relatively small amount of emissions, in keeping with the District's leave-no-stone-unturned approach, significant resources have been invested into evaluating potential emissions reductions opportunities from flares.

The District committed to continue evaluating flares through a further study measure in the District's *2012 PM2.5 Plan* and *2013 Plan for the Revoked 1-Hour Ozone Standard*. The District completed and published the *Rule 4311 (Flares) Further Study* report on September 16, 2014 (*2014 Study*).[38] In that study, District staff reviewed the submitted Flare Minimization Plans (FMPs), Annual Monitoring Report data, Reportable Flaring Event data, and NSPS requirements to identify and evaluate potential opportunities to further reduce emissions from flaring. In addition to the review committed in the plans, the District also reviewed the flare emission inventory in the Valley and analogous rules in other air districts in California. In the *2014 Study*, the District concluded that operators of flares in the Valley were subject to the most stringent emission requirements and were proactively implementing alternatives and committing to activities that reduce flaring. Based on that conclusion, the District recommended no rulemaking action for Rule 4311 at that time.

On April 16, 2015, the District's Governing Board adopted the *2015 Plan for the 1997 PM2.5 Standard* (*2015 PM2.5 Plan*)[39]. As demonstrated in the District's *2015 PM2.5 Plan*, Rule 4311 already meets the EPA BACM and MSM requirements. In fact, EPA approved Rule 4311 as satisfying all applicable federal requirements on November 3, 2011.[40] However, due to the need to demonstrate attainment for multiple federal ozone and PM2.5 standards in the coming years and the need to search for all available emissions reductions, the District committed to undertaking a comprehensive review of FMPs submitted under Rule 4311, publish a draft report for public review and commenting on December 1, 2015, and finalize the report on March 31, 2016 after receiving input from flare

[38] SJVAPCD. (2014) *Rule 4311 (Flares) Further Study 2014*. Retrieved from http://www.valleyair.org/Air_Quality_Plans/docs/R4311.pdf.
[39] SJVAPCD. (2015). *2015 Plan for the 1997 PM2.5 Standard*. Retrieved from http://www.valleyair.org/Air_Quality_Plans/PM25Plans2015.htm
[40] EPA. 76 Federal Register 213, 68106-68107. 11/3/2011. http://www.gpo.gov/fdsys/pkg/FR-2011-11-03/pdf/2011-28391.pdf

operators and addressing public comments. That comprehensive study resulted in the following findings and recommendations:

1. The District identified minimization practices currently performed at facilities that have the potential to be applied to other facilities.

a. The District recommends conducting a thorough evaluation of the most effective flare minimization practices included in approved FMPs and requiring the implementation of these practices where technologically achievable and economically feasible.

Even though operators of flares in the Valley have already taken extensive measures to reduce flaring, through this study the District has identified effective minimization practices currently performed at some facilities that could be employed at other facilities to further reduce flaring. To further evaluate opportunities for emission reductions from flaring, the District will commit to performing an exhaustive evaluation of these flare minimization practices and propose potential rule amendments requiring the use of these practices where technologically achievable and economically feasible.

b. The District recommends exploring options to further promote the implementation of the most effective flare minimization practices during the FMP submittal and review process.

Under Rule 4311, FMPs are required to be submitted and approved for existing, new, and modified flaring systems. For existing systems, an updated FMP is required to be submitted and approved every five years. Working with operators to identify potential flare minimization practices during the FMP review process provides operators the opportunity to incorporate feasible flare minimization practices when new and modified systems are proposed and during the ongoing review of FMPs.

2. Ultra-low NOx technologies with the potential to further reduce emissions from flaring have recently become available. The District recommends conducting a thorough evaluation of new ultra low NOx control technologies for flaring and requiring the implementation of these technologies where technologically achievable and economically feasible.

Through this further study, the District has identified new low NOx control technologies that may serve as suitable options for further reducing NOx emissions from flaring in the Valley. To further evaluate opportunities for emission reductions from flaring, the District will perform an exhaustive evaluation of NOx emission reduction control technologies and propose potential rule amendments

requiring the use of these technologies where technologically achievable and economically feasible.

Given the enormity of reductions needed to develop plans that demonstrate attainment with the latest federal ozone and PM2.5 standards and based on findings from the recent flare further study, the District committed in its *2016 Ozone Plan for the 2008 8-Hour Ozone Standard* to work closely with affected operators to undergo a regulatory amendment process for Rule 4311 to include the following:

- Additional ultra-low NOx flare emission limitations for existing and new flaring activities at Valley facilities to the extent that such controls are technologically achievable and economically feasible, and
- Additional flare minimization requirements to the extent that such controls are technologically achievable and economically feasible

This regulatory amendment process began last year, with the District hosting a scoping meeting on August 23, 2017. The District is in the process of working with stakeholders to evaluate the feasibility of additional flare minimization practices and ultra-low NOx flare technologies.

EMISSIONS INVENTORY

POLLUTANT	2013	2017	2019	2020	2022	2023	2024	2025	2026	2028
	Annual Average - Tons per day									
PM2.5	0.16	0.16	0.16	0.16	0.16	0.17	0.17	0.17	0.17	0.17
NOX	0.56	0.54	0.54	0.53	0.53	0.52	0.52	0.52	0.52	0.51
	Winter Average - Tons per day									
PM2.5	0.16	0.16	0.16	0.16	0.16	0.17	0.17	0.17	0.17	0.17
NOX	0.56	0.54	0.54	0.53	0.53	0.52	0.52	0.52	0.52	0.51

SOURCE CATEGORY

Flaring is a high temperature oxidation process used to burn combustible components, primarily hydrocarbons, of waste gases from industrial operations, primarily for the purpose of controlling emissions and as a safety device. The majority of waste gases flared are natural gas, propane, ethylene, propylene, butadiene and butane.

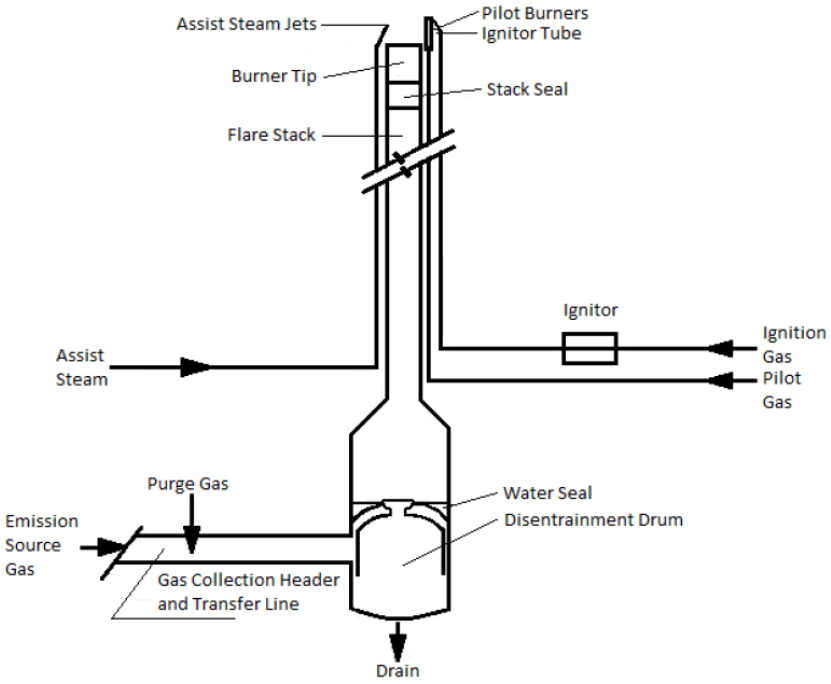
Combustion efficiency depends on flame temperature, residence time in the combustion zone, vent gas flammability, auto ignition temperature, heating value, and turbulent mixing. When operated at an optimal combination of these factors, flares have a destruction efficiency of 98 percent or greater. Complete combustion converts all VOCs to CO_2 and water; however incomplete combustion increases the presence of air pollutants such as carbon monoxide and particulate matter (as soot). Additionally, there is a possibility of pass through of hydrocarbons or H_2S if they have not been completely combusted. To prevent the creation of smoke or soot, which is influenced by fuel characteristics and the amount and distribution of oxygen in the combustion zone, most industrial flares are steam-assisted or air-assisted. In some cases, another fuel must be

added to flare gas to achieve the minimum heating value of 200-250 Btu/ft^3 (or higher) required for complete combustion.

There are two general types of flares: elevated and enclosed ground flares. Flares are further categorized 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 in the Valley and have larger capacities than enclosed ground flares. In an elevated flare, a waste gas stream is fed through a stack and is combusted near the tip of the stack. An elevated flare consists of five components: a gas collection header (to collect gases from various process units); a proprietary seal; a water seal, or purge gas supply (to prevent flash back); a single or multiple-burner unit in the flare stack; and gas pilots and an igniter. Figure C-2, below, depicts a typical configuration for a steam-assisted elevated flare.

Figure C-2 Flare Diagram



Enclosed ground flares, are less common in the Valley, vary in complexity and can consist of either conventional flare burners discharging horizontally with no enclosures or multiple burners in refractory-lined steel enclosures.

Flaring in the San Joaquin Valley

Flares serve two basic functions: as a safety device during unforeseeable and unpreventable emergency situations/standby situations and less commonly as a primary emissions control device for VOC emissions. As safety devices, flares are necessary to prevent catastrophic consequences such as the release of toxic gases and explosions, which could result in loss of property, injury, and loss of human life.

In the Valley, the vast majority of flares are employed in oil and gas production operations as emergency/standby control devices, which is in direct contrast with other regions, such as North Dakota, where flares are used for primary disposal of waste gas from oil and natural gas production. Also, while regions like North Dakota utilize flares to combust associated gas during the initial extraction phase of the production process (i.e., directly from the well), Valley flares are typically used further down the process chain, primarily as a safety device associated with gas collection systems, resulting in far lower quantities of flared gas. Valley operators have generally evaluated all feasible and cost-effective options for handling and disposing of the associated/waste gases generated by their facilities and installing a flare as the primary method of disposal would be the last resort.

In addition to Rule 4311 requirements to evaluate and implement all feasible measures to reduce flaring activities, other associated rules also implement stringent capture and control of these gases. Therefore, most facilities have made significant investments to capture and utilize these process gases in a variety of methods and this ability has allowed facilities to maximize income generation. Some capture and treat these gases and sell them to natural gas/utility providers (generates monetary income), while others utilize these gases on-site to fuel equipment that generates electricity and/or provides process heating (saves fuel costs). In fact, most Valley facilities regard flaring events as a significant monetary cost, through directly lost profits or increased fuel costs.

In the District's evaluation of Valley flaring activities,[41] nearly all of the significant flaring events were either one-time events due to new control equipment installation or maintenance of existing equipment, and therefore not repeated, or in response to emergency situations or process upsets. For example, one Valley facility (light oil production facility) experienced abnormally high flaring due to the sales transmission pipeline being offline for repairs. Another facility (wastewater treatment plant) normally uses the fuel onsite to produce electricity and process heating but could not do so because additional air pollution control devices were being installed.

Flares in the Valley subject to the requirements in Rule 4311 are employed by a diverse group of industries for a wide variety of applications, as illustrated by the below list. In contrast, other air districts' flare rules generally limit the applicability of their rules to petroleum production facilities or refineries.

- Gas plants
- Heavy oil production/ thermally enhanced oil recovery
- Light oil production

[41] SJVAPCD. *Rule 4311 (Flares) Further Study*. http://valleyair.org/Air_Quality_Plans/docs/R4311.pdf.

- Refinery operations
- Wastewater treatment plants
- Cheese production
- Wine
- Dairy operations
- Flat glass production
- Correctional facility

HOW DOES DISTRICT RULE 4311 COMPARE WITH FEDERAL AND STATE RULES AND REGULATIONS?

Federal Regulations
There are no EPA CTG or ACT requirements for this source category.

The following federal regulations apply to Rule 4311 sources:
NESHAP/MACT

- 40 CFR 63 Subpart SS (National Emission Standards for Closed Vent Systems, Control Devices, Recovery Devices and Routing to a Fuel Gas System or a Process)

NSPS

- 40 CFR 60.18 (General Control Device and Work Practice Requirements)
- 40 CFR 65.147 (Flares)
- 40 CFR 60 Subpart OOOOa (Standards of Performance for Crude Oil and Natural Gas Facilities for Which Construction, Modification, or Reconstruction Commenced After September 15, 2015)
- 40 CFR 60 Subpart Ja (Standards of Performance for Petroleum Refineries for Which Construction, Reconstruction, or Modification Commenced After May 14, 2007)

Rule 4311 is as stringent as or more stringent than the above NSPS and NESHAP requirements. The most recently amended NSPS (40 CFR 60 Subpart OOOO and 40 CFR 60 Subpart Ja) are discussed below.

40 CFR 60 Subpart OOOOa is a relatively new NSPS requirement that became effective on September 15, 2015. This NSPS may indirectly affect some Valley flares since there is a possibility that a flare is exempt from the majority of the requirements of Rule 4311 and is used as a control device for a vapor controlled tank that is subject to Subpart OOOOa.

Affected facilities under this subpart that may use flares as an approved control device include centrifugal compressors, storage vessels, and onshore natural gas processing plants. If the facility chooses to meet the control requirements, then the flare must be designed and operated in accordance with §60.18(b) and must conduct the compliance determination using Method 22 at 40 CFR part 60, appendix A-7, to determine visible emissions. §60.18(b) was last amended on December 22, 2008, which is before the last

amendment for District Rule 4311 (June 18, 2009). The requirements of the 2008 amendments were closely evaluated during the District's 2009 Rule amendment. EPA deemed Rule 4311 as being at least as stringent as established Reasonable Available Control Technology (RACT) requirements on January 10, 2012.[42] Since Subpart OOOOa has no new requirements for flares after the 2012 EPA RACT approval, Rule 4311 continues to be at least as stringent as these requirements.

40 CFR 60 Subpart Ja was amended by EPA on September 12, 2012. Amendments clarified existing requirements and applicability, including what constitutes a flare modification, clarification of secondary flares, and clarification of the records that must be maintained by the operator. EPA also added new requirements to Subpart Ja as part of these amendments, including flare related unit and process descriptions, assessments, and evaluations; analyses of causes and corrective actions for reportable flaring events; and sulfur limits for petroleum refineries.

Subpart Ja did not implement more stringent requirements than District Rule 4311. Subpart Ja has one new exemption for continuous monitoring, which allows for fewer requirements than previously required in the NSPS, and therefore, is not more stringent than current rule language. While there may be some minor differences in terminology or requirements making direct comparisons not possible, the same level of controls and emission reductions are achieved through District regulations as through this NSPS. Additionally, the District's Permit Services Department continuously evaluates NSPS on a case-by-case basis to ensure the relevant flares comply with all federal requirements as they are promulgated. Rule 4311 is as stringent as, if not more stringent than, this NSPS.

As demonstrated by the discussion above, Rule 4311 is as stringent as or more stringent than the applicable federal regulations.

State Regulations

There are no analogous state regulations for this source category.

HOW DOES DISTRICT RULE 4311 COMPARE TO RULES IN OTHER AIR DISTRICTS?

As previously stated, EPA analysis of Rule 4311 resulted in the 2012 determination that Rule 4311 is as stringent as requirements in other air districts in California (76 FR 68106); however, in keeping with the methodology of this plan, the District conducted a thorough examination of rules in other air districts, including the following:

- BAAQMD Regulation 12 Rule 12 (Flares at Petroleum Refineries)
- SCAQMD Rule 1118 (Control of Emissions from Refinery Flares)
- SMAQMD and VCAPCD do not have an analogous rule for this source category.

[42] EPA. (2012, January 10). 77 FR 1417. Retrieved 2/11/15 from http://www.gpo.gov/fdsys/pkg/FR-2012-01-10/pdf/2012-139.pdf.

The District also conducted an exhaustive search for rules in all other air districts, including those outside of California, to identify any that might contain more stringent requirements.

The District prepared comparisons to Santa Barbara County Air Pollution Control District (SBCAPCD) Rule 359 and North Dakota Century Code 38-08-06.4. The following tables compare major elements of Rule 4311 with those in other California air districts and the North Dakota rule.

SCAQMD

- South Coast AQMD Rule 1118 (Control of Emissions from Refinery Flares) *(Adopted Feb 13, 1998; Amended Nov 4, 2005, July 7, 2017)*

The District compared the requirements of District Rule 4311 with the requirements contained within SCAQMD's Rule 1118 and found no requirements that were more stringent than those already in Rule 4311.

	SJVAPCD Rule 4311	SCAQMD Rule 1118
Applicability	All flares	Flares used at: • Petroleum (petro.) refineries • Sulfur recovery plants • Hydrogen production plants
Exemptions	• Municipal solid waste landfill flares subject to Rule 4642 • Flares subject to 40 CFR 60 WWW or Cc • Stationary sources w/ potential to emit <10 tons VOC and <10 tons NOx per year (Not exempt from recordkeeping)	Exempt from sampling and analyses for higher heating values and sulfur concentration for flare event that: • Results from catastrophic event • Is safety hazard to sampling personnel; Sulfur dioxide emissions (emissions) from flaring events caused by: • External power curtailment beyond operator's control • Natural disasters • Acts of war or terrorism (Not exempt from flare monitoring system requirements)
Requirements	For sources greater than 10 tpy NO_x or VOC: Open flares (air-assisted, steam-assisted, or non-assisted): Comply with 40 CFR 60.18: Ground level enclosed flares without steam assist: 0.0051 lb-VOC/MMBtu, 0.0952 lb-NOx/MMBtu (<10 MMBtu/hr); 0.0027 lb-VOC/MMBtu, 0.1330 l-NOx/MMBtu (10-100 MMBtu/hr); 0.0013 lb-VOC/MMBtu, 0.5240 lb-NOx/MMBtu (> 100 MMBtu/hr).	No emission limit requirements

	SJVAPCD Rule 4311	SCAQMD Rule 1118
	Ground level enclosed flares with steam assist: 0.14 lb-VOC/MMBtu (as TOG), 0.068 lb-NOx/MMBtu (all ratings); Recordkeeping and reporting; Flare minimization plan for refinery flares or flares ≥ 5.0 MMBtu/hr at major sources of NO_x or VOC.	

BAAQMD

- Bay Area AQMD Rule 12-12 (Flares at Petroleum Refineries) *(Adopted Jul 20, 2005, amended Apr 5, 2006)*

The District compared the requirements of District Rule 4311 with the requirements contained within BAAQMD's Rule 12-12 and found no requirements that were more stringent than those already in Rule 4311.

	SJVAPCD Rule 4311	BAAQMD Regulation 12-12
Applicability	All flares	Flares used at petroleum refineries
Exemptions	• Municipal solid waste landfill flares subject to Rule 4642 • Flares subject to 40 CFR 60 WWW or Cc • Stationary sources w/ potential to emit <10 tons VOC and <10 tons NOx per year (Not exempt from recordkeeping)	Flares and thermal oxidizers used for: • Emissions from organic liquid storage vessels (subj. to R. 8-5) • Emissions from loading racks (subj. to R. 8-6, 8-33, or 8-39) • Emissions from marine vessel loading terminals (subj. to R. 8-44) Thermal oxidizers used for: • Emissions from wastewater treatment systems (subj. to R. 8-8) • Emissions from pump seals (subj. to R. 8-18) (except when emissions from pump are routed to flare header) Monitoring and reporting total hydrocarbon (HC) or methane composition doesn't apply to flare that burns flexicoker gas if weekly sampling shows methane/non-methane content of vent gas flared is <2%/<1% by volume
Requirements	For sources greater than 10 tpy NO_x or VOC: Open flares (air-assisted, steam-assisted, or non-assisted): Comply with 40 CFR 60.18: Ground level enclosed flares without steam assist: 0.0051 lb-VOC/MMBtu, 0.0952 lb-NOx/MMBtu (<10 MMBtu/hr);	No emission limit requirements

	SJVAPCD Rule 4311	BAAQMD Regulation 12-12
	0.0027 lb-VOC/MMBtu, 0.1330 l-NOx/MMBtu (10-100 MMBtu/hr); 0.0013 lb-VOC/MMBtu, 0.5240 lb-NOx/MMBtu (> 100 MMBtu/hr). Ground level enclosed flares with steam assist: 0.14 lb-VOC/MMBtu (as TOG), 0.068 lb-NOx/MMBtu (all ratings); Recordkeeping and reporting; Flare minimization plan for refinery flares or flares ≥ 5.0 MMBtu/hr at major sources of NO_x or VOC.	

SBCAPCD

- SBCAPCD Rule 359 (Flares and Thermal Oxidizers) *(Adopted Jun 28, 1994)*

SBCAPCD Rule 359 was adopted on June 28, 1994. Provisions of this rule apply to the use of flares and thermal oxidizers at oil and gas production sources, petroleum refinery and related sources, and natural gas services. Rule 359 sets specific requirements for the sulfur content in gaseous fuels, technology based standards, flare minimization plans, emergency events, and emission and operational limits.

The District compared the requirements of District Rule 4311 with the requirements contained within SBCAPCD's Rule 359 and found no requirements that were more stringent than those already in Rule 4311.

	SJVAPCD Rule 4311	SBCAPCD Rule 359
Applicability	All flares	Flares and thermal oxidizers used at: • Oil and gas production • Petro. refinery • Natural gas services and transportation • Wholesale trade in petro./petro. Products
Exemptions	• Municipal solid waste landfill flares subject to Rule 4642 • Flares subject to 40 CFR 60 WWW or Cc • Stationary sources w/ potential to emit <10 tons VOC and <10 tons NOx per year (Not exempt from recordkeeping)	Burning of sulfur, hydrogen sulfide, acid sludge, or other sulfur compounds in manufacturing of sulfur or sulfur compounds For oil and gas sources that recover sulfur as by-product of gas treating/sweetening, manufacturing exemption applies only to those specific processes (Except technology-based std.) Burning gas w/ net heating value <300 Btu/scf if

	SJVAPCD Rule 4311	SBCAPCD Rule 359
		fuel used to incinerate gas has sulfur compounds: • <15 grain/100 ft3 in Southern Zone • <50 grain/100 ft3 in Northern Zone Flare and thermal oxidizer units rated ≤1.7 MMBtu/hr., unless total cumulative rating of all such units at a source is ≥5 MMBtu/hr. (Not exempt from sulfur content std., technology std., monitoring, recordkeeping, and recording.) Flares and thermal oxidizers exempt from FMP: • Rated at <15 MMBtu/hr, unless cumulative rating >50 MMBtu/hr. Operations of only planned, continuous flaring due to non-availability of a produced gas pipeline outlet
Requirements	For sources greater than 10 tpy NO_x or VOC: Open flares (air-assisted, steam-assisted, or non-assisted): Comply with 40 CFR 60.18: Ground level enclosed flares without steam assist: 0.0051 lb-VOC/MMBtu, 0.0952 lb-NOx/MMBtu (<10 MMBtu/hr); 0.0027 lb-VOC/MMBtu, 0.1330 l-NOx/MMBtu (10-100 MMBtu/hr); 0.0013 lb-VOC/MMBtu, 0.5240 lb-NOx/MMBtu (> 100 MMBtu/hr). Ground level enclosed flares with steam assist: 0.14 lb-VOC/MMBtu (as TOG), 0.068 lb-NOx/MMBtu (all ratings); Recordkeeping and reporting; Flare minimization plan for refinery flares or flares ≥ 5.0 MMBtu/hr at major sources of NO_x or VOC.	Sulfur limits on planned flaring of 15 gr (as H_2S) in Southern Zone, 50 gr (as H_2S) in Northern Zone. FMP for flares ≥ 15 MMBtu/hr. Ground level enclosed flares without steam assist: 0.0051 lb-VOC/MMBtu, 0.0952 lb-NOx/MMBtu (<10 MMBtu/hr); 0.0027 lb-VOC/MMBtu, 0.1330 l-NOx/MMBtu (10-100 MMBtu/hr); 0.0013 lb-VOC/MMBtu, 0.5240 lb-NOx/MMBtu (> 100 MMBtu/hr). Ground level enclosed flares with steam assist: 0.14 lb-VOC/MMBtu (as TOG), 0.068 lb-NOx/MMBtu (all ratings)

Rule 359 Section D.3 requires a FMP be submitted by any source subject to this rule that operates a flare rated at 15 MMBtu/hour or greater. For planned flaring, the FMP for all sources subject to this rule shall list a targeted maximum monthly flared gas volume, which shall not exceed 5% of the average monthly gas handled/produced/treated at the source unless the operator demonstrates such a maximum volume to be infeasible based on safety, engineering or cost constraints and proposes a different percentage. Any flaring that causes an exceedance of the emission limits or standards of Rule 359 is also not considered to be in violation if the operator demonstrates that the exceedance resulted from an emergency event.

Additionally, under SBCAPCD Rule 359, flares for which flaring operations solely consist of planned, continuous flaring due to the non-availability of a produced gas pipeline are exempt from FMP requirements.

Although FMPs in SBCAPCD Rule 359 are required to list a targeted maximum monthly flared gas volume of five percent (5%) of the average monthly gas handled/produced/treated, the operator can obtain approval of a higher percentage by demonstrating that the maximum flare volume limit is infeasible based on safety, engineering, or cost constraints, which leaves the rule open to allow a higher amount of flaring. The District evaluated the percentage of gas flared in the Valley and found that the average percentage of gas flared between 2009 and 2013 was well below SBCAPCD's 5% theoretical level at 3.8% as shown in the table below.

Table C-1 Percent of Gas Flared at Valley Facilities

Year Of Data	Gas Produced (MCF)	5% Flared (if meeting SBCAPCD target) (Mscf)	Actual Flared (Mscf)	Percent of gas flared
2009	223,220,118	11,161,006	7,134,977	3.2
2010	241,676,822	12,083,841	7,884,879	3.3
2011	240,000,594	12,000,030	8,324,237	3.5
2012	216,232,509	10,811,625	10,147,080	4.7
2013	238,058,188	11,902,909	10,581,415	4.4
			Total Average Percent of Gas Flared in Valley	**3.8%**

In addition, unlike SBCAPCD rule 359, Rule 4311 does not allow an exceedance of any emissions limits or the requirement to minimize flaring activity, regardless of the cause. Allowing such a measure in the Valley would result in a serious relaxation of rule requirements and a potential increase in emissions. Under the District's rule, any exceedance or excess flaring not allowed under Rule 4311, regardless of the cause, would result in a violation and be subject to enforcement action. Flares subject to SBCAPCD Rule 359 whose flaring operations solely consist of planned, continuous flaring due to the non-availability of a produced gas pipeline outlet are also exempt from FMP requirements while such flares subject to Rule 4311 are not exempt from FMP requirements and are still required to identify and implement actions that reduce flaring.

Based on the discussion above, District Rule 4311 is clearly more stringent than SBCAPCD Rule 359 for the following reasons:

- Rule 4311 applies to a broader range of sources than SBCAPCD Rule 359
- SBCAPCD Rule 359 includes a performance standard for the volume of gas flared (5%), but also includes APCO discretion for allowing unlimited flaring activity
- SBCAPCD Rule 359 contains several exemptions not allowed in Rule 4311, including the allowance for exceedance of emission limits
- EPA analysis resulted in the 2012 determination that Rule 4311 is as stringent as requirements in SBCAPCD Rule 359 in terms of core RACT requirements
- Overall, Rule 4311 results in significantly less flared gas relative to flaring capacity in the District as compared the allowable levels of flaring under SBCAPCD

State of North Dakota

- Century Code 38-08-06.4[43]
- Industrial Commission Order[44]

North Dakota Century Code 38-08-06.4 applies to flaring of gas produced with crude oil from an oil well. The North Dakota rule allows for the uncontrolled flaring of all gases during the first year after opening a new crude oil production well, after which flaring of the entire volume of gas must cease and the well must be:

- Capped;
- Connected to a gas gathering line;
- Equipped with an electrical generator that consumes at least seventy-five percent (75%) of the gas from the well;
- Equipped with a system that intakes at least seventy-five percent (75%) of the gas and natural gas liquids volume from the well for beneficial consumption by means of compression to liquid for use as fuel, transport to a processing facility, production of petrochemicals or fertilizer, conversion to liquid fuels, separating and collecting over fifty percent (50%) of the propane and heavier hydrocarbons; ***or***
- Equipped with other value-added processes as approved by the industrial commission, which reduce the volume or intensity of the flare by more than sixty percent (60%).

The intent of this rule is to minimize the "waste" of a natural resource, and to assure that mineral rights owners were compensated for the oil and gas produced from their properties. This rule had a collateral benefit of reducing emissions from flaring activities.

Due to large amount flaring that has historically occurred in North Dakota, the North Dakota Industrial Commission acted on a motion of the commission to consider amending the current oil production rule to reduce the amount of flared gas by issuing an order in July 2014 to increase gas capture from oil wells. The order requires 74% of gas capture (instead of flaring) by October 2014, 77% by January 2015, 85% by 2016, and

[43] North Dakota Legislative Branch. (2013, August). *Century Code 38-08-06.4 Flaring of Gas Restricted – Imposition of Tax – Payment of Royalties – Industrial Commission Authority. Retrieved February 13, 2015 from* http://www.legis.nd.gov/cencode/t38c08.pdf?20150213153521.

[44] North Dakota Industrial Commission. (2014, July 1). *Order of the Commission*. Obtained February 3, 2015 from https://www.dmr.nd.gov/oilgas/or24665.pdf.

90% by 2020. By contrast, in the Valley, the quantity of gas captured is over 96%, i.e. only approximately 3.8% of gas produced is flared (see table above).

Due to the mature nature of oil production operations in the Valley, many of the sources subject to Rule 4311 design and operate their equipment and processes in a manner that inherently results in minimal flaring activity. Flare gas is typically flared further along in the process, rather than directly from production wells, resulting in less flaring activity. In contrast, sources in North Dakota flare large portions of the gas generated at oil production wells. This is oil production method is often seen in regions with little to no history of emission regulations and/or no pipeline infrastructure to transport produced gasses.

The District has two rules specific to the operation of crude oil wells. Rule 4401 (Steam-Enhanced Crude Oil Production Wells) and Rule 4409 (Components at Light Crude Oil Production Facilities, Natural gas Production Facilities, and Natural Gas Processing Plants). These rules contain control requirements including a minimum 95% capture and control, periodic leak detection, and repair requirements for steam enhanced wells and light oil wells. These rules also require the development of an Operator Management Plan (OMP) that describes how a facility will comply. The OMP must be updated annually to reflect any changes to the OMP, including changes to address newly installed wells. These prohibitory rules are applicable to both existing and new wells.

As discussed above, Rule 4311, and the common practices of the mature local oil production operations to recover the vast majority of produced gas, are more stringent than the North Dakota rule.

ADDITIONAL EMISSION REDUCTION OPPORTUNITIES

Ultra-Low NOx Flares

While the modernization of flare technology will not reduce the frequency or volume of flaring activities, it can reduce the emissions from such activities, thereby accomplishing the same end goal.

The District has identified a new class of VOC destruction devices that are similar to enclosed flares but operate with mixing controls and are being put into practice as control devices. These devices offer ultra-low NOx emissions of approximately 0.018–0.025 lb-NOx/MMBtu (compared to existing District Rule 4311 requirement of 0.068 lb-NOx/MMBtu). These devices may not be considered flares by the Rule 4311 definition, but are an alternative method for VOC control. One Permit to Operate and at least eight Authority to Construct permits have been issued to facilities in the Valley for these new devices.

These devices appear more suitable for use at sites with more steady gas disposal needs. These new devices may not be a viable replacement for some emergency flares, particularly those with high intermittent gas volume capacity requirements.

Cost-effectiveness varies depending on usage rates. For example, based on cost information from E&B Natural Resources, the cost for a 3.4 MMBtu/hr flare is estimated at $800,000 (capital and installation) with $1,000 monthly ongoing operational costs. Assuming an average $1.2 million initial cost estimate to account for larger flares, the annualized cost-effectiveness ranges from $23,000 per ton of NOx reduced to as high as $1,000,000 per ton of NOx reduced, depending on flare usage.

Flare Minimization Practices

District staff conducted a detailed review of all approved FMPs to identify the variety of flare minimization practices used by affected facilities. In addition, District staff also worked closely with affected facilities to gain more in-depth understanding of the minimization practices. The District found a variety of flare minimization practices specific to each facility that could potentially be employed at other facilities to further reduce flaring at their operations. These practices may not only serve to reduce flaring activities and associated emissions but may also provide economic, safety, and other benefits to affected facilities. Because of the unique nature of each facility, the technological achievability and economic feasibility of transferring these minimization practices or technologies from one facility to another needs to be considered.

Even though operators of flares in the Valley have already taken extensive measures to reduce flaring, the District is currently undergoing a robust public process to amend Rule 4311 to evaluate and require the use of these practices where technologically achievable and economically feasible.

Alternatives to Flaring

The following alternative uses for flare gas were identified in submitted FMPs.

- **Use gas as a fuel for equipment rather than flaring.** Capturing gas and routing it into a fuel gas system to power various processes is a means of utilizing gas that would otherwise be flared. There is a financial incentive to utilize this practice to the greatest extent feasible across all facility types as the gas can be used to supplement, or in some cases even completely supply, the process energy needed, (i.e. IC engines) to produce electricity, and boilers for steam generation and process heating.

  While many oil production operations in the Valley do use produced gas in their steam generation operations, there are several barriers to implementing this practice in all situations where gas is currently flared. Some facilities do not have a use for combustion equipment on-site. For those that do have a use for the combustion equipment, it may not be economically feasible to purchase, install and operate such equipment, the multiple stages of treatment equipment to make the gas suitable for use at the facility, and the infrastructure required to connect process streams and utilities to the fuel gas system. Additionally, the installation of extra equipment to handle the waste gas can potentially add more complexity to the maintenance and testing, and can increase the number of potential points of failure.

- **Injection of oil field gas into DOGGR-approved disposal wells**. Reinjection of gas into subsurface geologic formations disposal wells is a potential alternative to flaring. These wells are regulated by the California Department of Conservation, Division of Oil, Gas and Geothermal Resources (DOGGR). However, the permits for these wells can be extremely difficult to obtain from the state, and require significant capital investment to complete the various studies and installation of infrastructure in California. Additionally, the permits place a limit on volume reinjected that if exceeded requires the facility to dispose of gas by other means.

- **Send oil field gas to a sales gas line**. Gas that is of high enough quality (i.e. high energy content, low sulfur or nitrogen content) can be sold through a sales gas line. While many oil production operations in the Valley do sell their produced gas, there can be many barriers associated with implementing this alternative including proximity to an existing gas line, quantity and quality of gas generated, and the economics of purchasing, installing, and maintaining a new sales gas line and all the associated treatment and transmission equipment and infrastructure.

Preventative Maintenance

A proactive and preventative maintenance program can greatly reduce flaring by minimizing downtime from equipment failure which can lead to flaring of produced gas. The following preventative maintenance practices were identified in submitted FMPs to minimize flaring.

- **Implement a preventative maintenance program to predict failure in pipelines and stationary equipment (measure corrosion)**. The gas going through pipelines and stationary equipment can be very corrosive. A predictive method such as using x-rays to measure pipe thickness is used to determine when to replace the equipment. This testing is performed on a periodic basis as dictated by the equipment type and the service it is in.

- **Install high-pressure alarms on process vessels**. Installation of alarms on process vessels can indicate a high pressure build-up (before pressure relief valves opens and directs gasses to flares) so that operators can intervene before flaring occurs.

- **Inspect pressure relief valves routinely to ensure proper operation**. If a pressure relief valve improperly seats or is otherwise defective, gases will leak and be combusted in the flare. In an attempt to reduce such occurrences, the pressure relief valves can be inspected periodically.

- **Maintain and calibrate flare gas control valves on a routine schedule**. Flare gas lines are typically equipped with control valves to regulate the volume of gas going to flares. Should these valves malfunction, it is possible that excessive gas would be directed to the flare. These valves could be calibrated on a routine schedule.

- **Retain spare parts onsite to minimize system downtime**. Quick and easy access to spare parts reduces equipment downtime and associated flaring. While the economic feasibility of purchasing and maintaining backup equipment will need to be considered on a case-by-case basis for each facility, some facilities maintained the following types of equipment onsite to minimize flaring:

    - **Compressors**. Compressors are ubiquitous in the gas and petroleum industry and play a critical role in many different stages of oil and gas production, processing/refining, and transmission.

    - **Sulfur scrubber components/media**. If the sulfur scrubber system is down, the fuel cannot be processed for onsite use and must be flared instead.

    - **Spare parts for primary combustion equipment (blowers, etc.)**. If the primary combustion equipment is down, the fuel cannot be utilized onsite and must be flared instead.

Procedures to Reduce Flaring During Maintenance and Shutdowns

Another effective flare minimization measure is to optimize and coordinate maintenance activities so that equipment failure and downtime is minimized to the extent feasible. A proactive and preventative maintenance program can greatly reduce downtime and thereby minimize flaring. However, during maintenance and shutdown events, operators can take additional measures to avoid or reduce flaring. The following procedures were identified in submitted FMPs.

- **Perform maintenance on one area without impacting other operations on site.** Designing a facility in a manner that allows maintenance to be performed in one area of a facility without affecting other operations can reduce flaring. This allows the other operations to continue normally without the need to flare excess gas.

- **Curtail oil/gas production during planned shutdown of sales line**. In the event of a planned shutdown of a sales gas pipeline, and/or major maintenance activities, oil/gas production can be curtailed. This could potentially result in lost revenue.

- **Close oil well casing vents during vapor control system maintenance**. Casing gas remains in reservoir instead of being flared, but this can potentially result in reduced oil production rate until vents are opened.

- **Store gas in bladder tank.** For waste water treatment plants, limited amounts of digester gas can be stored in bladder tanks during maintenance, testing, or process upsets and later be routed to combustion devices for beneficial use on-site.

- **Plan maintenance activities during optimal periods.** Scheduling maintenance during periods of minimum capacity needs and/or following planned process unit shutdowns has the potential of minimizing flaring activities.

- **Optimize planned shutdowns for major maintenance.** Most inspection, repair, and minor maintenance work can be performed while a facility is in operation. However, there are times when a facility has to shut down and flare process gas to conduct major maintenance work. The management of a facility shutdown is known as a "turnaround". Scheduled facility shutdowns are expensive and labor intensive due to the loss of production and the expense of the turnaround itself. While turnaround procedures are primarily focused on minimizing downtime, the following specific procedures were identified in submitted FMPs to minimize flaring during plant turnaround.
    - Have extra personnel on site to re-start the plant as quickly as possible
    - Recycle discharge gas back to compressor inlets until minimum operating pressure is obtained
    - Prior to turnaround, identify critical equipment to be serviced to avoid refinery downtime and associated flaring
    - Phase equipment and process unit shutdowns to minimize fuel gas imbalances that may result in additional flaring
    - Identify alternate disposition of process gases to minimize flaring;
    - Identify key process unit operations such as fuel gas systems and sulfur recovery operations that must remain in operation to minimize flaring of sulfur-containing gases

Phase equipment and process unit start-ups to minimize start-up duration and the flaring associated with these transitional operations

Redundant Systems

Even with the most rigorous and proactive maintenance programs in place, there is always the potential for critical equipment failure. Installing redundant systems minimizes the potential of downtime by allowing operators to quickly switch from one system to another in the event of equipment failure or during maintenance. The following redundant systems were identified in FMPs to minimize flaring.

- **Redundant compressors.** Compressors can fail, and as a result the gas may need to be flared. Installation of a redundant secondary compressor can minimize flaring when the primary compressor is down.

- **Redundant gas treatment systems (sulfur scrubber).** This allows gas to continue to be treated and burned in combustion equipment when one unit is not available.

- **Redundant digester gas-fired turbines.** Some wastewater treatment plants have incorporated redundant digester-gas-fired turbines into their system design. The redundant system allows the turbines to be maintained without the need to flare. This has potential to reduce a considerable amount of flaring, as the turbines for these types of operations typically require frequent maintenance. In addition, a redundant system reduces downtime and extends the life of the turbines.

Procedures to Prevent or Mitigate the Effects of Power Outages to Reduce Flaring
A power outage has the potential to result in flaring as vapors are sent to flares to protect the facility from being over-pressurized. The following specific procedures were identified in submitted FMPs to mitigate the effects of power outages and reduce flaring.

- **Backup generators.** Install emergency IC engine/generators to power equipment during power outages.

- **Power outage alarm.** Send alarms to all operators when power outage occurs to ensure rapid response.

- **Infrared testing.** Implement infrared testing of electrical equipment on a routine basis to identify hot-spots that could result in a power outage.

- **Avian guards.** Install avian guarding in substations to deter birds from contacting energized equipment.

EVALUATION FINDINGS

Even though flares are not a significant source of PM2.5 and NOx in the Valley, the District has evaluated all potential control technologies and all control technologies achieved in practice in other areas or included in other state implementation plans. As demonstrated above, Rule 4311 currently has in place the most stringent measures feasible to implement in the Valley.

While the District meets or exceeds RACM, BACM, and MSM requirements for this source category, given the enormity of reductions needed to demonstrate attainment with the latest PM2.5 standards, the District will pursue the following potential opportunities that are projected to provide 0.05 tons NOx per day of additional emissions reductions towards the District's aggregate plan commitment. The District will continue to work closely with affected operators and other stakeholders to undergo a regulatory amendment process for Rule 4311 to include:

- Additional ultra-low NOx flare emission limitations for existing and new flaring activities at Valley facilities to the extent that such controls are technologically achievable and economically feasible,
- Additional flare minimization requirements to the extent that such controls are technologically achievable and economically feasible
- Expand the applicability of the rule by removing the exemption for non-major sources

C.12 RULE 4313 (LIME KILNS)

DISCUSSION

Lime kilns can be used in a variety of manufacturing and processing operations, including food and agriculture. In 2003, 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. There are currently no lime kilns operating in the Valley.

EMISSIONS INVENTORY

There is no emissions inventory associated with lime kilns because there are no lime kilns operating in the Valley. District staff have verified that there are no lime kilns in the preliminary permitting process to become operational in the Valley, nor are any lime kilns expected to be operated in the Valley in the future.

HOW DOES DISTRICT RULE 4313 COMPARE WITH FEDERAL AND STATE RULES AND REGULATIONS?

Federal Regulations

There are no EPA CTG or ACT requirements for this source category.

NSPS

- 40 CFR 60 Subpart HH (Standards of Performance for Lime Manufacturing Plants)

The District evaluated the requirements contained within 40 CFR 60 Subpart HH and found no requirements that were more stringent than those already in Rule 4313.

NESHAP/ MACT

- 40 CFR 63 Subpart AAAAA (National Emission Standards for Hazardous Air Pollutants for Lime Manufacturing Plants)

The District evaluated the requirements contained within 40 CFR 63 Subpart AAAAA and found no requirements that were more stringent than those already in Rule 4313.

State Regulations

There are no state regulations applicable to this source category.

HOW DOES DISTRICT RULE 4313 COMPARE TO RULES IN OTHER AIR DISTRICTS?

There are no lime kiln rules in SCAQMD, BAAQMD, SMAQMD, and VCAPCD.

EVALUATION FINDINGS

The District has evaluated all potential control technologies and all control technologies achieved in practice in other areas or included in other state implementation plans for this source category. As demonstrated above, Rule 4313 currently has in place the most stringent measures feasible to implement in the Valley, and therefore meets or exceeds RACM, BACM, and MSM requirements for this source category.

C.13 Rule 4352 (Solid Fuel-Fired Boilers, Steam Generators, and Process Heaters)

Discussion

The purpose of Rule 4352 is to limit NOx and CO emissions from any boiler, steam generator or process heater fired on solid fuel. The adoption of Rule 4352 on September 14, 1994, established NOx 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 most recent amendments, in December 2011, strengthened the rule by lowering NOx 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 new emission limits. EPA finalized approval of Rule 4352 on November 6, 2012.

Emissions Inventory

POLLUTANT	2013	2017	2019	2020	2022	2023	2024	2025	2026	2028
	Annual Average - Tons per day									
PM2.5	0.65	0.79	0.84	0.87	0.89	0.91	0.93	0.95	0.97	0.99
NOX	2.77	3.21	3.36	3.47	3.54	3.58	3.65	3.73	3.79	3.87
	Winter Average - Tons per day									
PM2.5	0.64	0.77	0.83	0.86	0.88	0.90	0.92	0.92	0.94	0.96	0.98
NOX	2.49	2.91	3.07	3.18	3.24	3.28	3.28	3.35	3.43	3.49	3.57

Source Category

Boilers, steam generators, and process heaters are used in a broad range of industrial, commercial, and institutional settings. Units subject to this rule fire on a variety of solid fuels: coal, petroleum coke, biomass, tire-derived fuel, and municipal solid waste (MSW). The two primary methods of controlling NOx emissions from boilers, steam generators, and process heaters are either to change the combustion parameters to reduce NOx formation (i.e., combustion modification, lower combustion temperature, etc) or to treat the NOx formed in the process before the NOx is emitted into the atmosphere (i.e., post-combustion control or flue gas treatment). While previous rule-amending projects for Rule 4352 have not quantified specific emissions reductions, the use of biomass facilities in the Valley has fostered emissions reductions.

Permitted Sources - Biomass

Twelve biomass-fired units are currently permitted within the District; however, only five biomass-fired units are currently operating. All five operating units are used to generate electricity for electric utilities. The remaining seven units have been shut down and are dormant.

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.

Permitted Sources – Municipal Solid Waste

Two of the solid fuel-fired units permitted with in the District are fired on municipal solid waste. The municipal solid waste fired units are located at a single facility that generates electricity for electric utilities.

Permitted Sources – Other

One solid fuel-fired unit permitted with in the District may be fired on coal and petcoke. This particular unit is also permitted to be fired on biomass has been exclusively fired on biomass since 2013.

HOW DOES DISTRICT RULE 4352 COMPARE WITH FEDERAL AND STATE RULES AND REGULATIONS?

Federal Regulations
There are no EPA CTG or MACT requirements for this source category.

The District evaluated the requirements contained within the Alternative Control Techniques (ACT) for NOx Emissions from Industrial/Commercial/Institutional Boilers and the ACT for NOx Emissions from Utility Boilers and found no requirements that were more stringent than those already in Rule 4352.

The District evaluated the requirements contained within the NSPS in 40 CFR 60 Subpart Cb (Large Municipal Waste Combustors), Subpart D (Fossil-Fuel-Fired Steam Generators), and Subpart Db (Industrial-Commercial-Institutional Steam Generating Units) and found no requirements that were more stringent than those already in Rule 4352.

The NESHAP in 40 CFR 63 Subpart DDDDD (Industrial, Commercial, and Institutional Boilers and Process Heaters) was amended on January 31, 2013 to include new emission limits for PM, CO, and total selective metals (TSM), replace numeric dioxin emission limits with work practice standards, add new subcategories of facilities, and add alternative monitoring approaches. The District evaluated the requirements contained within this NESHAP and found no requirements that were more stringent than those already in Rule 4352 and required by District permits.

State Regulations
There are no California state regulations applicable to this source category.

HOW DOES DISTRICT RULE 4352 COMPARE TO RULES IN OTHER AIR DISTRICTS?

There are no analogous rules for this source category in Ventura County APCD.

SCAQMD

- South Coast AQMD Rule 1146 (Emissions of Oxides of Nitrogen from Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters) *(Amended November 1, 2013)*

The District evaluated the requirements contained within SCAQMD Rule 1146 and the 40 ppmv @ 3% O_2 limit for non-gaseous fuels is potentially more stringent than those already in District Rule 4352. However, all of the remaining solid-fuel fired boilers operating within the Valley are used by electric utilities to generate electricity, a category which South Coast AQMD specifically exempts from the requirements of Rule 1146. Furthermore, it was determined that there are no biomass-fired power plants in South Coast District and there are two municipal solid waste-fired power plants generating electricity for electric utilities that are therefore not subject to 40 ppm requirement and do not meet an emissions limit more stringent than those required by this rule. In conclusion, no sources in SCAQMD are currently complying with the 40 ppmv limit of SCAQMD Rule 1146.[45] In summary, the District found no requirements that were more stringent than those already required by the District.

	SJVAPCD Rule 4352	SCAQMD Rule 1146
Applicability	NOx emission limit is applicable to any boiler, steam generator or process heater fired on solid fuel	Boilers, steam generators, and process heaters ≥ 5 MMBtu/hr rated heat input capacity used in all industrial, institutional, and commercial operations
Exemption	NOx emission limits do not apply to units operated at a Stationary Source that has a potential to emit < 10 tpy of NOx	Units rated heat ≤ 5 MMBtu/hr. Boilers used by electric utilities to generate electricity. NOx emissions from RECLAIM facilities
Requirements Emission Limits	Municipal Solid Waste ≤ 165 ppmv NOx corrected to 12% CO_2 Biomass ≤ 90 ppmv NOx corrected to 3% O_2 All others ≤ 65 ppmv NOx corrected to 3% O_2	Non-gaseous < 40 ppmv NOx corrected to 3% O_2

BAAQMD

- BAAQMD Regulation 9 Rule 7 (Nitrogen Oxides and Carbon Monoxide from Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters) *(Amended May 4, 2011)*

[45] Approval and Disapproval of California Air Plan; San Joaquin Valley Serious Are Plan and Attainment Date Extension for the 1997 PM2.5 NAAQS. Final Rule. 81 Fed. Reg. 26, pp. 6936-6986. (2016, February 9) (to be codified at 40 CFR Parts 52 and 81) https://www.gpo.gov/fdsys/pkg/FR-2016-02-09/pdf/2016-02325.pdf and http://www.calbiomass.org/facilities-map/

The District evaluated the requirements contained within BAAQMD Regulation 9 Rule 7 and the 40 ppmv @ 3% O_2 limit for non-gaseous fuels is potentially more stringent than those already in District Rule 4352. However, all of the solid-fuel fired boilers operating within the Valley are used by electric utilities to generate electricity or are qualifying small power producing facilities, a category which BAAQMD exempts from the requirements of Regulation 9, Rule 7. Therefore, the District found no requirements that were more stringent than those already required by District Rule 4352 for the categories of solid-fuel fired units located in the Valley.

	SJVAPCD Rule 4352	BAAQMD Regulation 9 Rule 7
Applicability	NOx emission limit is applicable to any boiler, steam generator or process heater fired on solid fuel	Boilers, steam generators, and process heaters with a rated heat input ≥ 1 MMBtu/hr used in all industrial, institutional, and commercial operations
Exemption	Stationary Source that has a potential to emit < 10 tpy of NOx	Boilers used by public electric utilities or qualifying small power production facilities, as defined in Section 228.5 of the PUC code, to generate electricity
Requirements Emission Limits	Municipal Solid Waste ≤ 165 ppmv NOx corrected to 12% CO_2 Biomass ≤ 90 ppmv NOx corrected to 3% O_2 All others ≤ 65 ppmv NOx corrected to 3% O_2	Non-gaseous fuel: ≤ 40 ppmv NOx corrected to 3% O_2

BAAQMD

- Bay Area AQMD Regulation 9 Rule 11 (Nitrogen Oxides and Carbon Monoxide from Utility Electric Power Generating Boilers) *(Adopted May 17, 2000)*

The District evaluated the requirements contained within BAAQMD Regulation 9, Rule 11 and found that the NOx limitations in Regulation 9 Rule 11 are more stringent than those already in District Rule 4352. However, there are no biomass facilities and no municipal solid-waste fired power plants in BAAQMD. Therefore no solid-fuel fired units in BAAQMD are currently complying with the BAAQMD Rule 411 limits for non-gaseous fuel.[46]

	SJVAPCD Rule 4352	BAAQMD Regulation 9 Rule 11
Applicability	NOx emission limit is applicable to any boiler, steam generator or process heater fired on solid fuel	NOx emission limit is applicable to any electric power generating steam boiler with rated heat input capacity ≥ 1.5 BBtu/hr

[46] Approval and Disapproval of California Air Plan; San Joaquin Valley Serious Are Plan and Attainment Date Extension for the 1997 PM2.5 NAAQS. Final Rule. 81 Fed. Reg. 26, pp. 6936-6986. (2016, February 9) (to be codified at 40 CFR Parts 52 and 81) https://www.gpo.gov/fdsys/pkg/FR-2016-02-09/pdf/2016-02325.pdf and http://www.calbiomass.org/facilities-map/

	SJVAPCD Rule 4352	BAAQMD Regulation 9 Rule 11
Exemption	Stationary Source that has a potential to emit < 10 tpy of NOx Duration of startup and shutdown period may not exceed 12 hours	Boilers with a rated heat input capacity < 0.250 MMBtu/hr Boilers ≥ 5 BBtu/hr during startup period may not exceed 20 hours unless catalytic reaction temperature has not been reached, if applicable Boilers with rated heat input capacity of < 5 BBtu/hr during startup period may not exceed 12 hours unless catalytic reaction temperature has not been reached, if applicable Duration of shutdown period may not exceed 8 hours
Requirements NOx Emission Limits	Municipal Solid Waste ≤ 165 ppmv NOx corrected to 12% CO_2 Biomass ≤ 90 ppmv NOx corrected to 3% O_2 All others ≤ 65 ppmv NOx corrected to 3% O_2	Non-Gaseous Fuel (Boilers with rated heat input capacity ≥ 1.75 MMBtu/hr) ≤ 25 ppmv NOx corrected to 3% O_2, and Boilers shall not be fired on non-gaseous fuel from May 1 to October 31 unless gaseous fuel is not available because of a force majeure natural gas curtailment

SMAQMD

- Sacramento Metropolitan AQMD Rule 411 (NOx from Boilers, Process Heaters, and Steam Generators) (Amended August 23, 2007)

For biomass units, the District Rule 4352 NOx limit is more stringent than SMAQMD Rule 411. While SMAQMD Rule 411 includes a 40 ppm NOx @ 3% O_2 limit for non-gaseous fired units that may be more stringent than the District's Rule 4352 limits for non-biomass fired units, the non-biomass fired units in the District are used by electric utilities to generate electricity, which is a category that is exempt from SMAQMD Rule 411 requirements. Therefore, the District found no requirements that were more stringent than those already required by District Rule 4352 for the categories of solid-fuel fired units located in the Valley.

	SJVAPCD Rule 4352	SMAQMD Rule 411
Applicability	NOx emission limit is applicable to any boiler, steam generator or process heater fired on solid fuel	Boilers, steam generators, and process heaters ≥ 1 MMBtu/hr rated heat input capacity
Exemption	Stationary Source that has a potential to emit < 10 tpy of NOx	Unit used by electric utility to generate electricity and waste heat recovery
Requirements	Municipal Solid Waste	Non-gaseous:

	SJVAPCD Rule 4352	SMAQMD Rule 411
Emission Limits	≤ 165 ppmv NOx corrected to 12% CO_2 Biomass ≤ 90 ppmv NOx corrected to 3% O_2 All others ≤ 65 ppmv NOx corrected to 3% O_2	≤ 40 ppmv NOx corrected to 3% O_2 Biomass ≤ 70 ppmv corrected to 12% CO_2 (Equivalent to 99 ppmv corrected to 3% O_2)

Yolo Solano AQMD

- YSAQMD Rule 2-43 (Biomass Boilers) (Amended November 10, 2010)

The District evaluated the requirements contained within YSAQMD Rule 2-43 and found no requirements to be more stringent than those already in District Rule 4352.

	SJVAPCD Rule 4352	YSAQMD Rule 2-43
Applicability	NOx emission limit is applicable to any boiler, steam generator or process heater fired on solid fuel	Boilers and steam generators with rated heat input of ≥ 5 MMBtu/hr used with biomass fuel
Exemption	Stationary Source that has a potential to emit < 10 tpy of NOx	Combustion units primarily used to burn municipal solid waste.
Requirements Emission Limits, corrected at 3% O_2	Municipal Solid Waste ≤ 165 ppmv NOx corrected to 12% CO_2 Biomass ≤ 90 ppmv NOx corrected to 3% O_2 All others ≤ 65 ppmv NOx corrected to 3% O_2	Biomass ≤ 90 ppmv corrected to 3% O_2

Eldorado County APCD

- ECAPCD Rule 232 (Biomass Boilers) (Amended September 25, 2001)

The District evaluated the requirements contained within EDCAPCD Rule 232 and found no requirements to be more stringent than those already in District Rule 4352.

	SJVAPCD Rule 4352	EDCAPCD Rule 232
Applicability	NOx emission limit is applicable to any boiler, steam generator or process heater fired on solid fuel	Boilers and steam generators with rated heat input of ≥ 5 MMBtu/hr that have a primary energy source of biomass that consist of a minimum of 75% of the total annual heat input
Exemption	Stationary Source that has a potential to emit < 10 tpy of NOx	Combustion units primarily used to burn municipal solid waste.
Requirements	Municipal Solid Waste	Biomass

	SJVAPCD Rule 4352	EDCAPCD Rule 232
	≤ 165 ppmv NOx corrected to 12% CO_2 Biomass ≤ 90 ppmv NOx corrected to 3% O_2 All others ≤ 65 ppmv NOx corrected to 3% O_2	≤ 115 ppmv NOx corrected to 12% CO_2 (equivalent to 163 ppmv NOx corrected to 3% O_2)

Placer County APCD

- PCAPCD Rule 233 (Biomass Boilers) (Amended June 14, 2012)

The District evaluated the requirements contained within PCAPCD Rule 233 and found no requirements to be more stringent than those already in District Rule 4352.

	SJVAPCD Rule 4352	PCAPCD Rule 233
Applicability	NOx emission limit is applicable to any boiler, steam generator or process heater fired on solid fuel	Stoker and circulating fluidized bed boilers and steam generators with rated heat input of < 500 MMBtu/hr a potential to emit 25 tons of NOx emissions in which have a primary energy source of biomass consisting of a minimum of 75% of the total annual heat input
Exemption	Stationary Source that has a potential to emit < 10 tpy of NOx	Combustion units primarily used to burn municipal solid waste.
Requirements	Municipal Solid Waste ≤ 165 ppmv NOx corrected to 12% CO_2 Biomass ≤ 90 ppmv NOx corrected to 3% O_2 All others ≤ 65 ppmv NOx corrected to 3% O_2	Biomass Units less than 500 MMBtu/hr ≤ 68 ppmv NOx corrected to 12% CO_2 (equivalent to 96 ppmv NOx corrected to 3% O_2) Biomass Units greater than 500 MMBtu/hr ≤ 115 ppmv NOx corrected to 12% CO_2 (Equivalent to 163 ppm NOx corrected to 3% O_2)

ADDITIONAL EMISSION REDUCTION OPPORTUNITIES

Municipal Solid Waste

Current Status of Municipal Solid Waste Facilities in the Valley

One facility in the Valley operates two Municipal Solid Waste-fired units in the Valley. Each unit is equipped with a baghouse for PM10 control, a dry lime scrubber for SOx control, and a selective non-catalytic reduction system for NOx control.

Potential NOx Control Technologies

MSW facilities nationwide are generally equipped with Selective Non-Catalytic Reduction (SNCR) and utilize this technology to meet emission limits ranging between 165 ppmv corrected to 12% CO_2 to 210 ppmv corrected to 12% CO_2. The District identified the following NOx control technologies that can achieve lower emission rates.

Selective Catalytic Reduction (SCR) is an add-on control system that may be used to reduce NOx emissions from MSW-fired units. SCR systems reduce NOx emissions by converting the emissions to water and elemental nitrogen in the presence of a catalyst. While no SCR retrofits of MSW-fired units were identified in the U.S., several European MSW-fired plants have been retrofitted with selective catalytic reduction systems. For example, Acegas in Padova, Italy retrofitted two municipal solid waste units with a selective catalytic reduction system, achieving a permitted NOx limit of 50 ppmv corrected to 7% O_2 (equivalent to 47 ppmv NOx @ 12% CO_2). While sometimes possible, retrofits of MSW-fired units with selective catalytic reduction systems can be infeasible since the retrofit often requires major changes to existing building structures, results in lost revenue due to extensive down-time of the MSW unit, and requires new natural gas pipelines be installed to provide supplemental fuel for required auxiliary burners.

In addition to conventional SCR, Gore & Associates Inc. manufactures DeNOx filter bags that include a catalytic insert for the reduction of NOx emissions from MSW plants. Installation of the Gore De-NOx filter bags simply requires removing the filter bags in the existing baghouse serving the MSW unit and replacing them with Gore De-NOx filter bags that include the catalytic insert. The catalytic insert reduces NOx emissions in the same manner that an SCR catalyst reduces NOx emissions. According to the manufacturer, nine units in Europe have been retrofitted with Gore De-NOx systems and the typical guaranteed NOx emission level for units with this system is 60 ppmv corrected to 7% O_2 (equivalent to 57 ppmv NOx corrected to 12% CO_2). Unlike installations of conventional SCR, Gore De-NOx retrofits do not require extensive building modifications and do not result in significant downtime of the MSW unit. However, the Gore De-NOx system does have several limitations. First, the system requires the baghouse inlet temperature be maintained within a tight operating range of 180 °C to 230 °C. In some instances, facilities can control their temperature to be within this range by adjusting the dilution water flow to the dry lime scrubbers. Secondly, the

catalytic filters are only guaranteed by the manufacturer for three years and must be replaced periodically. Finally and most importantly, SOx emissions at the baghouse inlet cannot exceed 10 ppmv corrected to 7% O_2; otherwise ammonia sulfate and ammonium disulfate can form and poison the catalytic filter inserts. In practice, maintaining such low SOx levels requires the operator to vigilantly inspect and remove construction debris from the municipal solid waste fuel. Specifically, gypsum-containing drywall is known to cause spikes in SOx emissions when combusted in MSW plants.

Additional control technologies for MSW plants were identified. In partnership with Martin GMBH of Germany, Covanta Inc. has developed two proprietary NOx control systems for reducing NOx emissions from MSW-fired units. The first technology, known as VLN™, uses a unique combustion system design which, in addition to conventional primary and secondary air systems, features a new internal stream of "VLN™-gas" which is drawn from the combustor and re-injected into the furnace. The gas flow distribution between the primary air, secondary air, and VLN™ gas is controlled to yield the optimal flue gas composition and furnace temperature profile to minimize NOx formation and optimize combustion. In conjunction with an optimized SNCR system, VLN™ technology reduces NOx to levels below 60 ppm @ 7% O_2 (equivalent to 57 ppm NOx @ 12% CO_2). However, this system is only available for new units and is not technologically feasible as a retrofit technology.

Covanta Inc. has also developed a simplified version of the VLN™ technology, known as LN™. This technology was specifically designed for retrofits of existing MSW combustors. Like VLN™, the LN™ technology adds a stream of "LN™ gas" and optimizes the gas flow distribution between the primary air, secondary air, and the LN™ gas streams to reduce NOx emissions. Unlike VLN™, LN™ gas is drawn from outside the furnace. In conjunction with an optimized SNCR system, Covanta guarantees NOx emission rates of 110 ppmv corrected to 12% CO_2 on a 24-hour basis and 90 ppmv corrected to 12% CO_2 on a rolling 12-month basis. Covanta LN™ technology has been used at multiple sites within the US. For example, Covanta LN™ technology with an optimized SNCR system is used to reduce NOx emissions from three existing MSW units at the Montgomery County Resource Recovery Facility in Maryland.

Cost-effectiveness of Selective Catalytic Reduction for Municipal Solid Waste Units

The District performed a cost analysis to determine the cost-effectiveness of installing a selective catalytic reduction system for a municipal solid waste unit. The District used the following methodology and assumptions for this cost-effectiveness analysis:

Assumptions:

- Baseline emission factor is 0.286 lb-NOx/MMBtu (equivalent to 165 ppmv @ 12% CO2)
- SCR provides control to 50 ppmv at 7% O2 (equivalent to 47 ppmv @ 12% CO2)
- Capital cost annualized at 10% interest for 10 years

Cost data was obtained from a preconstruction approval by the Florida Department of Environmental Protection (FDEP) issued on December 23, 2010. The approval was issued for an MSW-fired combustor equipped with SCR for NOx control. The control equipment costs from the FDEP application include uncontrolled NOx emissions of 250 ppmv and controlled NOx emissions of 50 ppmv which represents an 80% reduction in NOx from the SCR. However, 80% reduction from 165 ppmv @ 12% CO2 would yield controlled emissions of 33 ppmv, which is well below BACT. Therefore, controlled emissions are evaluated at the BACT limit of 47 ppmv @ 12% CO2.

The FDEP SCR installation was sized for a unit rated at approximately 460 MMBtu/hr used to produce superheated steam for an electrical generator. The District reviewed the expected exhaust parameters and found them comparable to the parameters for solid fuel-fired boilers in the Valley. Therefore, it is believed that this cost estimate provides a valid basis for estimating costs for installing SCR on MSW-fired boilers in the Valley.

To maximize the emission reductions and economies of scale in estimating the retrofit costs, it is assumed that a 350 MMBtu/hr unit operating at full fire at 100% capacity factor year round for the MSW facility. The purpose of these assumptions is to err on the conservative side throughout the analysis.

Emissions are calculated in the following table:

Table C-2 Emissions from MSW Unit

Fuel	Rating (MMBtu/hr)	Time (hr/yr)	EF (lb/MMBtu)	Emissions (lb/yr)	Emissions (tons/yr)
MSW (baseline)	350	8,760	0.286	876,876	438
MSW (controlled with SCR)	350	8,760	0.081	248,346	124

The capital and operational costs are sized to the facility size using the six-tenths rule, where:

$C_B = C_A \times (S_B \div S_A)^{0.6}$

- CA is a known cost of equipment of size A
- CB is the estimated cost of equipment of size B
- SB is the size of equipment B
- SA is the size of equipment A

It is standard District policy for Best Available Control Technology (BACT) analyses to use a 10 year life and 10% interest rate unless information indicates otherwise; therefore the capital recovery factor (CRF) of 0.1627 will be used to annualize the capital costs.

It is noted that the FDEP cost analysis is for a new unit with an adequately-sized induced draft (ID) fan. However, for a new unit the ductwork can be designed in a way that

minimizes pressure losses, allowing for a smaller ID fan than may be required for a retrofit. Affected sources have provided some estimates for additional electrical costs associated with the larger ID fan required for a retrofit, so these have been incorporated into the analysis. In addition, the FDEP analysis is for a new unit so it does not include the loss of revenue from taking a unit off-line to retrofit the new technology. For each unit it is estimated that the retrofit would require at least six months of downtime at $118/MW-hr; this will be added to the capital cost. Finally, the FDEP analysis specifically ignored sales tax on capital equipment on the grounds it is exempt from sales tax in Florida. This would not be the case in California, so 8% sales tax has been included. The cost-effectiveness analysis for installing SCR on a MSW unit is as follows:

Table C-3 Cost-Effectiveness for Installing SCR on a MSW Unit

Description of Cost	Cost Factor	Cost	Source
Direct Capital Costs (DC):			
Purchase Equipment Costs (PE):			
(A) Basic Equipment:			
1) SCR System (Quote from Babcock Power)		$6,790,099	FDEP[47]
2) Additional Ductwork (220 ft)	$1,800/ft	$336,110	FDEP
3) Increased ID fan size		$7,384	FDEP
Subtotal of Basic Equipment	A	$7,133,593	
(B) Instrumentation and controls: (1% of A)	0.01 A	$71,336	OAQPS
(C) Freight: (5% of A)	0.05 A	$356,680	OAQPS
(D) Taxes	0.08 (A+B+C)	$604,929	OAQPS
PE Total:		$8,166,538	
Direct Installation Costs (DI): Assume Modular SCR w/ simple installation			
Foundation and Supports:	0.16 PE	$1,306,646	OAQPS
Handling and Erection:	0.40 PE	$3,266,615	OAQPS
Electrical: (quote from CH2M Hill)	0.10 PE	$816,654	Industry
Piping: (quote from CH2M Hill)	0.20 PE	$1,633,308	Industry
Insulation:	0.01 PE	$81,665	OAQPS
Painting:	0.01 PE	$81,665	OAQPS
Costs for Expansion of APC Building for SCR Components (quote Malcolm Pirnie)		$366,665	FDEP
DI Total:		$7,553,218	
Retrofit (Deconstruct existing building/structures, estimated equal to DI total)		$7,553,218	District
Natural gas pipeline (replace fuel oil #2)		$3,000,000	Industry
Site Preparation and Buildings			
DC Total = PE + DI + retrofit + pipeline:		$26,272,974	
Indirect Costs (IC):			
Engineering:	0.10 PE	$816,654	OAQPS
Construction and Field Expenses:	0.05 PE	$408,327	OAQPS
Contractor Fees:	0.10 PE	$816,654	OAQPS
Contingencies:	0.15 PE	$1,224,981	FDEP
Start-up:	0.02 PE	$163,331	OAQPS
Performance Testing:	0.01 PE	$81,665	OAQPS
Retrofit Downtime (6 months minimum, electricity sales and tipping fees)		$11,000,000	Industry

[47] All costs from FDEP size-adjusted using six-tenths rule from 460 MMBtu/hr to 350 MMBtu/hr.

Description of Cost	Cost Factor	Cost	Source
IC Total:		$14,511,612	
Total Capital Investments (TCI = DC + IC):		**$40,794,586**	
Direct Annual Costs (DAC):			
Operating Costs (O): (≈ 1,095 shifts/year @ 3 shifts/day)			
Operator: 1.0 hr/shift	$50/hr	$54,750	FDEP
Supervisor:	15% operator	$8,213	OAQPS
Maintenance Costs (M):			
Labor: 1.0 hr/shift	$50/hr	$54,750	FDEP
Material:	100% labor	$54,750	FDEP
Utility Costs (U):			
Performance loss:	$0.08848/kW-hr	$386,495	FDEP
Electricity Cost: (additional 818 kW[48])	$0.08848/kWhr	$634,019	Industry
Catalyst Replace:		$123,071	FDEP
Total DAC:		$1,316,048	
Indirect Annual Costs (IAC):			
Overhead:	60% O & M	$87,828	OAQPS
Insurance:	0.01 TCI	$407,946	OAQPS
Property Tax:	0.01 TCI	$407,946	OAQPS
Administrative:	0.02 TCI	$815,892	OAQPS
Annualized Total Capital Investment: interest rate (%) 10			
Period (years): 10	0.1627 TCI	$6,637,279	District Policy
Total IAC:		$9,672,939	
Total Annual Cost (DAC + IAC):		**$9,672,939**	

Table C-4 Summary of Cost-Effectiveness for Installing SCR on a MSW Unit

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	$9,672,939	**$30,806/ton**

The cost-effectiveness for installing SCR on a MSW fired boiler is $30,806 per ton of NOx reduced. It is important to note that this calculation is based off of a new installation of SCR, not a retrofit as would be required by Valley facilities. While some retrofit expenses have been included, operators would incur significant additional costs when retrofitting to incorporate SCR including expenses for additional ductwork, installation of a new natural gas pipeline to replace the existing fuel oil supply, and labor; therefore, District staff assumes the cost-effectiveness is even higher than presented in this analysis.

[48] Resized from industry estimate of 2 trains, 628 kW/train, for a 715 MMBtu/hr facility, resized to 350 MMBtu/hr

Cost-effectiveness of Gore De-NOx for Municipal Solid Waste Units

The District performed a cost analysis to determine the cost-effectiveness of Gore De-NOx for a municipal solid waste unit. The District used the following methodology and assumptions for this cost-effectiveness analysis:

Assumptions:

- Baseline emission factor is 0.286 lb-NOx/MMBtu (equivalent to 165 ppmv @ 12% CO2)
- Gore De-NOx provides control to 60 ppmv at 7% O2 (equivalent to 57 ppmv @ 12% CO2)
- Capital cost annualized at 10% interest for 10 years
- The Current ID Fan is sufficient for the Gore De-NOx system (per Manufacturer)
- 3-year catalytic insert life (guarantee from manufacturer)
- De-NOx filter replacements will be financed.

Capital cost data was obtained from the manufacturer. To maximize the emission reductions and economies of scale in estimating the retrofit costs, it is assumed that a 350 MMBtu/hr unit operating at full fire at 100% capacity factor year round for the MSW facility. A 350 MMBtu/hr unit is assumed to be equivalent to approximately an 800 ton/day MSW plant. The purpose of these assumptions is to err on the conservative side throughout the analysis.

Emissions are calculated in the following table:

Table C-5 Emissions from a MSW Unit

Fuel	Rating (MMBtu/hr)	Time (hr/yr)	EF (lb/MMBtu)	Emissions (lb/yr)	Emissions (tons/yr)
MSW (baseline)	350	8,760	0.286	876,876	438
MSW (controlled, Gore De-NOx)	350	8,760	0.099	303,534	152

It is standard District policy for Best Available Control Technology (BACT) analyses to use a 10 year life and 10% interest rate unless information indicates otherwise; therefore the capital recovery factor (CRF) of 0.1627 will be used to annualize the capital costs. The cost-effectiveness analysis for installing Gore De-NOx on a MSW unit is as follows:

Table C-6 Cost-Effectiveness for Installing Gore De-NOx on a MSW Unit

Description of Cost	Cost Factor	Cost	Source
Direct Capital Costs (DC):			
Purchase Equipment Costs (PE):			
(A) Basic Equipment:			
1) Initial Catalytic Filter Bag Installation		$3,224,000	Manufacturer

Description of Cost	Cost Factor	Cost	Source
2) Two Catalytic Filter Bag Replacements during 10 year span.		$6,448,000	Manufacturer
Subtotal of Basic Equipment	A	$9,672,000	
(B) Instrumentation and controls: (1% of A)		0	Manufacturer
(C) Freight: (5% of A)	0.05 A	$483,600	District
(D) Taxes	0.08 (A+B)	$773,760	Local Rate
PE Total:		$10,929,360	
Direct Installation Costs (DI):			
Foundation and Supports:		0	Manufacturer
Handling and Erection:	0.40 PE	$4,371,744	OAQPS
Electrical: (quote from CH2M Hill)		0	Manufacturer
Piping: (quote from CH2M Hill)		0	Manufacturer
Insulation:		0	Manufacturer
Painting:		0	Manufacturer
DI Total:		$4,371,744	
DC Total = PE + DI:		$15,301,104	
Indirect Costs (IC):			
Engineering:	0.10 PE	$1,092,936	OAQPS
Construction and Field Expenses:	0.05 PE	$546,468	OAQPS
Contractor Fees:	0.10 PE	$1,092,936	OAQPS
Contingencies:	0.15 PE	$1,639,404	OAQPS
Start-up:	0.02 PE	$218,587	OAQPS
Performance Testing:	0.01 PE	$109,294	OAQPS
Retrofit Downtime (1 week for initial install and 2 weeks for replacement, electricity sales and tipping fees)		$1,375,000	Based on estimate in 2015 Plan for 1997 PM2.5 Standard
IC Total:		$6,074,625	
Total Capital Investments (TCI = DC + IC):		$21,375,729	
Direct Annual Costs (DAC):			
Operating Costs (O): (≈ 1,095 shifts/year @ 3 shifts/day)			
Operator: 1.0 hr/shift	$50/hr	$54,750	FDEP
Supervisor:	15% operator	$8,213	OAQPS
Maintenance Costs (M):			
Labor: 1.0 hr/shift	$50/hr	$54,750	FDEP
Material:	100% labor	$54,750	OAQPS
Construction Material Sorting Cost: 292,000 tons sorted/year, Based on 800 tons/day @ 365 days/year	$15/ton	$4,380,000	EU Report[49]
Total DAC:		$4,552,463	
Indirect Annual Costs (IAC):			
Overhead:	60% O & M	$87,828	OAQPS
Insurance:	0.01 TCI	$213,757	OAQPS

[49] Source: "Costs for Municipal Waste Management in the EU: Final Report to Directorate General Environment, European Commission" lists a MSW sorting cost range of €14/tonne to €22/tonne, depending on the type of material sorted from the waste. The District conservatively used €14/tonne (equivalent to $15/ton) to estimate the cost to sort construction material from the waste, which is necessary to prevent catalyst poisoning).

Description of Cost	Cost Factor	Cost	Source
Property Tax:	0.01 TCI	$213,757	OAQPS
Administrative:	0.02 TCI	$427,515	OAQPS
Annualized Total Capital Investment: interest rate (%) 10 Period (years): 10	0.1627 TCI	$3,477,831	District Policy
Total IAC:		$4,420,688	
Total Annual Cost (DAC + IAC):		**$8,973,151**	

Table C-7 Summary of Cost-effectiveness for Installing Gore De-NOx on a MSW Unit

Fuel Type	Baseline Emissions (tons/yr)	Controlled Emissions (tons/yr)	Emissions Reduced (tons/yr)	Adjusted Annualized Cost ($/yr)	Cost-effectiveness ($/ton)
MSW	438	152	286	$8,973,151	**$31,375/ton**

Cost-effectiveness of Covanta LN^{TM} for Municipal Solid Waste Units

The District performed a cost analysis to determine the cost-effectiveness of Covanta LN^{TM} for a municipal solid waste unit. The District used the following methodology and assumptions for this cost-effectiveness analysis:

Assumptions:

- Baseline emission factor is 0.286 lb-NOx/MMBtu (equivalent to 165 ppmv @ 12% CO2)
- LN^{TN} provides control to 90 ppmv @ 12% CO2, on an annual average (per Covanta)
- Capital cost annualized at 10% interest for 10 years

Since the Covanta LN^{TM} system is proprietary, capital and operating costs are difficult to obtain directly from the manufacturer. However, the total capital investment and operating costs for an actual; LN^{TM} installation were obtained from the "NOx RACT for Municipal Waste Combustors (MWCs)", a presentation by the Maryland Department of Environment at a stakeholder meeting on January 17, 2017. For three 600 ton/day MSW units, the combined total capital investment for LN^{TM} was approximately $7,500,000 (2017 dollars), or $2,500,000/unit. Per the presentation, the annual combined operating cost was $566,000/year, or about $189,000/unit.

To maximize the emission reductions and economies of scale in estimating the retrofit costs, it is assumed that a 350 MMBtu/hr unit operating at full fire at 100% capacity factor year round for the MSW facility. A 350 MMBtu/hr unit is assumed to be equivalent to approximately an 800 ton/day MSW plant. The purpose of these assumptions is to err on the conservative side throughout the analysis.

The capital and operational costs are sized to the facility size using the six-tenths rule, where:

- CA is a known cost of equipment of size A
- CB is the estimated cost of equipment of size B
- SB is the size of equipment B
- SA is the size of equipment A

$C_B = C_A \times (S_B \div S_A)^{0.6}$

Emissions are calculated in the following table:

Table C-8 Emissions from a MSW Unit

Fuel	Rating (MMBtu/hr)	Time (hr/yr)	EF (lb/MMBtu)	Emissions (lb/yr)	Emissions (tons/yr)
MSW (baseline)	350	8,760	0.286	876,876	438
MSW (controlled, LN™)	350	8,760	0.156	478,296	239

It is standard District policy for Best Available Control Technology (BACT) analyses to use a 10 year life and 10% interest rate unless information indicates otherwise; therefore the capital recovery factor (CRF) of 0.1627 will be used to annualize the capital costs.

The cost-effectiveness analysis for installing LN™ on a MSW unit is as follows:

Table C-9 Cost-effectiveness for Installing LN™ on a MSW Unit

Description of Cost	Cost Factor	Cost	Source
Total Capital Investment			
TCI, including 3-months lost revenue for downtime.		$10,300,000	Maryland RACT Presentation[50]
Direct Annual Costs (DAC):			
Total DAC:		225,000	Maryland RACT Presentation[6]
Indirect Annual Costs (IAC):			
Insurance:	0.01 TCI	$103,000	OAQPS
Property Tax:	0.01 TCI	$103,000	OAQPS
Administrative:	0.02 TCI	$206,000	OAQPS
Annualized Total Capital Investment: interest rate (%) 10 Period (years): 10	0.1627 TCI	$1,675,810	District Policy
Total IAC:		$2,087,810	
Total Annual Cost (DAC + IAC):		**$2,312,810**	

[50] All costs from Maryland RACT Presentation were size-adjusted using six-tenths rule from a 600 tons/day MSW Unit to an 800 ton/day MSW Unit. An additional 7.3 million in lost revenue was added to the adjusted cost from the Maryland RACT presentation. This value was based on an estimated 4-month installation timeline, equivalent to the March through June 2006 timeline for a VLN installation in Bristol Connecticut. The revenue lost was based on a linear adjustment of the revenue losses listed in the 2015 Ozone plan for an MSW plant downtime of 6 months.

Table C-10 Summary of Cost-Effectiveness for Installing LN™ on a MSW Unit

Fuel Type	Baseline Emissions (tons/yr)	Controlled Emissions (tons/yr)	Emissions Reduced (tons/yr)	Adjusted Annualized Cost ($/yr)	Cost-effectiveness ($/ton)
MSW	438	239	199	$2,312,810	**$11,622/ton**

In May 2018, the District issued an Authority to Construct to Covanta municipal solid waste combustion operation to implement Covanta LN technology to lower NOx emissions from 165 ppm at 12% CO_2 on a daily average to 110 ppm at 12% CO_2 on a daily average and 90 ppm at 12% CO_2 on an annual average. However, the construction has not started and the feasibility of this technology remains to be demonstrated on a continuous basis. The District will continue to monitor the progress of the implementation of this new technology.

Biomass Facilities

Current Status of Biomass Facilities in the Valley and District Exploration of Biomass Alternatives

Historically, the presence of biomass facilities in the Valley has played a vital role in reducing NOx and PM emissions from open burning practices. Until 2014, District restrictions reduced open burning of agricultural waste in the Valley by 80% and much of that waste was diverted to biomass-fired power plants. However, the biomass industry has indicated that given current energy policy in California there is concern that biomass power facilities are in jeopardy. Many biomass plants in the Valley are nearing, or have come to, the end of their long-term contracts with utilities and find themselves in a position where the power that they provide is not the type of power that utilities are seeking (base load vs. intermittent) and that the prices being offered for new contracts are too low to support their operations.

Since 2012, six of the valley's biomass plants have shut down, reducing the valley's biomass power plant capacity by more than 50%. With additional biomass facilities on the brink of closure, it has become even more infeasible to require citrus orchard removals to be sent for use in biomass power plants. At the same time, drought and increase in fallowed land has resulted in an increased need to dispose of agricultural waste. The District anticipates open burning emissions to increase without cost-effective alternatives for the disposal of agricultural waste.

The District has convened a number of productive meetings with agricultural stakeholders and representatives of the biomass industry in order to more fully understand the issues faced by the industry and develop a common vision of the future of biomass power amongst the stakeholders in the Valley. The meetings have been helpful in forging a better working relationship between agriculture representatives and biomass power producers and developing consensus on long-term solutions.

In June 2014, the District's Governing Board adopted positions on two pieces of legislation that impact the biomass industry. The District adopted a position in support of AB 2363 (Dahle), which was sponsored by the biomass industry, and would make biomass plants more competitive by fully accounting for the costs associated with intermittent sources of renewable power (solar and wind) when comparing them to other sources of power. AB 2363 was signed by the Governor and will begin to help level the renewable energy playing field. The District also took a position in opposition to SB 1139 (Hueso) that would have given preferential treatment to new geothermal power plants by requiring that utilities purchase specified amounts of new geothermal power. Ultimately, AB 1139 was not passed by the legislature.

On November 14 and 15, 2017, the District hosted the *Central Valley Summit on Alternatives to Open Burning of Agricultural Waste.* In addition to traditional biomass power plants, alternatives to open burning discussed included soil re-incorporation of agricultural waste, composting, conversion of agricultural waste into electrical power or fuels, biochar plants, on-site/portable power production for electrical generation and irrigation well pump power, and air curtain incineration. The district has recently permitted, or is in the process of permitting, permits for several air curtain burners and permits for a forest waste gasification/pyrolysis operation that provides syn-gas to two engines for the production of electricity. Additionally, Aemetis has approached the District with a proposal to install a biomass to ethanol plant in Riverbank, and several biochar manufacturers have approached the District with proposals for biochar manufacturing operations. However, traditional biomass power producers continue to play the largest role in reducing the open burning of agricultural waste.

There is consensus that biomass power producers currently are not on a level playing field in competing with other renewable sources of power for utility contracts. They are also not receiving any preferential treatment for the societal benefits for providing a cleaner alternative to the open burning of agricultural waste and assisting with meeting landfill diversion goals. Contracts between power producers and utilities are confidential, but the current market rate that the biomass plants can garner is approximately 6 cents/KWH. This is the rate that the utilities obtain through contracts with solar power providers. This low cost is made possible largely due to government subsidies provided for solar power production. Biomass power producers have indicated that it takes approximately 9-10 cents/KWH for the plants to cover their operating costs.

The District and representatives from agriculture and biomass industries are working to develop and pursue specific actions with the legislative branch, utilities, Public Utility Commission, CalRecycle, and other government agencies to help level the playing field and allow the biomass industry to fairly compete. The District will also continue to work with the stakeholders including the Federal Department of Energy, California Energy Commission, and other partner agencies to pursue clean alternatives to biomass power production for agricultural waste disposal.

Potential Control Technologies to Reduce NOx emissions from Biomass-fired Units

Most existing Biomass fired power plants in the Valley control NOx using selective non-catalytic reduction (SNCR), also referred to as ammonia injection. NOx emission limits for biomass power plants controlled with SNCR systems range from 0.08 lb-NOx/MMBtu to 0.1 lb-NOx/MMBtu (daily average). The current rule 4352 limits NOx emissions from biomass-fired boilers to 90 ppm @ 3% O_2 (equivalent to 0.12 lb/MMBtu using an F-Factor of 9420 dscf/MMBtu).

Selective Catalytic Reduction (SCR) add-on control systems are considered BACT for biomass-fired power plants. SCR systems reduce NOx emissions by converting the emissions to water and elemental nitrogen in the presence of a catalyst. One known issue with the use of SCR systems on biomass-fired power plants is catalyst poisoning and subsequent catalyst activity reduction. In particular, catalyst poisoning by alkali metals is an issue that is unique for biomass-fired plants that are equipped with SCR catalysts. To reduce the potential for catalyst poisoning by alkali metals, SCR systems for biomass-fired units are nearly always tail-end systems, where the SCR catalyst is located downstream of a particulate matter control device. Additionally, wet flue-gas desulfurization systems may be used after the particulate matter control device and prior to the SCR inlet to further reduce the quantity of ash and soluble alkali metals from reaching and poisoning the SCR catalyst. Biomass plants with Selective Catalytic Reduction typically are able to achieve emission rates of 0.065 lb-NOx/MMBtu (daily average), which is just under 50 ppmvd @ 3% O_2.

Cost-Effectiveness of Selective Catalytic Reduction for Biomass Plants

As mentioned earlier, most existing facilities in the valley are equipped with SNCR and although it appears that facilities could possibly achieve a lower NOx limit beyond the revised proposed rule amendments, additional NOx control technology such as SCR would be needed. In fact, the installations that are achieving lower NOx emissions are typically installed as new installations equipped with the SCR technology, with one exception. One facility in the Valley has installed SCR on a smaller existing boiler under an experimental research exemption approved in February 2008. In March 2009, the District approved the facility's application to replace the existing SNCR (which had become inoperable) with the SCR installed under the experimental research exemption. This modification did not result in any reduction in permitted emissions as the SCR-equipped boiler is only required to comply with the same emission limit the SNCR-equipped boiler was. This modification was incorporated into the Title V permit in September 2010. While this example may indicate that SCR is technologically feasible as a retrofit for smaller sized biomass-fired boilers, there are many other considerations unique to each facility that may inhibit the retrofit of a SCR system. It is important to note that this cost-effectiveness analysis does not take into consideration the current economic struggles of the biomass industry, as previously described.

The District used the following methodology and assumptions for this cost-effectiveness analysis:

Assumptions

- Baseline emission factor is 0.11 lb-NOx/MMBtu for Biomass (equivalent to 85ppmv @ 3% O2)
- SCR reduces NOx emissions to 0.004 lb-NOx/MMBtu (annual average, based on review of annual CEMS data for a permitted biomass unit with SCR)
- Capital cost annualized at 10% interest for 10 years

Cost data was obtained from a preconstruction approval by the FDEP issued on December 23, 2010, as described above in the MSW section.

To maximize the emission reductions and economies of scale in estimating the retrofit costs, it is assumed that a 350 MMBtu/hr unit is operating at full fire at 100% capacity factor year round is representative for the Valley biomass facilities. The purpose of these assumptions is to err on the conservative side throughout the analysis.

Table C-11 Emissions from a Biomass Unit

Fuel	Rating (MMBtu/hr)	Time (hr/yr)	EF (lb/MMBtu)	Emissions (lb/yr)	Emissions (tons/yr)
Biomass (baseline)	350	8,760	0.11	337,260	169
Biomass (controlled, SCR)	350	8,760	0.04	122,640	61

It is standard District policy for Best Available Control Technology (BACT) analyses to use a 10 year life and 10% interest rate unless information indicates otherwise; therefore the capital recovery factor (CRF) of 0.1627 will be used to annualize the capital costs.

The cost-effectiveness analysis for installing SCR on a biomass unit is as follows:

Table C-12 Cost-Effectiveness for Installing SCR on a Biomass Unit

Description of Cost	Cost Factor	Cost	Source
Direct Capital Costs (DC):			
Purchase Equipment Costs (PE):			
(A) Basic Equipment:			
1) SCR System (Quote from Babcock Power)		$6,790,099	FDEP[51]
2) Additional Ductwork (220 ft)	$1,800/ft	$336,110	FDEP
3) Increased ID fan size		$7,384	FDEP
Subtotal of Basic Equipment	A	$7,133,593	
(B) Instrumentation and controls: (1% of A)	0.01 A	$71,336	OAQPS
(C) Freight: (5% of A)	0.05 A	$356,680	OAQPS
(D) Taxes	0.08 (A+B+C)	$604,929	OAQPS

[51] All costs from FDEP size-adjusted using six-tenths rule from 460 MMBtu/hr to 350 MMBtu/hr.

Description of Cost	Cost Factor	Cost	Source
PE Total:		$8,166,538	
Direct Installation Costs (DI): Assume Modular SCR w/ simple installation			
Foundation and Supports:	0.16 PE	$1,306,646	OAQPS
Handling and Erection:	0.40 PE	$3,266,615	OAQPS
Electrical: (quote from CH2M Hill)	0.10 PE	$816,654	Industry
Piping: (quote from CH2M Hill)	0.20 PE	$1,633,308	Industry
Insulation:	0.01 PE	$81,665	OAQPS
Painting:	0.01 PE	$81,665	OAQPS
DI Total:		$7,186,553	
DC Total = PE + DI		$15,353,091	
Indirect Costs (IC):			
Engineering:	0.10 PE	$1,535,309	OAQPS
Construction and Field Expenses:	0.05 PE	$767,655	OAQPS
Contractor Fees:	0.10 PE	$1,535,309	OAQPS
Contingencies:	0.15 PE	$2,302,964	FDEP
Start-up:	0.02 PE	$307,062	OAQPS
Performance Testing:	0.01 PE	$153,531	OAQPS
IC Total:		$6,601,829	
Total Capital Investments (TCI = DC + IC):		$21,954,920	
Direct Annual Costs (DAC): Assume SCR requires 0.5 hrs/shift			
Operating Costs (O): (≈ 1,095 shifts/year @ 3 shifts/day)			
Operator: 1.0 hr/shift	$50/hr	$54,750	FDEP
Supervisor:	15% operator	$8,213	OAQPS
Maintenance Costs (M):			
Labor: 1.0 hr/shift	$50/hr	$54,750	FDEP
Material:	100% labor	$54,750	FDEP
Utility Costs (U):			
Performance loss:	$0.08848/kW-hr	$386,495	FDEP
Electricity Cost: (additional 818 kW[52])	$0.08848/kWhr	$634,019	Industry
Catalyst Replace:		$123,071	FDEP
Total DAC:		$1,316,048	
Indirect Annual Costs (IAC):			
Overhead:	60% O & M	$87,828	OAQPS
Insurance:	0.01 TCI	$219,549	OAQPS
Property Tax:	0.01 TCI	$219,549	OAQPS
Administrative:	0.02 TCI	$439,098	OAQPS
Annualized Total Capital Investment: interest rate (%) 10 Period (years): 10	0.1627 TCI	$3,572,065	District Policy
Total IAC:		$4,538,089	
Total Annual Cost (DAC + IAC):		**$5,854,137**	

[52] Resized from industry estimate of 2 trains, 628 kW/train, for a 715 MMBtu/hr facility, resized to 350 MMBtu/hr

Emissions are calculated in the following table:

Table C-13 Summary of Cost-Effectiveness for Installing SCR on a Biomass Unit

Fuel Type	Baseline Emissions (tons/yr)	Controlled Emissions (tons/yr)	Emissions Reduced (tons/yr)	Adjusted Annualized Cost ($/yr)	Cost-effectiveness ($/ton)
Biomass	169	61	108	5,854,137	**$54,205/ton**

Other Solid Fuels

Current Status of Other Solid Fuel Fired Units in the Valley

One facility in the Valley operates a unit that is permitted to fire on coal/biomass; however, the unit has only been fired on biomass since 2013. This facility is equipped with a baghouse for PM10 control, dry lime injection for SOx control, and a selective non-catalytic reduction system for NOx control.

Potential NOx Control Technologies for Other Solid Fuel Fired Units

Other solid fuel fired facilities are generally equipped with Selective Non-Catalytic Reduction (SNCR) and utilize this technology to meet emission the Rule 4352 emission limit of 65 ppmv @ 3% O_2. Selective Catalytic Reduction (SCR) is an add-on control system that may be used to reduce NOx emissions from other solid fuel fired units. SCR systems reduce NOx emissions by converting the emissions to water and elemental nitrogen in the presence of a catalyst. Using SCR, other solid fuel fired units would be expected to achieve emission rates at low as 0.04 lb-NOx/MMBtu on an annual average. The District used the following methodology and assumptions for this cost-effectiveness analysis:

Assumptions

- Baseline emission factor is 0.09 lb-NOx/MMBtu coal/petcoke/other fuels (equivalent to 65ppmv @ 3% O2)
- SCR reduces NOx emissions to 0.04 lb-NOx/MMBtu (annual average, based on review of annual CEMS data for a permitted biomass unit with SCR)
- Capital cost annualized at 10% interest for 10 years

Cost data was obtained from a preconstruction approval by the FDEP issued on December 23, 2010 as described above in the MSW section.

To maximize the emission reductions and economies of scale in estimating the retrofit costs, it is assumed that a 350 MMBtu/hr unit is operating at full fire at 100% capacity factor year round is representative for the Valley solid-fired fuel facilities. The purpose of these assumptions is to err on the conservative side throughout the analysis.

Table C-14 Emissions from an Other Solid Fuel Fired Unit

Fuel	Rating (MMBtu/hr)	Time (hr/yr)	EF (lb/MMBtu)	Emissions (lb/yr)	Emissions (tons/yr)
Other(baseline)	350	8,760	0.09	275,940	138
Other (controlled, SCR)	350	8,760	0.04	122,640	61

It is standard District policy for Best Available Control Technology (BACT) analyses to use a 10 year life and 10% interest rate unless information indicates otherwise; therefore the capital recovery factor (CRF) of 0.1627 will be used to annualize the capital costs. The cost-effectiveness analysis for installing SCR on an other solid fuel fired unit is as follows:

Table C-15 Cost-Effectiveness for Installing SCR on Other Solid Fired Fuel Unit

Description of Cost	Cost Factor	Cost	Source
Direct Capital Costs (DC):			
Purchase Equipment Costs (PE):			
(A) Basic Equipment:			
4) SCR System (Quote from Babcock Power)		$6,790,099	FDEP[53]
5) Additional Ductwork (220 ft)	$1,800/ft	$336,110	FDEP
6) Increased ID fan size		$7,384	FDEP
Subtotal of Basic Equipment	A	$7,133,593	
(B) Instrumentation and controls: (1% of A)	0.01 A	$71,336	OAQPS
(C) Freight: (5% of A)	0.05 A	$356,680	OAQPS
(D) Taxes	0.08 (A+B+C)	$604,929	OAQPS
PE Total:		$8,166,538	
Direct Installation Costs (DI): Assume Modular SCR w/ simple installation			
Foundation and Supports:	0.16 PE	$1,306,646	OAQPS
Handling and Erection:	0.40 PE	$3,266,615	OAQPS
Electrical: (quote from CH2M Hill)	0.10 PE	$816,654	Industry
Piping: (quote from CH2M Hill)	0.20 PE	$1,633,308	Industry
Insulation:	0.01 PE	$81,665	OAQPS
Painting:	0.01 PE	$81,665	OAQPS
DI Total:		$7,186,553	
DC Total = PE + DI		$15,353,091	
Indirect Costs (IC):			
Engineering:	0.10 PE	$1,535,309	OAQPS
Construction and Field Expenses:	0.05 PE	$767,655	OAQPS
Contractor Fees:	0.10 PE	$1,535,309	OAQPS
Contingencies:	0.15 PE	$2,302,964	FDEP
Start-up:	0.02 PE	$307,062	OAQPS
Performance Testing:	0.01 PE	$153,531	OAQPS
IC Total:		$6,601,829	
Total Capital Investments (TCI = DC + IC):		$21,954,920	
Direct Annual Costs (DAC): Assume SCR requires 0.5 hrs/shift			
Operating Costs (O): (≈ 1,095 shifts/year @ 3 shifts/day)			

[53] All costs from FDEP size-adjusted using six-tenths rule from 460 MMBtu/hr to 350 MMBtu/hr.

Description of Cost	Cost Factor	Cost	Source
Operator: 1.0 hr/shift	$50/hr	$54,750	FDEP
Supervisor:	15% operator	$8,213	OAQPS
Maintenance Costs (M):			
Labor: 1.0 hr/shift	$50/hr	$54,750	FDEP
Material:	100% labor	$54,750	FDEP
Utility Costs (U):			
Performance loss:	$0.08848/kW-hr	$386,495	FDEP
Electricity Cost: (additional 818 kW[54])	$0.08848/kWhr	$634,019	Industry
Catalyst Replace:		$123,071	FDEP
Total DAC:		$1,316,048	
Indirect Annual Costs (IAC):			
Overhead:	60% O & M	$87,828	OAQPS
Insurance:	0.01 TCI	$219,549	OAQPS
Property Tax:	0.01 TCI	$219,549	OAQPS
Administrative:	0.02 TCI	$439,098	OAQPS
Annualized Total Capital Investment: interest rate (%) 10			
Period (years): 10	0.1627 TCI	$3,572,065	District Policy
Total IAC:		$4,538,089	
Total Annual Cost (DAC + IAC):		**$5,854,137**	

Table C-16 Summary of Cost-Effectiveness for Installing SCR on Other Solid Fuel Fired Unit

Fuel Type	Baseline Emissions (tons/yr)	Controlled Emissions (tons/yr)	Emissions Reduced (tons/yr)	Adjusted Annualized Cost ($/yr)	Cost-effectiveness ($/ton)
Other	138	61	77	5,854,137	**$76,028/ton**

Controls for Direct PM2.5 Emissions from All Unit Types

The District researched the potential opportunity of specifying required controls for direct PM2.5 emissions. 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 units.[55] 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

[54] Resized from industry estimate of 2 trains, 628 kW/train, for a 715 MMBtu/hr facility, resized to 350 MMBtu/hr
[55] 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.

District units.[56] 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 facility[57]. 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.

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.

EVALUATION FINDINGS

Biomass-Fired Units

The District has evaluated all potential control technologies and all control technologies achieved in practice in other areas or included in other state implementation plans for this category. As demonstrated above, Rule 4352 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds both BACM and MSM requirements for this source category.

Municipal Waste-Fired Units

The District has evaluated all potential control technologies and all control technologies achieved in practice in other areas or included in other state implementation plans for this category. As demonstrated above, Rule 4352 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds both BACM and MSM requirements for this source category. The District's evaluation of potential control technologies has found that the Gore De-NOx and Selective Catalytic Reduction technologies demonstrated in Europe are extremely costly, require additional evaluation for feasibility, and are overall economically infeasible in this sector. The

[56] 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.

[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.

District's evaluation of the Covanta LN NOx technology has found that, while costly, installation of this technology may be cost-effective. While the District meets or exceeds RACM, BACM, and MSM requirements for this source category, given the enormity of reductions needed to demonstrate attainment with the latest PM2.5 standards, the District will pursue the following potential opportunities to reduce NOx emissions for municipal waste-fired units to the extent that additional NOx controls are technologically and economically feasible:

- Lower NOx limit from 165 ppmv @ 12% CO_2 to 110 ppmv @ 12% CO_2 over 24-hr period and 90 ppmv @ 12% CO_2 over annual period
- Evaluate feasibility of lower NOx emission levels

C.14 RULE 4354 (EMISSIONS FROM GLASS MELTING FURNACES)

DISCUSSION

The provisions of Rule 4354 are applicable to glass melting furnaces in the Valley. The purpose of this rule is to limit NOx, SOx, VOC, CO, and particulate matter (PM10) emissions from glass melting furnaces.

Rule 4354 was adopted on September 14, 1994, and has been subsequently amended six times. EPA finalized approval of the most recent amendments to Rule 4354 on January 31, 2013, and deemed this rule as being as stringent as or more stringent than established RACT requirements. As a result of this stringent prohibitory rule and continuing efforts on behalf of this industry to reduce emissions, the Valley is home to six glass-making facilities with glass melting furnaces that utilize the most advanced low-NOx firing technology. The NOx emission limits contained within Rule 4354 require the installation of the best available NOx technology (i.e. oxy-fuel firing or SCR systems).

EMISSIONS INVENTORY

Pollutant	2013	2017	2019	2020	2022	2023	2024	2025	2026	2028
	Annual Average - Tons per day									
PM2.5	0.34	0.18	0.18	0.18	0.20	0.20	0.20	0.20	0.20	0.20
NOx	6.21	3.26	3.30	3.32	3.50	3.50	3.50	3.50	3.50	3.50
	Winter Average - Tons per day									
PM2.5	0.34	0.18	0.18	0.18	0.20	0.20	0.20	0.20	0.20	0.20
NOx	6.21	3.25	3.30	3.32	3.50	3.50	3.50	3.50	3.50	3.50

SOURCE CATEGORY

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. The emission limits of Rule 4354 depend on the type of glass produced, furnace firing technology and the emission-averaging period.

HOW DOES DISTRICT RULE 4354 COMPARE WITH FEDERAL AND STATE RULES AND REGULATIONS?

Federal Regulations

There are no EPA CTG requirements for this source category

Alternative Control Techniques (ACT)

- EPA-453/R-94-37 - NOx Emissions from Glass Manufacturing (June 1994)

The District evaluated the requirements contained within the ACT for NO_X Emissions from glass melting furnaces and found no requirements that were more stringent than those already required by Rule 4354.

New Source Performance Standards (NSPS)

- 40 CFR 60 Subpart CC - Standards of Performance for Glass Manufacturing Plants (Amended October 17, 2000)

40 CFR 60 Subpart CC was last amended on October 17, 2000. However, this subpart only applies to glass melting furnaces that commenced construction or modification after June 15, 1979. All glass melting furnaces currently in the Valley have commenced construction prior to June 15, 1979 and have not been modified (as defined in subpart CC) since that time. Therefore, none of the glass plants located within the Valley are subject to the requirements of Subpart CC and its requirements have not been included as a part of this control measure source category evaluation.

- 40 CFR 60 Subpart PPP - Standards of Performance for Wool Fiberglass Manufacturing Plants (Amended October 17, 2000)

The District evaluated the requirements contained within Subpart PPP and found no requirements that were more stringent than those already in Rule 4354.

National Emissions Standards for Hazardous Air Pollutants (NESHAP)/Maximum Achievable Control Technology (MACT)

- 40 CFR 61 Subpart N – National Emission Standard for Inorganic Arsenic Emissions from Glass Manufacturing Plants

40 CFR 61 Subpart N was last amended on February 27, 2014; however, this NESHAP only regulates inorganic arsenic emissions and therefore does not apply to this control measure source category evaluation.

- 40 CFR 63 Subpart NN – National Emission Standards for Hazardous Air Pollutants for Wool Fiberglass Manufacturing at Area Sources

The District evaluated the requirements contained within Subpart NN and found no requirements that were more stringent than those already in Rule 4354.

- 40 CFR 63 Subpart NNN – National Emission Standards for Hazardous Air Pollutants for Wool Fiberglass Manufacturing

The District evaluated the requirements contained within Subpart NNN and found no requirements that were more stringent than those already in Rule 4354.

- 40 CFR 63 Subpart HHHH – National Emission Standards for Hazardous Air Pollutants for Wet-Formed Fiberglass Mat Production

40 CFR 63 Subpart HHHH was last amended on April 20, 2006; however, this NESHAP only contains emission limits and regulations to reduce formaldehyde emissions. Formaldehyde is an organic compound which is most closely related to VOC emissions. This control measure analysis does not apply to VOC emissions. Therefore, the requirements of Subpart HHHH have not been included as a part of this control measure source category evaluation.

- 40 CFR 63 Subpart SSSSSS – National Emission Standards for Hazardous Air Pollutants for Glass Manufacturing Area Sources

The District evaluated the requirements contained within Subpart SSSSSS and found no requirements that were more stringent than those already in Rule 4354.

State Regulations
There are no state regulations applicable to this source category.

HOW DOES DISTRICT RULE 4354 COMPARE TO RULES IN OTHER AIR DISTRICTS?

There are no analogous rules for this source category in SMAQMD and VCAPCD

SCAQMD

- SCAQMD Rule 1117 (Emissions of Oxides of Nitrogen from Glass Melting Furnaces) *(Amended January 6, 1984)*

The District evaluated the control requirements in SCAQMD Rule 1117, and found no requirements that were more stringent than those already in Rule 4354.

	SJVAPCD Rule 4354	SCAQMD Rule 1117
Applicability	The provisions of this rule shall apply to any glass melting furnaces for the production of, container glass, fiberglass, and flat glass.	This rule limits the emission of NOx from glass melting furnaces.
Exemption	• Electric furnaces which all heat is provided by electric current from electrodes. • Any glass melting furnace that is part of a stationary source with a total potential to emit for all processes, less than 10.0 tons/yr of NOx and less than 10.0 tons/yr of VOC. • A unit that meets all of the following criteria is not subject to the PM_{10} emission limits or the PM_{10} monitoring requirements of the rule: - Furnace has permitted glass production capacity less 5 tons/day. - Total actual NO_X emissions for a facility less than 8 tons/year.	• Furnaces which are limited by Permit to operate to 15 lbs/hour of NOx or less. • Glass remelt facilities using exclusively glass cullet, marbles, chips, or similar feedstock in lieu of basic glass-making raw materials. • Furnaces used in the melting of glass for the production of glass tableware exclusively. • Flat glass melting furnaces. • Furnaces used in the melting of glass for the production of fiberglass exclusively. • Idling furnaces.

	SJVAPCD Rule 4354		SCAQMD Rule 1117
	- Total actual VOC emissions for a facility less than 8 tons/year.		
Requirements	The operator of any glass melting furnace shall not operate a furnace in such a manner that results in NO_X or PM_{10} emissions exceeding the following limits:		After December 31, 1992, no person shall operate a furnace capable of discharging NO_X into the atmosphere unless such discharge of NO_X in to the atmosphere is limited to the following:
	Container Glass:		
	NO_X	1.5 lb/ton[B]	4.0 lb/ton[A]
	PM_{10}	0.50 lb/ton[A]	No Limit Specified
	Fiberglass:		
	NO_X	1.3 lb/ton[A, C]	No Limit Specified, Exempt
		3.0 lb/ton[A, D]	
	PM_{10}	0.50 lb/ton[A]	No Limit Specified, Exempt
	Flat Glass:		
	NO_X Standard Option	3.7 lb/ton[A]	No Limit Specified, Exempt
		3.2 lb/ton[B]	
	NO_X Enhanced Option	3.4 lb/ton[A]	
		2.9 lb/ton[B]	
	PM_{10}	0.70 lb/ton[A]	No Limit Specified, Exempt

[A] Block 24-hour average
[B] Rolling 30-day average
[C] Not subject to California Public Resources Code Section 19511
[D] Subject to California Public Resources Code Section 19511

BAAQMD

- BAAQMD Regulation 9 Rule 12 (Nitrogen Oxide Emissions from Glass Melting Furnaces) *(Adopted January 19, 1994)*

The District evaluated the control requirements in BAAQMD Regulation 9 Rule 12, and found no requirements that were more stringent than those already in Rule 4354.

	SJVAPCD 4354		BAAQMD Regulation 9 Rule 12
Applicability	The provisions of this rule shall apply to any glass melting furnaces for the production of, container glass, fiberglass, and flat glass.		This rule limits the emission of NOx from glass melting furnaces.
Exemption	• Electric furnaces which all heat is provided by electric current from electrodes. • Any glass melting furnace that is part of a stationary source with a total potential to emit for all processes, less than 10.0 tons/yr of NOx and less than 10.0 tons/yr of VOC. • A unit that meets all of the following criteria is not subject to the PM_{10} emission limits or the PM_{10} monitoring requirements of the rule: - Furnace has permitted glass production capacity less 5 tons/day. - Total actual NO_X emissions for a facility less than 8 tons/year - Total actual VOC. emissions for a facility less than 8 tons/year.		• Electric furnaces which all heat is provided by electric current from electrodes. • Furnaces with a production capacity of 4550 kg (5 short tons) of glass per day or less.
Requirements	The operator of any glass melting furnace shall not operate a furnace in such a manner that results in NO_X or PM_{10} emissions exceeding the following limits:		A person subject to this rule shall reduce emissions of NO_X from any glass melting furnace until emissions do not exceed the following limits:
	Container Glass:		
	NO_X	1.5 lb/ton[B]	5.5 lb/ton, averaged over any consecutive 3-hour period
	PM_{10}	0.50 lb/ton[A]	No Limit Specified
	Fiberglass:		
	NO_X	1.3 lb/ton[A, C] 3.0 lb/ton[A, D]	5.5 lb/ton, averaged over any consecutive 3-hour period
	PM_{10}	0.50 lb/ton[A]	No Limit Specified

	SJVAPCD 4354		BAAQMD Regulation 9 Rule 12
	Flat Glass:		
	NO_X Standard Option	3.7 lb/ton[A]	5.5 lb/ton, averaged over any consecutive 3-hour period
		3.2 lb/ton[B]	
	NO_X Enhanced Option	3.4 lb/ton[A]	
		2.9 lb/ton[B]	
	PM_{10}	0.70 lb/ton[A]	No Limit Specified

[A] Block 24-hour average
[B] Rolling 30-day average
[C] Not subject to California Public Resources Code Section 19511
[D] Subject to California Public Resources Code Section 19511

ADDITIONAL EMISSION REDUCTION OPPORTUNITIES

Owens-Brockway Facility Location in Vernon, CA (SCAQMD)

Owens-Brockway operates a glass container manufacturing facility located in Vernon, CA. Prior to 2017, the facility consisted of two oxy-fuel fired glass melting furnaces. In the 4th quarter of 2017, this facility underwent construction and modification to install a Tri-Mer UltraCat ceramic catalytic filtration system (SCR system) on the exhaust of each of the oxy-fuel fired glass furnaces operated at this facility. This type of installation, pairing an oxy-fuel fired glass melting furnace with an SCR system, is the first of its kind anywhere in the world. Tri-Mer, the manufacturer and supplier of the SCR system installed at this facility indicated that with these two NO_X control systems in operation together, these glass furnaces could be able to achieve NO_X emission rates at a level as low as 0.20 pounds of NO_X per ton of glass produced.

The Owens-Brockway facility has been operating the oxy-fuel fired glass furnaces with the new SCR systems since the 1st quarter of 2018. Their preliminary source test data shows their furnace emissions levels are meeting 0.20 pounds of NO_X per ton of glass produced, on a 1-hour average basis. However, based on discussions the District has had with Owens-Brockway facility staff, they have experienced wide ranging spikes in their NO_X emissions from the glass furnaces while operating the new control systems and are still tuning the glass furnaces and control system operating parameters to optimize their NO_X emission control and still have the ability to produce a quality product. At this time, it is also not known how the new ceramic catalyst will perform over time and if the facility will be able to sustain emission rates as low as 0.20 pounds of NO_X per ton of glass produced.

In addition, despite continued efforts, the District has not been able to obtain the necessary information to reconcile Continuous Emission Monitoring System (CEMS) data with production data from the plant (glass pulled per hour, day, and month) to demonstrate continuous compliance with the 0.20 lb-NOx/tons of glass produced RECLAIM target. In conclusion, this technology is still under development, has not yet

been achieved in practice, is not established as an enforceable permit limit or control measure, and cannot yet be considered a feasible technology at this time.

EVALUATION FINDINGS

The District has evaluated all potential control technologies and all control technologies achieved in practice in other areas or included in other state implementation plans for glass melting furnaces. As demonstrated above, Rule 4354 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds RACM, BACM, and MSM requirements for this source category.

While the District meets or exceeds RACM, BACM, and MSM requirements for this source category, given the enormity of reductions needed to demonstrate attainment with the latest PM2.5 standards, the District will pursue the following potential opportunities to reduce NOx emissions for container glass furnaces to the extent that additional NOx controls are technologically and economically feasible:

- Evaluate feasible ultra low-NOx control technologies (catalytic filtration, oxy-fuel combined with SCR, etc.)
- Lower NOx limit from 1.5 lb/ton to a level ranging from 1.0-1.2 lb-NOx/ton glass pulled or lower, based on a rolling 30-day average

C.15 RULE 4550 (CONSERVATION MANAGEMENT PRACTICES)

DISCUSSION

Rule 4550 is the District's Conservation Management Practices (CMP) rule. Rule 4550 was the first rule of its kind in the nation to reduce fugitive particulate emissions from agricultural operations through the required reduction in the number of passes through a field taken by agricultural equipment and through the implementation of other conservation practices. Rule 4550 established a then-unique menu approach of control techniques to accommodate the wide variability of agricultural industries found in the San Joaquin Valley, which approach has since been duplicated by other agencies. The selected CMPs are listed on application forms that are submitted to the District for approval as a CMP Plan. Approved CMP plans are enforced through onsite inspections and operators are required to submit applications to modify their plans when changing their conservation management practices. Agricultural operations are then required to maintain detailed records verifying use of the approved Conservation Management Practices. Through this rule, PM10 emissions have been reduced by 35.3 tons per day, which is approximately a 24% reduction for this source category.

The District worked extensively with stakeholders, growers, and the Agricultural Technical Committee for the San Joaquin Valley-wide Air Pollution Study Agency (AgTech) for two years prior to developing the original Conservation Management Practices (CMP) Rule, researching and gathering information on conservation management practices, their effectiveness in reducing PM10 emissions, and variations in effectiveness varied with various soil parameters, crop and animal types, and agronomic practices. Rule 4550 was adopted on August 19, 2004, as a PM10 control measure to help bring the Valley into attainment of federal PM10 standards. As noted above, Rule 4550 has since served as a model for other regions seeking to reduce fugitive PM10 emissions from agricultural sources.

Upon adoption of Rule 4550, the District embarked on an ambitious implementation strategy, working extensively with agricultural stakeholders to ensure that affected sources were assisted as much as possible in complying with the requirements, and consequently ensuring that the CMP Program was successful. To this end, the District created special CMP application forms, which were designed to allow growers to select approved practices from simplified checklists. A special web page was created that contains answers to frequently asked questions, application forms, and other forms of assistance for agricultural operations. The District hired additional staff, including additional Small Business Assistance (SBA) staff, and took part in over 40 workshops throughout the Valley to assist sources in completing and submitting the required CMP application forms. The workshops were coordinated with agricultural stakeholders, and tremendous outreach was performed to ensure that as many affected sources as possible would attend and receive assistance at the workshops.

As a result of these efforts, the District's CMP Program realized the following notable achievements:

- Approximately 4,000 participants attended workshops, with many of the participants submitting CMP Plan applications during the workshops.

- The District received and processed over 6,000 CMP Plan applications during 2005.
- The practices used by Valley agricultural sources encompass 3.2 million acres of farmland, and over 30,000 miles of unpaved roads.
- The PM10 reductions are quantifiable and enforceable through approved CMP plans and subsequent inspections.
- The collaborative effort that resulted in the CMP program received US EPA Region IX's "2005 Environmental Award for Outstanding Achievement."

The District also conducted an additional 60 workshops throughout the Valley since 2005 for the purpose of assisting sources to comply with the CMP rule and other ag-related issues and requirements.

EPA finalized approval of Rule 4550 on February 14, 2006 and determined that the rule met BACM requirements.[58] Subsequent to EPA's approval of Rule 4550, two separate lawsuits were filed challenging EPA's approval of the rule as satisfying BACM. The Ninth District Court of Appeals, in both cases, agreed with EPA's approval and reaffirmed EPA's finding that the District's Rule 4550 meets BACM requirements.[59,60]

EMISSIONS INVENTORY

While Rule 4550 was designed to reduce PM10, and was very successful in doing so, it also generates reductions of PM2.5, as discussed in more detail later in this chapter. The emissions inventory for the category, as impacted by the current rule, is as follows:

POLLUTANT	2013	2017	2019	2020	2022	2023	2024	2025	2026	2028
	Annual Average - Tons per day									
PM2.5	18.78	18.46	18.30	18.22	18.06	17.98	17.90	17.82	17.74	17.58
NOX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Winter Average - Tons per day									
PM2.5	15.05	14.74	14.59	14.51	14.35	14.28	14.20	14.12	14.04	13.89
NOX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

SOURCE CATEGORY

This rule is applicable to on-field farming and agricultural operation sites located within the Valley, and was adopted to reduce emissions of PM10 from such operations. Rule 4550 limits fugitive dust emissions from farming operations by requiring CMP plans for farms with 100 acres or more, dairies with 500 or more mature cows, cattle feedlots with

[58] 71 Federal Register 30, 7683-7688. (2006, February 14). *Revisions to the California State Implementation Plan; San Joaquin Valley Unified Air Pollution Control District*. Retrieved from http://www.gpo.gov/fdsys/pkg/FR-2006-02-14/pdf/06-1311.pdf

[59] U.S. Court of Appeals for the Ninth Circuit. *Latino Issues Forum v. EPA.* Retrieved from http://njlaw.rutgers.edu/collections/resource.org/fed_reporter/NEWcircs/cir9/0671907_cir9.html

[60] SJVAPCD. *Court rules in favor of Air District ag rule. Second decision this week affirms PM progress.* Retrieved from https://www.valleyair.org/recent_news/Media_releases/2009/PR%20Court%20decision%20favors%20District%20ag%20rule.pdf

190 or more cows, turkey ranches with 55,000 or more turkeys, chicken ranches with 125,000 or more chickens, and chicken egg ranches with 82,000 or more laying hens.

Rule 4550 specifies that agricultural operations must select at least one CMP from each of the identified applicable CMP categories discussed below, and as many as three CMPs per category, to control PM10 emissions. There are five CMP categories for the cropland source category, four CMP categories for the dairy source category, four CMP categories for the feedlot source category, and five CMP categories for the poultry source category. Animal feeding operation (AFO) sources subject to Rule 4550 that also grow field crops must select CMPs for their field crops, as well as their AFO. The selected CMPs must be noted on the applications provided and then submitted to the District for approval. Completed applications constitute a CMP Plan once approved by the District.

Emissions from agricultural operations vary by many factors, some beyond the control of the agricultural operations. Particulate emissions (primarily PM10) are generated during land preparation activities, harvest activities, and post-harvest activities. Emissions are caused by the mechanical disturbance of the soil by implements and the tractors pulling them, resulting in the entrainment of soil or plant materials into the air. Wind blowing across exposed agricultural land also causes the entrainment of particulates into the air. In addition, particulate emissions can also become entrained from vehicular travel over unpaved roads and unpaved parking/equipment areas. Conservation management practices fall into several broad categories and are intended to reduce emissions as follows:

- The reduction of soil or manure disturbance;
- Soil protection from wind erosion;
- Equipment modifications to physically produce less particulates; and
- Application of water or dust suppressants on unpaved roads and other travel areas to reduce emissions entrained by moving vehicles and equipment.

Fugitive PM2.5 Dust Emissions from Agricultural Operations

Rule 4550 was intended and designed to reduce PM10, and it has been successful in doing so, reducing 35.3 tons per day of PM10 from agricultural operations. However, as discussed in more detail below, recent studies have indicated that the PM2.5 fraction of emissions makes up a small portion of the total particulate emissions from agricultural operations, and therefore Rule 4550 and other conservation management-based rules are less effective at reducing PM2.5.

Additionally, particulate emissions from agricultural operations are geologic in nature (dust). Analysis of data from ambient PM2.5 monitors has demonstrated that these geologic particulate emissions make up a relatively small portion of the overall PM2.5 concentrations during the winter season.[61] In addition, these geologic particulate

[61] See: California Air Resources Board (2016) Meeting PM2.5 Standards in the San Joaquin Valley. Public Workshop. Fresno, CA. December 1, 2016. https://www.arb.ca.gov/planning/sip/sjvpm25/workshopslides.pdf and

emissions in the San Joaquin Valley have relatively low toxicity relative to the organic carbon fraction of PM2.5 and to re-suspended road dust. [62]

Accordingly, particulate emissions from agricultural sources do not play a significant role with regard to attainment of the PM2.5 standards addressed by this plan, and Rule 4550 remains primarily a PM10 reduction strategy. For example, the latest available speciation analyses of PM2.5 from the Speciated Trends Network in Bakersfield, Modesto, and Visalia found that the annual average geologic fraction during 2011-2013 was 12%, 5%, and 6%, respectively, and the speciation analysis of PM2.5 in Fresno during 2012-2014, found that the annual average geologic fraction was 7%.[63] Given that PM2.5 emissions from agricultural field operations are generally subject to deposition near their source, the predominant source of this geologic PM2.5 would be urban re-suspended road dust with relatively little contribution from agricultural activities.[64]

As discussed below, the most recent science has demonstrated that PM2.5 emissions from agricultural field operations had previously been significantly over-estimated in absolute terms due to species differences between the fine and coarse fractions of geologic emissions. For example, in 2003, Countess Environmental estimated the PM2.5/PM10 ratios for the predominant trace elements found in fugitive dust using Valley ambient measurements of such elements. The average ratio for aluminum and silicon was 0.05 and ranged between 0.10 to 0.16 for calcium, titanium, and iron. Based on the relative abundances of these elements in fugitive dust, the overall PM2.5/PM10 ratio was estimated to be 0.06 (6%).[65] This ratio estimate is substantially lower than the ratio of 0.20 that Midwest Research Institute (MRI) previously recommended, based on limited supporting data and broad assumptions, as an interim revision to the PM2.5/PM10 ratio for agricultural crops nationwide in 1996. Note that the MRI's 1996

California Air Resources Board (2012) ARB Staff Report: Proposed Revision to the PM2.5 State Implementation Plan (SIP) for the San Joaquin Valley, Appendix B: Weight of Evidence Analysis. https://www.arb.ca.gov/planning/sip/sjvpm25/2012plan_appendix_b.pdf

[62] Veranth, J., Rielly, C.A., Veranth, M.M., Moss, T.A., Langelier, C.R., Lanza, D.L., & Yost, G.S. (2004). Inflammatory Cytokines and Cell Death in BEAS-2B Lung Cells Treated with Soil Dust, Lipopolysaccharide, and Surface-Modified Particles. *Toxicological Science 82(1)*, 88–96. http://toxsci.oxfordjournals.org/content/82/1/88.full.pdf+html doi: 10.1093/toxsci/kfh24

Rogge, W. F., Hildemann, L. M., Mazurek, M. A., Cass, G. R. and Simoneit, B. R. T. *Sources of Fine Organic Aerosol—3. Road Dust, Tire Debris, and Organometallic Brake Lining Dust—Roads as Sources and Sinks*. Environmental Science & Technology 27(9), 1892-1904. 1993.

[63] California Air Resources Board (2016) ARB Staff Report: ARB Review of San Joaquin Valley 2016 Moderate Area Plan for the 2012 PM2.5 Standard https://www.arb.ca.gov/planning/sip/sjvpm25/2016pm25/2016pm25staffreport.pdf

San Joaquin Valley Air Pollution Control District (SJVAPCD) 2016 Moderate Area Plan for the 2012 PM2.5 Standard, Chapter 2 Risk-Based Strategy. http://www.valleyair.org/Air_Quality_Plans/docs/PM25-2016/2016-Plan.pdf

California Air Resources Board (2015) Modeling Documentation for the 2015 PM2.5 Plan for the San Joaquin Valley, Methodology and Results - Attainment Demonstration for the San Joaquin Valley 2015 PM2.5 Plan for the Annual (15 µg/m3) and 24-Hour (65 µg/m3) Standards. https://www.arb.ca.gov/planning/sip/planarea/Attainment_Demo_Methodology_and_Results.pdf

[64] Countess, R. (2001) Methodology for Estimating Fugitive Windblown and Mechanically Resuspended Road Dust Emissions Applicable for Regional Air Quality Modeling, 10th Annual EPA Emissions Inventory Meeting, Denver, CO. May 1-3, 2001. https://www3.epa.gov/ttnchie1/conference/ei10/fugdust/countess.pdf

[65] Countess, R. (2003) Reconciling Fugitive Dust Emission Inventories with Ambient Measurements, 12th Annual EPA Emissions Inventory Meeting, San Diego, CA. April 29-May 1, 2003. https://www.epa.gov/ttn/chief/conference/ei12/fugdust/countess.pdf https://www.epa.gov/ttn/chief/conference/ei12/fugdust/present/countess.pdf

interim revision to the PM2.5/PM10 ratios for fugitive dust sources was meant to improve the PM2.5/PM10 ratios that MRI had previously developed based on data from cascade impactors in the 1980's, which had also been shown to significantly overestimate PM2.5 emissions. As described by Thomas Pace of US EPA at the 2005 US EPA Emissions Inventory Conference, MRI's 1996 interim revision to the PM2.5/PM10 ratios for fugitive dust still appeared to overestimate PM2.5 emissions. Pace's review of the most recent research on PM2.5/PM10 ratios nationally shows a consistent mid-point estimate of between 0.10 and 0.12, [66] which is consistent with the higher-end values seen in the Valley. To summarize, PM2.5 comprises a small fraction of total PM10 emissions from agricultural field operations in the Valley, approximately 6% to 12%.

Pace concludes that both PM2.5 emissions from agricultural field operations as well as their contribution to ambient PM2.5 concentrations had previously been significantly overestimated. Factors that contributed to this previous overestimation of PM2.5 emissions from agricultural operations included: (1) the multiplier used to infer PM2.5 from PM10 emissions, (2) difficulty in obtaining activity data to apply to emission factor algorithms, and (3) modeling transport over-estimation (especially in the treatment of particles near their point of emissions).[67]

In respect to over-estimation of PM2.5 transport, much of the ground level fugitive dust from soil disturbance is likely to be removed close to the source.[68] This is due to the low release height and turbulence which keeps particles temporarily close to the surface where they are subject to removal by impaction on nearby surfaces, including vegetation and structures. Equally significant in respect to the previous over-estimation of PM10 and PM2.5, earlier grid models ignored all removal processes in the grid cell where the emissions originate. Given that 4 kilometers is a typical grid dimension, a considerable fraction of PM2.5 emitted under normal field operations could and often would be deposited within that cell, but models ignored such deposition.

Wind-blown Dust in the Valley

Although the Valley may occasionally experience wind-blown dust events from time to time, these events typically do not coincide with the winter period in which the PM2.5 concentrations in the Valley are the highest. For example, both Fresno and Bakersfield have seasonal variation in wind speeds throughout the year with the highest average wind speeds in Fresno occurring from April to July with highest wind speeds in late May and early June, and the highest average wind speeds in Bakersfield occurring from late

[67] Pace, T.G., US EPA (2005) Examination of the Multiplier Used to Estimate PM2.5 Fugitive Dust Emissions from PM10, 14th Annual EPA Emissions Inventory Meeting, Las Vegas, Nevada, April 11 - 14, 2005.
https://www3.epa.gov/ttnchie1/conference/ei14/session5/pace.pdf
https://www3.epa.gov/ttnchie1/conference/ei14/session5/pace_pres.pdf

[68] Countess, R. (2001) Methodology for Estimating Fugitive Windblown and Mechanically Resuspended Road Dust Emissions Applicable for Regional Air Quality Modeling, 10th Annual EPA Emissions Inventory Meeting, Denver, CO. May 1-3, 2001. https://www3.epa.gov/ttnchie1/conference/ei10/fugdust/countess.pdf
Fitz, D., Pankratz, D., Philbrick, R., and Li, G. (2003) Evaluation of Fugitive Dust Deposition Rates Using Lidar, 12th Annual EPA Emissions Inventory Meeting, San Diego, CA. April 29-May 1, 2003.
https://www3.epa.gov/ttnchie1/conference/ei12/fugdust/fitz.pdf
https://www.epa.gov/ttn/chief/conference/ei12/fugdust/present/fitz.pdf

March to mid-July with the highest wind speeds typically in late May. [69] These high wind events are less likely to occur during the winter season, in which PM2.5 concentrations are elevated during stagnation events that are characterized by low wind speeds, moderate temperatures, vertical atmospheric stability, and high relative humidity.

These high wind events primarily cause higher PM10 concentrations, but rarely result in elevated PM2.5 concentrations. In addition to the rarity of elevated PM2.5 concentrations during high-wind events, the PM2.5 values recorded during the strong stagnation periods of the winter season are usually much higher than those recorded during wind events. Because of this, the Valley's PM2.5 design values are driven primarily by high winter-time concentrations, mostly due to organic carbon and the secondary formation of ammonium nitrate. Comparatively, the geologic component of the Valley's peak PM2.5 concentrations is only a fraction of the mass formed through secondary processes and other sources (less than 6%).[70]

As a result of the facts discussed above, the wind events experienced in the Valley are not a significant contributor to the 24-hr PM2.5 attainment challenges for the region, and have essentially no impact on annual PM2.5 averages.

HOW DOES DISTRICT RULE 4550 COMPARE WITH FEDERAL AND STATE RULES AND REGULATIONS?

Federal Regulations

There are no air quality requirements such as federal NSPS, NESHAP, MACT, CTGs, and ACTs for this source category.

State Regulations

There are no state regulations that are applicable to this source category.

HOW DOES DISTRICT RULE 4550 COMPARE TO RULES IN OTHER AIR DISTRICTS?

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 BACM requirements of CAA 189(b).

[69] Retrieved from https://weatherspark.com

[70] California Air Resources Board (2012) ARB Staff Report: Proposed Revision to the PM2.5 State Implementation Plan (SIP) for the San Joaquin Valley, Appendix B: Weight of Evidence Analysis. https://www.arb.ca.gov/planning/sip/sjvpm25/2012plan_appendix_b.pdf

For this Plan, the PM2.5 reduction requirements and applicability of Rule 4550 were compared to analogous rules in other air districts and states to determine the stringency of Rule 4550 compared to those other rules. The District found three analogous rules, in Arizona, South Coast AQMD, and Imperial County APCD.

However, it should be noted that our examination found that each of the rules discussed below were developed to reduce PM10 emissions from agricultural operations in PM10 non-attainment areas. This was the situation for the District CMP rule, as well – in fact, we believe that the District's ground-breaking CMP program was a significant contributor to the District's subsequent attainment of the PM10 standard.

None of these rules was developed or modified for the purpose of generating PM2.5 reductions, or as a part of a PM2.5 attainment planning process. As discussed above, PM2.5 is a small fraction of the PM10 from agricultural operations, and the effectiveness of controlling PM2.5 with such measures is not as well understood as the effectiveness of controlling PM10. Since the degree of effectiveness in controlling PM2.5 is not well understood, the corresponding cost-effectiveness of implementing CMPs for the purposes of controlling PM2.5 is also unknown. Because of these factors, none of the three rules listed below can be considered to establish BACM or MSM for PM2.5.

Nonetheless, the District examined the following rules and found that District Rule 4550 was, overall, as stringent or more stringent than each of them:

> ***Arizona Department of Environmental Quality-Agricultural Best Management Practices (BMPs)*** *(Amended June 30, 2010)*
>
> ***SCAQMD Rule 403 (Fugitive Dust)*** *(Amended June 3, 2005)*
>
> ***Imperial County APCD Rule 806 (Conservation Management Practices)*** *(Amended October 16, 2012)*

In January of 2016, the federal EPA agreed with this position, as published in their evaluation of the District's CMP rule as a part of a Technical Support Document (TSD) related to their proposed approval of the District's 2015 PM2.5 Plan. In that TSD, EPA found that District Rule 4550 meets BACM and MSM requirements and "is at least as stringent as the analogous rules implemented elsewhere." In their approval, EPA specifically cited the significantly superior enforcement mechanisms in the District regulation, including:

- It is the only rule to require applications to be filed, specifying the CMPs to be employed,
- It requires an approval process of the chosen CMPs, unlike the other analogous rules,
- It is the only rule to require owner/operators to maintain records for five years,
- It is the only rule to require confirmation of CMP implementation and demonstrations for claimed exemptions.

EVALUATION FINDINGS

As noted above, the existing District Rule 4550 has been found by the District and the federal EPA to establish RACM, BACM, and MSM level PM2.5 requirements for this source category.

While the attainment modeling process has demonstrated that additional CMPs will not significantly contribute to our attainment efforts, to further develop the District's understanding of the effectiveness of CMP measures on controlling PM2.5 emissions in the Valley, the District is committing to undertaking scientific research on the PM2.5 content, constituents, and stability during wind events of the many soil types found throughout the Valley. This research would be conducted in close coordination with USDA-NRCS, agricultural sources, researchers through established processes including the San Joaquin Valleywide Air Pollution Study Agency, Policy Committee, and Agricultural Technical Subcommittee.

Although Rule 4550 already meets RACM, BACM, and MSM for this source category, the District will go beyond MSM in this Plan and is committing to further evaluate ways to promote conservation tillage practices and to reduce dust from agricultural operations to the extent that they are found to practicably reduce PM2.5, using the following process. The District will work with the Agricultural Technical Committee (AgTech) to evaluate the feasibility and effectiveness of requiring the selection of additional control measures to achieve additional PM2.5 emissions reductions from tilling and other land preparation activities based on the research discussed above. More widespread implementation of conservation tillage practices such as cover cropping, no till, low till, strip till, and precision agriculture, through additional incentives under Rule 4550, may help to further limit PM2.5 in the Valley. To this end, the District will evaluate measures to promote the selection of conservation tillage as a CMP for croplands.

The District will evaluate the feasibility and effectiveness of CMPs on fallow lands that are tilled or otherwise worked with implements of husbandry to reduce windblown PM2.5 emissions from disturbed fallowed acreage. This evaluation will rely on additional research, in coordination with USDA-NRCS, agricultural sources, and researchers, which recognizes the Valley's unique soil characteristics and agricultural practices to ensure that Valley-specific solutions are considered in this process.

C.16 Rule 4692 (Commercial Charbroiling)

Discussion

The charbroiling source category consists of two types of commercial charbroilers: chain-driven and underfired. 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 underfired charbroiler has a metal "grid," a heavy-duty grill similar to that of a home barbecue, with gas burners, electric heating elements, or solid fuel (wood or charcoal) located under the grill to provide heat to cook the food. The smoke and vapors generated by cooking on either type of charbroiler contain water, 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 particulate pollution are exhausted outside the restaurant, unless a secondary control is installed.

The emission inventory for the source category of commercial charbroiling is comprised of both chain-driven and underfired charbroilers (see table below). Underfired charbroiling is responsible for approximately 89% of the PM 2.5 emissions for this source category, or 2.57 tons per day (tpd) of the 2.89 tpd emitted from commercial charbroiling in the Valley in 2013. Commercial charbroiling emissions contribute a significant fraction of the PM2.5 found in urban areas. A California Regional Particulate Air Quality Study (CRPAQS) study conducted in Fresno estimated that meat cooking contributed 6 to 14% of organic carbon aerosol found in the city. The same study found that charbroiled hamburger emits up to 40 grams of fine aerosol per kilogram of meat cooked, versus 7 grams per kilogram for extra lean meat. As underfired charbroilers are the majority of the remaining total commercial charbroiling inventory, and because these units are currently unregulated in the Valley, there is a large potential to achieve emissions reductions from the regulation of underfired charbroiling emissions.

Emissions Inventory

POLLUTANT	2013	2017	2019	2020	2022	2023	2024	2025	2026	2028
	Annual Average - Tons per day									
PM2.5	2.89	3.06	3.16	3.21	3.30	3.36	3.41	3.46	3.51	3.62
NOX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Winter Average - Tons per day									
PM2.5	2.89	3.06	3.16	3.20	3.30	3.35	3.41	3.46	3.51	3.62
NOX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Source Category

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. Rule 4692 requires emission controls for chain-driven charbroilers that cook 400 pounds of meat or

more per week. Rule 4692 does not currently require emissions controls for underfired charbroilers.

Catalytic oxidizers are not effective for reducing emissions from underfired charbroilers because the exhaust from these devices loses heat as it is directed to the control device, and the reactions at the catalyst cannot take place under these lower temperatures. In a chain-driven charbroiler, charbroiling 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. Controlling emissions from underfired charbroilers has proven to be far more challenging. To date, no cost-effective technologies have been demonstrated as achieved in practice. As such, the rule currently does not have requirements specific to underfired charbroilers.

The original rule, adopted in March 2002, reduced PM2.5 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 PM2.5 chain-driven charbroiler emissions. EPA finalized approval for Rule 4692 on November 3, 2011.[71]

HOW DOES DISTRICT RULE 4692 COMPARE WITH FEDERAL AND STATE RULES AND REGULATIONS?

Federal Regulations
There are no EPA CTG, ACT, NSPS, NESHAP, or MACT requirements for this source category.

State Regulations
There are no state regulations applicable to air quality from commercial charbroiling activities.

HOW DOES DISTRICT RULE 4692 COMPARE TO RULES IN OTHER AIR DISTRICTS?

There are no analogous rules for this source category in SMAQMD.

BAAQMD

- BAAQMD Regulation 6 Rule 2 (Commercial Cooking Equipment) *(Last amended December, 5, 2007)*

BAAQMD Regulation 6 Rule 2 regulates both chain-driven and under-fired units, and was adopted on December 5, 2007. Operations that become subject to the rule requirements with chain-driven charbroilers are required to install a certified control device to limit PM10 emissions to not more than 1.3 pounds PM10 per 1,000 lbs of beef cooked. 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 also apply to pre-existing units. This

[71] EPA Federal Register, Volume 76 No. 213. (November 3, 2011). Codified at: 40 C.F.R. pt. 52

rule exempts low-use chain-driven charbroilers that grill less than 400 lbs of beef per week, and exempts underfired charbroilers that grill less than 800 lbs of beef per week. Although this rule was adopted in 2007 and has had requirements in effect since 2010, the majority of under-fired charbroilers in the Bay Area are able to avoid the control requirements based on the established grill size and throughput exemptions. Additionally, since adoption of the rule, the BAAQMD has not certified any compliant control devices. BAAQMD has not been enforcing this rule or doing inspections on restaurants until they create a list of certified, approved technology, and as a result, no installations of controls has occurred under this rule.

The District evaluated the requirements contained within BAAQMD's Regulation 6, Rule 2 and found no requirements that were more stringent than those already in Rule 4692 for chain-driven charbroilers.

	SJVAPCD Rule 4692	BAAQMD Regulation 6 Rule 2
Applicability	Chain-driven charbroilers and underfired charbroilers at commercial cooking operations.	Chain-driven charbroilers and underfired charbroilers at commercial cooking operations.
Exemption	Charbroilers that cook less than 400 lbs of meat per week, or less than 10,800 lbs of meat per week and the total amount of meat cooked per week does not exceed 875 lbs.	Chain-driven charbroilers that cook less than 400 lbs of beef per week; underfired charbroilers which cook less than 800 lbs of beef per week
Requirements	Requires that chain-driven charbroilers reduce PM emissions by 83% through the installation of an approved catalytic oxidizer. Registration requirements for under-fired charbroilers. Weekly record-keeping requirement for both charbroiler categories.	Requires the installation of a certified catalytic oxidizer (controlled to 1.3 lbs of PM10 and 0.32 lbs VOCs per 1,000 lbs of beef cooked) Underfired Charbroiler requirements specify that emissions be limited to no more that 1lb PM10 per 1000 lbs of beef cooked for new and existing units.

New York Department of Environmental Protection (NYDEP)

- City of New York Title 24 of the Administrative Code, Section 24-149.4 (Emission Reduction Technologies for Char Broilers) *(Amended May, 2016)*

Passed in May, 2016, this rule essentially requires the installation of a control device which is certified to provide at least 75% emissions reductions for new underfired charbroilers and for any new or existing chain-driven charbroiler used to cook 875 lbs or more of meat per week. Registration and the payment of a $100 administration fee are required for existing charbroiler units. Consideration of control requirements for existing units has been pushed back until at least 2019 due to the feasibility questions and higher cost of retrofitting existing operations. New York staff are in the introductory stages of establishing an inventory and planning for inspections and enforcement, with no control installations yet required under the rule.

The requirements of District Rule 4692 are more stringent that those found in NYC's Section 24-149.4 for chain-driven charbroilers. The District has recently amended Rule 4692 to require the registration of underfired charbroiler units, and is evaluating the feasibility of controls for new and existing underfired units.

	SJVAPCD Rule 4692	NYDEP Title 24 §24-149.4
Applicability	Chain-driven charbroilers and underfired charbroilers at commercial cooking operations	Chain-driven charbroilers and underfired charbroilers at commercial cooking operations
Exemption	Charbroilers that cook less than 400 lbs of meat per week, or less than 10,800 lbs of meat per week and the total amount of meat cooked per week does not exceed 875 lbs.	Charbroilers that cook less than 875 lbs of meat per week
Requirements	Requires that chain-driven charbroilers reduce PM emissions by 83% through the installation of an approved catalytic oxidizer. Registration requirements for under-fired charbroilers. Weekly record-keeping requirement for both charbroiler categories.	**Chain-driven**: requires catalytic oxidizer or control of PM10 by 75%. **Under-fired:** Registration requirement for existing units. New units required to install control devices to limit PM emissions by 75% (currently unenforced)

SCAQMD

- SCAQMD Rule 1138 (Control of Emissions from Restaurant Operations) *(Amended November 14, 1997)*

In November 1997, South Coast Air Quality Management District (SCAQMD) adopted Rule 1138, which achieved 0.5 tons per day of PM10 emissions from chain-driven charbroilers. In 1999 they amended their attainment plan to include a commitment to further reduce 0.9 tons per day of VOC and 7.0 tons per day of PM10 emissions. However, in August 2000, SCAQMD staff reported that cost-effective controls for under-fired charbroilers were limited and recommended substituting the remaining 0.9 tons per day of VOC emissions reductions assigned to this category with reductions from another control measure. Their 2003 air quality management plan (AQMP) included reducing PM10 from under-fired charbroilers by 1 ton per day by 2010. A report to the SCAQMD Board in 2004 demonstrated that controls from under-fired charbroilers were infeasible and again substituted emissions reductions from other adopted rules. To help advance the demonstration of these technologies, South Coast recommended funding for demonstration projects and their Board approved $200,000 to fund six to eight new or retrofit demonstration sites on large restaurants. However, no applications were received for that program. In 2008-2009, SCAQMD staff reinitiated rule development for restaurants with under-fired charbroilers and held a series of working group meetings and a public workshop. Due to lack of demonstrable cost-effective and affordable control technologies SCAQMD staff determined rule adoption at that time was not feasible.

The recent amendment of the SCAQMD air quality management plan included the future adoption of a rule for underfired charbroilers as a contingency measure.
The District evaluated the requirements contained within SCAQMD's Rule 1138 and found no requirements that were more stringent than those already in Rule 4692.

	SJVAPCD Rule 4692	SCAQMD Rule 1138
Applicability	Chain-driven charbroilers and underfired charbroilers at commercial cooking operations	Chain-driven charbroilers
Exemption	Charbroilers that cook less than 400 lbs of meat per week, or less than 10,800 lbs of meat per week and the total amount of meat cooked per week does not exceed 875 lbs	Exempt if (1) accept a permitting condition limiting the amount of meat cooked to less than 875 lbs per week; or (2) submit testing showing that emissions are less that 1lb per day
Requirements	Requires that chain-driven charbroilers reduce PM emissions by 83% through the installation of an approved catalytic oxidizer. Registration requirements for under-fired charbroilers. Weekly record-keeping requirement for both charbroiler categories.	Only operate a chain-driven charbroiler with an approved catalyst, plus maintenance requirements and recordkeeping.

VCAPCD

- VCAPCD Rule 74.25 (Restaurant Cooking Operations) *(Amended October 12, 2004)*

VCAPCD Rule 74.25 applies to all conveyorized charbroilers, and requires that the owner of a conveyorized charbroiler reduce ROG and PM emissions by 83% through the installation of a certified control device. The rule exempts charbroilers placed into service before October 12, 2005, that cook less than 875 pounds per week. The District evaluated the requirements contained within VCAPCD's Rule 74.25 and found no requirements that were more stringent than those already in Rule 4692.

	SJVAPCD Rule 4692	VCAQMD Rule 74.25
Applicability	Chain-driven charbroilers and underfired charbroilers at commercial cooking operations	Conveyorized (chain-driven) charbroilers)
Exemption	Charbroilers that cook less than 400 lbs of meat per week, or less than 10,800 lbs of meat per week and the total amount of meat cooked per week does not exceed 875 lbs.	Charbroilers placed into service prior to Oct. 2005 that cook less than 875 lbs per week (no exemption for throughputs for units installed after Oct. 2005)
Requirements	Requires that chain-driven charbroilers reduce PM emissions by 83% through the installation of an approved catalytic oxidizer. Registration requirements for under-fired charbroilers. Weekly record-keeping requirement for both charbroiler categories.	Requires the installation of an approved control device to reduce PM emissions by 83%.

ADDITIONAL EMISSION REDUCTION OPPORTUNITIES

EPA interprets MSM to assure additional controls that can be feasibly implemented beyond the set of measures adopted as BACM are implemented. This is done through evaluation of expanding rule applicability, or re-analyzing measures that were rejected during the BACM analysis to see if they are now feasible. Beyond the review of current regulation and rule requirements, the District performed an extensive review of the feasibility of expanding applicability or removal of exemptions for this source category, technologies and measures that have been implemented in practice in other regions, and potential new technologies and measures that may be feasible for implementation in the near future.

Pursuant to District Rule 4692 and District Rule 2010 (Permits Required), all chain-driven charbroilers are required to have a Permit to Operate. A 2018 review of District permits showed that all commercial cooking operations with a permit for chain-driven charbroilers had applied for a permit level which exceeds the 400 lbs. per week limit, even if their actual throughput was below this amount. These operations installed and maintain an approved catalytic oxidizer for compliance with their permit requirements. Due to the requirement for all operations with a chain-driven charbroiler to obtain a Permit to Operate, and because all permits are currently for an amount above the exemption limit, all permitted charbroilers in the Valley have installed a catalytic oxidizer. No emission reductions would occur from lowering the exemption level for chain-driven charbroilers.

For this attainment plan, the District evaluated the feasibility of requiring pollution controls for commercial cooking operations with underfired charbroilers. District staff have made the following findings with respect to the current state of underfired charbroiling control technologies:

- *There has been an increasing number of particulate control technology installations primarily at new or newer restaurants in response to local ordinances and nuisance concerns*: Based on discussions with control technology manufacturers and vendors, an increasing number of particulate control technologies have been installed at restaurants in dense urban areas to address nuisance requirements and concerns. The majority of these installations have been at new or newer restaurants. It is unclear how many of these installations have been at restaurants with underfired charbroilers as it has been difficult to obtain this information from technology vendors and restaurants directly. Restaurants that the District has been able to identify as having installed underfired charbroiling control technologies include Chipotle (multiple installations outside of Valley), Yard House (multiple installations outside of Valley), Bourbon's Steak & Pub at Levi's Stadium (San Francisco, CA), Deli Delicious (Visalia, CA), Season's 52 (multiple installations outside of Valley), Capital Grill (multiple installations outside of Valley), and the Habit Burger Grill (multiple installations inside and outside of Valley).

- *Retrofitting controls on existing restaurants can be prohibitively expensive and technologically infeasible*: Based on discussions with restaurant operators,

technology vendors, and other regulatory agencies, it can be extremely difficult and cost-prohibitive to add controls on existing restaurants. The installation may require structural, electrical, or water-line modifications that may not be feasible. This makes installation costs much higher for existing restaurants compared to new restaurants that can integrate emissions controls into the design. The existing structure may not have the necessary space or structural support for the control unit. Installing the control equipment may require the restaurant to temporarily shut down, resulting in loss of revenue. Furthermore, the existing restaurant may not have the authority to make changes to the building if the space is leased and the landlord is unwilling to accommodate.

- *Installation cost of controls can be prohibitively expensive*: The cost of control units themselves are expensive, ranging from $30,000 up to $80,000 for the most complicated unit configurations. In addition, installation costs range from $10,000 to $20,000 for new construction and $20,000 to $60,000 or higher, depending on the structural and electrical modifications required, for retrofits. It is possible that some high-volume restaurants may be able to support this cost, but restaurants with less income would be financially unable to install these units without incentive support.

- *Maintenance of controls can be prohibitively expensive*: Regular maintenance of control devices is critical to ensure control effectiveness. Depending on the control technology and the type and volume of food cooked, filter change-out is required on a monthly or quarterly basis, with more in-depth filter replacement or unit cleaning required annually. Annual maintenance costs including both labor and materials starts around $6,000 and can exceed $100,000 for the highest volume restaurants with solid-fuel fired underfired charbroilers.

- *Maintenance requires specially trained staff that may not be accessible to all restaurants*: Control device cleaning is a complex process, requiring specially trained staff. Training restaurant staff to perform this task may not be feasible, and service companies capable of performing the maintenance may not be readily available nearby. Any delays in required maintenance could cause significant economic impacts to restaurants.

Due to the potential lack of economic and technological feasibility of requiring these controls, the District is first seeking to require registration of underfired charbroilers pursuant to Rule 2250 (Permit-Exempt Equipment Registration) and recently amended Rule 4692 to require the submittal of a one-time report from all Valley commercial cooking operations with an underfired charbroiler. This report will detail meat throughputs, hours of operation, and any installed control technology. Information obtained through the registration and reporting process will be used to further evaluate the feasibility of requiring controls for this source category.

EVALUATION FINDINGS

The District has evaluated all potential control technologies and all control technologies achieved in practice in other areas or included in other state implementation plans for this source category. As demonstrated above, Rule 4692 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds RACM, BACM, and MSM requirements for this source category.

After thorough review of potential opportunities to reduce emissions from this source category, the District amended Rule 4692 to implement a registration and reporting requirement for underfired charbroiler operations in order to gather better inventory and emissions information for this source category. Using new survey and registration information, the District will pursue reductions in commercial underfired charbroiler emissions through an incentive-based approach to fund the installation of controls for commercial underfired charbroilers within urban boundaries in hot-spot areas of Fresno, Kern, and Madera counties, with a future year regulatory requirement to encourage participation by Valley businesses.

C.17 Rule 4702 (Emissions from Internal Combustion Engines)

Discussion

Rule 4702 applies to any internal combustion (IC) engine rated at 25 brake horsepower (bhp) or greater. The purpose of this rule is to limit NOx, CO, VOC, and SOx emissions from units subject to this rule.

The District's original IC engine rule, Rule 4701 (Internal Combustion Engines – Phase 1), was adopted on May 21, 1992, superseded by Rule 4702, adopted on August 21, 2003, and subsequently amended five times. The rule established NOx limits between 25-50 ppmv achieving 90-96% control for non-agricultural operation rich-burn engines, and 65-75 ppmv achieving 85-90% control for non-agricultural operation lean-burn engines.

Substantial emission reductions from agricultural IC engines have also been achieved through a combination of regulatory efforts and incentive actions. Rule 4702 has reduced emissions from agricultural engines by 84% since the 2005 amendments to the rule, with substantial investments being made by the affected sources to comply with the rule. This effort included working closely with agricultural sources, investor owned utilities, and the U.S. Department of Agriculture-Natural Resources Conservation Service to develop a collaborative model of extensive outreach, strong incentives to assist in defraying high costs, and significant investments from agricultural sources to replace thousands of agricultural engines to comply with Rule 4702. The rule was further strengthened in August 2011 when rule amendments implemented more stringent NOx limits as low as 11 ppmv for spark-ignited engines used in non-agricultural operations.

Emissions Inventory

POLLUTANT	2013	2017	2019	2020	2022	2023	2024	2025	2026	2028
	Annual Average - Tons per day									
PM2.5	0.49	0.30	0.29	0.28	0.26	0.25	0.24	0.23	0.22	0.21
NOX	12.94	6.89	6.46	6.18	5.72	5.52	5.34	5.16	5.00	4.67
	Winter Average - Tons per day									
PM2.5	0.36	0.24	0.23	0.22	0.21	0.20	0.20	0.19	0.19	0.18
NOX	9.37	5.29	5.01	4.79	4.46	4.33	4.20	4.08	3.97	3.75

Source Category

An internal combustion engine is an engine that operates by burning its fuel inside the engine. Engines generate power by the combustion of an air/fuel mixture. The main types of engines are spark-ignited engines and compression-ignited (or diesel) engines. In the case of spark-ignited engines, a spark plug ignites the air/fuel mixture. Spark-ignited engines come in several designs, including rich-burn and lean-burn. Spark-ignited engines may use one or more fuels, such as natural gas, propane, butane, liquefied petroleum gas, oil field gas, digester gas, landfill gas, methanol, ethanol, and gasoline. Compression-ignited engines rely on heating of the inducted air during the compression stroke to ignite the injected diesel fuel. In addition to being classified into compression-ignited and spark-ignited, IC engines can be further divided into two-stroke

and four-stroke engines. While larger diesel engines may be two-stroke, most diesel engines are four-stroke. Natural gas fired spark-ignited engines are usually four-stroke, two-stroke engines may be more appropriate for certain applications.

Internal combustion engines are used by a variety of private businesses and public agencies throughout the Valley for a number of purposes. Primary uses of IC engines in the Valley include powering irrigation pumps, compressors, or electrical generators. Examples of businesses and industries that use IC engines include schools and universities, agriculture, oil and gas production and pipelines, petroleum refining, manufacturing facilities, food processing, electrical power generation, landfill and waste water treatment facilities, and water districts. Many IC engines in the Valley are limited or low use in nature, such as emergency standby engines that provide backup power when electric service is interrupted.

HOW DOES DISTRICT RULE 4702 COMPARE WITH FEDERAL AND STATE RULES AND REGULATIONS?

Federal Regulations

There are no EPA Control Technique Guidelines (CTG) requirements for this source category.

Alternative Control Technology (ACT)

- EPA – 453/R-93-032 (Alternative Control Techniques Document – NOx Emissions from Stationary Internal Combustion Engines)

The District evaluated the requirements contained within the EPA – 453/R-93-032 ACT document and found no requirements that were more stringent than those already in Rule 4702.

Standards of Performance for New Stationary Sources (NSPS)

- 40 CFR 60 Subpart IIII (Standards of Performance for Stationary Compression Ignition Internal Combustion Engines)

The District evaluated the requirements contained within 40 CFR 60 Subpart IIII and found no requirements that were more stringent than those already in Rule 4702.

- 40 CFR 60 Subpart JJJJ (Standards of Performance for Stationary Spark Ignition Internal Combustion Engines)

The District evaluated the requirements contained within 40 CFR 60 Subpart JJJJ and found no requirements that were more stringent than those already in Rule 4702.

NESHAP/ MACT

- 40 CFR 63 Subpart ZZZZ (NESHAP for Stationary Reciprocating Internal Combustion Engines)

The District evaluated the requirements contained within 40 CFR 63 Subpart ZZZZ NESHAP and found no requirements that were more stringent than those already in Rule 4702.

State Regulations
The following state regulations apply to sources covered under Rule 4702:

- 17 CCR 93114 (ATCM to Reduce Particulate Emissions from Diesel-Fueled Engines—Standards for Nonvehicular Diesel Fuel)
- 17 CCR 93115 (ATCM for Stationary Compression Ignition Engines)

The District implements the requirements of 17 CCR 93114 and 17 CCR 93115 through Rule 4702 and the District's new source review permitting program (Rule 2201).

HOW DOES DISTRICT RULE 4702 COMPARE TO RULES IN OTHER AIR DISTRICTS?

The requirements and applicability of Rule 4702 were compared to analogous rules in other air districts and states to determine the stringency of Rule 4702 compared to those other rules.

BAAQMD

- BAAQMD Regulation 9 Rule 8 (Nitrogen Oxides and Carbon Monoxide from Stationary Internal Combustion Engines) *(Amended July 25, 2007)*

Although for one minor limited use category the BAAQMD rule may apply a more stringent limit, District Rule 4702 has significantly more stringent limits all other categories of engines. In addition, engines used for agricultural purposes are exempt from the BAAQMD rule, while District Rule 4702 has established NOx and PM limits for agricultural engines for many years. Therefore, the District found the requirements contained within BAAQMD Regulation 9 Rule 8 are not more stringent than those already in District Rule 4702.

	SJVAPCD Rule 4702	BAAQMD Regulation 9 Rule 8
Applicability	Internal combustion engine rated at ≥ 25 bhp	Internal combustion engine rated at ≥ 50 bhp
Exemption	Limited to operate less than 100 hrs/yr De-rated engine that has been physically limited and restricted by permit to an operational level of < 50 hp not used in agricultural operation (prior to 6/1/04) De-rated engine that has been physically limited and restricted by permit to an operational level of < 50 bhp used in agricultural operation (prior to 6/1/05)	Engines rated by < 50 bhp Low Use Engines (varying from 100 hrs to 200 hrs) Engines used directly and exclusively for the growing of crops or the raising of animals
	NOx Emission Limits **Non-Agricultural Operations (Non-AO) Engines Rated >50 bhp** *(corrected to 15% oxygen on a dry basis)*	

	SJVAPCD Rule 4702		BAAQMD Regulation 9 Rule 8
	Rich Burn-Waste Gas Fueled	50 ppmv or 90% reduction	70 ppmv
	Rich-Burn Cyclic Loaded, Field Gas Fueled	50 ppmv	No such category
	Rich-Burn Limited Use	25 ppmv	No such category
	Rich-Burn Engine, “not listed above"	11 ppmv	25 ppmv
	Lean-Burn Two-Stroke, Gaseous Fueled, >50 bhp and < 100 bhp	65 ppmv	No such category
	Lean-Burn Limited Use	65 ppmv	No such category
	Lean-Burn Engine Used for Gas Compression	65 ppmv or 93% reduction	65 ppmv
	Lean-Burn Waste Gas Fueled	65 ppmv or 90% reduction	70 ppmv
	Lean-Burn Engine, "not listed above"	11 ppmv	65 ppmv
	NOx Emission Limits for Agricultural Operations (AO) Spark-Ignited Engines Rated >50 bhp *(corrected to 15% oxygen on a dry basis)*		
	Rich-Burn Spark	90 ppmv or 80% reduction	Exempt
	Lean-Burn Spark	150 ppmv or 70% reduction	Exempt
	NOx Emission Limits for Agricultural Operations (AO) Certified Compression-Ignited Engine *(corrected to 15% oxygen on a dry basis)*		
	Tier 1 or Tier 2	Meet EPA Tier 4 by12 years after installation date, but not later than 6/1/2018	Exempt
	Tier 3 or Tier 4	Meet certified compression-ignited engine standard in effect at time of installation	Exempt

SMAQMD

- SMAQMD Rule 412 (Stationary Internal Combustion Engines at Major Stationary Sources of NOx) *(Adopted June 1, 1995)*

Although in theory the SMAQMD's general limits for rich burn engines may be more stringent than some specialized categories found in the District rule, it is unlikely that engines exist in many of those categories in the SMAQMD. District Rule 4702 has significantly more stringent limits for all identified engine categories, including the largest non-specialized use categories. In addition, agricultural engines are exempt from the SMAQMD rule, while District Rule 4702 has established NOx limits for agricultural engines for many years. Therefore, the District found the requirements contained within SMAQMD Rule 412 are not more stringent than those already in District Rule 4702.

	SJVAPCD Rule 4702		SMAQMD Rule 412
Applicability	Internal combustion engine rated at ≥ 25 bhp		Emissions limits apply to Internal combustion engine rated at ≥ 50 bhp
Exemption	Limited to operate less than 100 hrs/yr De-rated engine that has been physically limited and restricted by permit to an operational level of < 50 hp not used in agricultural operation (prior to 6/1/04) De-rated engine that has been physically limited and restricted by permit to an operational level of < 50 used in agricultural operation (prior to 6/1/05)		Engines used directly and exclusively for agricultural operations
	NOx Emission Limits **Non-Agricultural Operations (Non-AO) Engines Rated >50 bhp** *(corrected to 15% oxygen on a dry basis)*		
	Rich Burn-Waste Gas Fueled	50 ppmv or 90% reduction	No such category
	Rich-Burn Cyclic Loaded, Field Gas Fueled	50 ppmv	No such category
	Rich-Burn Limited Use	25 ppmv	No such category
	Rich-Burn Engine, "not listed above"	11 ppmv	25 ppmv
	Lean-Burn Two-Stroke, Gaseous Fueled, >50 bhp and < 100 bhp	65 ppmv	No such category
	Lean-Burn Limited Use	65 ppmv	No such category
	Lean-Burn Engine Used for Gas Compression	65 ppmv or 93% reduction	No such category
	Lean-Burn Waste Gas Fueled	65 ppmv or 90% reduction	No such category
	Lean-Burn Engine, "not listed above"	11 ppmv	65 ppmv
	NOx Emission Limits for Agricultural Operations (AO) **Spark-Ignited Engines Rated >50 bhp** *(corrected to 15% oxygen on a dry basis)*		
	Rich-Burn Spark	90 ppmv or 80% reduction	Exempt

	SJVAPCD Rule 4702		SMAQMD Rule 412
	Lean-Burn Spark	150 ppmv or 70% reduction	Exempt
	NOx Emission Limits for Agricultural Operations (AO) Certified Compression-Ignited Engine *(corrected to 15% oxygen on a dry basis)*		
	Tier 1 or Tier 2	EPA Tier 4 12 years after installation date, but not later than 6/1/2018	Exempt
	Tier 3 or Tier 4	Meet certified compression-ignited engine standard in effect at time of installation	Exempt

VCAPCD

- VCAPCD Rule 74.9 (Stationary Internal Combustion Engines) *(Amended November 8, 2005)*

Although in theory the VCAPCD's general limits for lean burn engines may be more stringent than some specialized categories found in the District rule, it is unlikely that engines exist in many of those categories in the VCAPCD. District Rule 4702 has significantly more stringent limits for all identified engine categories, including the largest non-specialized use categories. In addition, agricultural engines are exempt from the VCAPCD rule, while DIstrict Rule 4702 has established NOx limits for agricultural engines for many years. Therefore, the District found the requirements contained within VCAPCD Rule 74.9 are not more stringent than those already in District Rule 4702.

	SJVAPCD Rule 4702	VCAPCD Rule 74.9
Applicability	Internal combustion engine rated at ≥ 25 bhp	Internal combustion engine rated at ≥ 50 bhp
Exemption	Limited to operate <100 hrs/yr De-rated engine that has been physically limited and restricted by permit to an operational level of < 50 hp not used in agricultural operation (prior to 6/1/04) De-rated engine that has been physically limited and restricted by permit to an operational level of < 50 used in agricultural operation (prior to 6/1/05)	Engines rated < 50 hp Engines operating < 200 hrs/yr Engines rated < 100 hp, emitting no more than The rule exempts engines used directly and exclusively for the growing of crops or the raising of animals
	NOx Emission Limits Non-Agricultural Operations (Non-AO) Engines Rated >50 bhp *(corrected to 15% oxygen on a dry basis)*	

	SJVAPCD Rule 4702		VCAPCD Rule 74.9
	Rich Burn-Waste Gas Fueled	50 ppmv or 90% reduction	50 ppmv
	Rich-Burn Cyclic Loaded, Field Gas Fueled	50 ppmv	No such category
	Rich-Burn Limited Use	25 ppmv	No such category
	Rich-Burn Engine, “not listed above"	11 ppmv	25 ppmv
	Lean-Burn Two-Stroke, Gaseous Fueled, >50 bhp and < 100 bhp	65 ppmv	No such category
	Lean-Burn Limited Use	65 ppmv	No such category
	Lean-Burn Engine Used for Gas Compression	65 ppmv or 93% reduction	No such category
	Lean-Burn Waste Gas Fueled	65 ppmv or 90% reduction	125 ppmv
	Lean-Burn Engine, "not listed above"	11 ppmv	45 ppmv
	NOx Emission Limits for Agricultural Operations (AO) Spark-Ignited Engines Rated >50 bhp *(corrected to 15% oxygen on a dry basis)*		
	Rich-Burn Spark	90 ppmv or 80% reduction	Exempt
	Lean-Burn Spark	150 ppmv or 70% reduction	Exempt
	NOx Emission Limits for Agricultural Operations (AO) Certified Compression-Ignited Engine *(corrected to 15% oxygen on a dry basis)*		
	Tier 1 or Tier 2	Meet EPA Tier 4 by12 years after installation date, but not later than 6/1/2018	Exempt
	Tier 3 or Tier 4	Meet certified compression-ignited engine standard in effect at time of installation	Exempt

SCAQMD

- SCAQMD Rule 1110.2 (Emissions from Gaseous- and Liquid-Fueled Engines) (*Amended June 3, 2016*)

South Coast Air Quality Management District (SCAQMD) regulates the emissions from IC engines through a combination of control measures. SCAQMD 1110.2 is directly applicable to IC engines and includes emissions limitations for various applications. SCAQMD's RECLAIM program (Rules 2000 – 2020) allows operators to purchase credits in lieu of instituting engine emissions controls otherwise required under SCAQMD 1110.2. Therefore, their limits must not be compared to emissions limitations included in District rules that must be met and do not have RECLAIM exemptions. Given these overlapping sets of requirements, Rule 4702 must be compared in context of both regulations. Additionally, many of the engine applications found in the San Joaquin Valley vary substantially from engine applications in SCAQMD; for example, based on discussion with SCAQMD, there are only two rich-burn engines used in agricultural operations operating hours of 1,900 hrs/yr and 1,500 hrs/yr. No lean-burn agricultural engines are operating in SCAQMD.

	SJVAPCD Rule 4702		SCAQMD Rule 1110.2
Applicability	Internal combustion engine rated at ≥ 25 bhp		Emissions limits apply to Internal combustion engine rated at ≥ 50 bhp
Exemption	Limited to operate less than 100 hrs/yr De-rated engine that has been physically limited and restricted by permit to an operational level of < 50 hp not used in agricultural operation (prior to 6/1/04) De-rated engine that has been physically limited and restricted by permit to an operational level of < 50 used in agricultural operation (prior to 6/1/05)		Engines operating < 500 hr/yr or < 1 billion Btu/hr Agricultural where electrical motor is not possible due to utility company rejecting service Does not qualify for funding under CHSC Section 44229 to replace, retrofit or repower the engine Engines installed prior to 2/1/08, engines installed by electric utility on Santa Catalina Island, engines installed at remote locations without access to natural gas and electrical power RECLAIM facilities (NOx emissions only)
	NOx Emission Limits **Non-Agricultural Operations (Non-AO) Engines Rated >50 bhp** *(corrected to 15% oxygen on a dry basis)*		
	Rich Burn-Waste Gas Fueled	50 ppmv or 90% reduction	No such category
	Rich-Burn Cyclic Loaded, Field Gas Fueled	50 ppmv	No such category
	Rich-Burn Limited Use	25 ppmv	No such category
	Rich-Burn Engine, "not listed above"	11 ppmv	11 ppmv*

	SJVAPCD Rule 4702		SCAQMD Rule 1110.2
	Lean-Burn Two-Stroke, Gaseous Fueled, >50 bhp and < 100 bhp	65 ppmv	No such category
	Lean-Burn Limited Use	65 ppmv	No such category
	Lean-Burn Engine Used for Gas Compression	65 ppmv or 93% reduction	No such category
	Lean-Burn Waste Gas Fueled	65 ppmv or 90% reduction	No such category
	Lean-Burn Engine, "not listed above"	11 ppmv	11 ppmv*
	NOx Emission Limits for Agricultural Operations (AO) Spark-Ignited Engines Rated >50 bhp *(corrected to 15% oxygen on a dry basis)*		
	Rich-Burn Spark[72]	90 ppmv or 80% reduction	11 ppmv*
	Lean-Burn Spark[73]	150 ppmv or 70% reduction	11 ppmv*
	NOx Emission Limits for Agricultural Operations (AO) Certified Compression-Ignited Engine *(corrected to 15% oxygen on a dry basis)*		
	Tier 1 or Tier 2	Meet EPA Tier 4 by January 1, 2015 or 12 years after installation date, but no later than June 1, 2018	Tier 1: 11 ppmv NOx or Tier 4 by July 1, 2008* Tier 2: 11 ppmv NOx or Tier 4 by January 1, 2010*
	Tier 3 or Tier 4	Meet certified compression-ignited engine standard in effect at time of installation	11 ppmv NOx or Tier 4 by January 1, 2010*

**Sources not required to meet these limits through RECLAIM*

Medium and large operators in the South Coast Air Basin are most likely part of the South Coast RECLAIM program and are subsequently not required to meet the engine emission limitations included in Rule 1110.2. All facilities that emit over a certain threshold are required to participate in the RECLAIM program. As part of the RECLAIM program, certain companies receive emission allocations every year, usable for 12 months. The portion of the allocation not needed to offset the operator's own emissions can be sold to other companies. If the operator does not receive an emission allocation, they must buy emission credits from operators with unused emission allocations. In this way, the RECLAIM program is similar to a cap-and-trade program. The District does not have a RECLAIM-type program for this source category; therefore, all operators are required to meet the stringent emission limitations included in Rule 4702.

[72] There are only 2 rich-burn spark ignited engines operating in SCAQMD per discussions with their staff
[73] There are no lean-burn spark ignited ag engines operating in SCAQMD per discussions with their staff

Although the SCAQMD emission level of 11 ppm has not yet been proven as technologically feasible in the remote agricultural settings found in the San Joaquin Valley, and it is unclear what percentage of facilities are complying with the current SCAQMD NOx limits for non-ag categories, the District evaluated the cost-effectiveness and feasibility of implementing an 11 ppmv NOx emission limit for the following categories of IC engines:

- Non-Agricultural Operations (Non-AO) Waste Gas Engines
- Non-AO Spark-Ignited Engines
  - Cyclic Loaded, Field Gas Fueled
  - Limited Use Engines
    - Lean-Burn Engines
    - Rich-Burn Engines
  - Two-Stroke, Gaseous Fueled Engines 50-100 bhp
  - Lean-Burn Engines Used for Gas Compression
- Agricultural Operations (AO) Spark-Ignited Engines

To determine potential emissions reductions, the District used the following equations:

NOx = (BHP x HR x EF x LF) / (CF)

Where:

NOx = Current annual NOx emissions or potential annual NOx emissions in ton/year
BHP = engine power
HR = annual hours of operation
EF = NOx emission factor
LF = engine load factor
CF = conversion factor from grams to pounds

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

Potential Emissions Reduction = current annual NOx emissions – potential annual NOx emissions

ADDITIONAL EMISSION REDUCTION OPPORTUNITIES

NOx Emission Limitation for Non-Agricultural Operations (Non-AO) Waste Gas Engines:

The District analyzed the technological feasibility of lowering the NOx emission limit for waste gas engines and determined that due to the variability of waste gas, additional levels of NOx control on existing waste gas engines can pose significant technical and feasibility challenges.

Waste gas includes landfill gas, which is generated at landfills, and digester gas, which is generated from anaerobic digestion. Both landfill and digester gas result from the decomposition of organic matter by microorganisms in the absence of oxygen. Unlike pipeline natural gas, the composition of waste gas is not consistent or guaranteed. The heating value and composition of the gas (e.g. methane and oxygen contents) will vary with the type of materials that enter the landfill or digester and can fluctuate seasonally or even daily. Both landfill and digester gases contain impurities, such as siloxanes, sulfur compounds, and halides. Landfill gas also contains entrained particulate matter, and emissions from both landfill and digester gas may contain particulates that result from combustion of the impurities in the gas. The contaminants in waste gas can coat and/or poison catalysts, rendering them ineffective. Because of its variable composition and contaminants, untreated waste gas is not interchangeable with pipeline-quality natural gas and extensive and costly cleanup would be necessary to allow the use of catalytic emission controls needed to achieve 11 ppmv. This is not a practical option for most existing waste gas-fired engines, which were not designed to include the required gas systems and catalytic controls.

In addition to the District's efforts to identify additional potential technology options for this category, SCAQMD has also been evaluating this issue. In February 2008, SCAQMD amended Rule 1110.2 to include an 11 ppmv limit for waste gas engines rated at >50 bhp. The original compliance date for this emissions limit was July 1, 2012, with the assumption that SCAQMD would complete a Technology Assessment to verify the feasibility of available control technologies for waste gas engines. However, SCAQMD had to amend Rule 1110.2 in September 2012, to extend the compliance deadline for waste gas engines from 2012 to 2016 in order to allow for more time to complete their Final Technology Assessment. Following further evaluation, SCAQMD amended the rule to extend the compliance date to January 1, 2017, for all biogas engines with the exception of demonstration projects prior to January 2015, would be required to comply with emissions limit of 11 ppmv by January 1, 2018, or defer compliance to January 1, 2019, through an alternative compliance option. Additionally, these sources may also have been in a position to avoid installing additional NOx control technologies through their participation in SCAQMD's RECLAIM program.

District Rule 4702 contains the most stringent limits feasible for existing waste gas-fueled engines based on the use of combustion processes that minimize emissions without the use of post-combustion catalytic controls. Therefore, Rule 4702 meets or exceeds BACM and MSM for non-AO waste gas fueled spark-ignited engines. Additionally, the District continues to investigate potential NOx and SOx control technologies for waste gas engines through its Technology Advancement Program, with projects currently approved for funding that will continue to demonstrate new technologies in this sector.

NOx Emission Limitation for Non-AO Spark-Ignited Engines:

Cyclic Loaded, Field Gas Fueled

Cyclic-loaded, field gas fueled engines can achieve some level of control, but not the stringent level of control that can be imposed on engines that operate in a narrow and

more stable range of loads. The exhaust gas temperature of cyclic loaded engines varies as a function of the engine load; however, catalyst chemistry is dependent on a minimum temperature to be effective in reducing emissions. When the cyclic load engine is operating in a particular engine load range, the exhaust gas temperature can reach the catalyst's effective range and allow for emissions to be well-controlled; however, as the engine cycles out of this load range, the exhaust gas temperature becomes too low for effective emissions control. Since the exhaust temperature fluctuates frequently for this category of units, it is technologically infeasible to require a lower NOx limit for cyclic loaded field-gas fueled engines. The current emission limit for this category of engines meets or exceeds BACM and MSM for these sources.

Limited Use Engines

During the 2011 amendments to Rule 4702, the District created this category of engines based on the high costs and cost-effectiveness associated with the installation of additional controls for these engines (<4,000 hours of operation). The NOx emission reductions foregone from not lowering the existing NOx limits to 11 ppmv for limited use engines was insignificant (about 0.004 tons per day in 2011).[74]

The District re-evaluated the cost-effectiveness of lowering the NOx emission limits to 11 ppmv for limited use non-AO rich-burn and lean-burn engines. The costs in the analyses below were gathered from information in the District's Permits database, IC engine manufacturers, emission control system manufacturers and suppliers, and operators.

Limited Use Lean-Burn Engines

When evaluating the ability to lower NOx emissions to 11 ppmv, an operator can either retrofit the existing lean-burn IC engine with a selective catalytic reduction (SCR) system or install a new lean-burn engine with an SCR system. In many cases, retrofitting an existing IC engine is technologically infeasible or may require substantial additional unanticipated costs (such as the incompatibility of an older engine with less sophisticated operating controls with additional control technology, additional labor/maintenance costs, etc.). However, for the purpose of evaluating all potential controls, the District has included both options in the below analysis.

Table C-17 Annual Costs for Retrofitting an Existing Limited Use Lean-Burn Engine and Installing a New Limited Use Lean-Burn Engine with SCR

Item	Assumptions/Methodology	Cost
Average Engine Power Rating	1,100 brake horsepower (bhp)	n/a
Annual Operation	2,500 hours (hr)	n/a
Capital Costs		

[74] SJVAPCD. (2011, August 18). *Adopt Revised Proposed Amendments to Rule 4702 (Internal Combustion Engines).* Retrieved from http://www.valleyair.org/Board_meetings/GB/agenda_minutes/Agenda/2011/August/Agenda_Item_10_Aug_18_2011.pdf

Item	Assumptions/Methodology	Cost
New Engine Cost (without SCR)	Includes: engine, freight, installation, start-up, additional equipment (belt guards, fuel connection, etc.), and tax	$300,000
Annualized Engine Capital Costs (10 years, 10%)	0.163 x New Engine Cost	**$48,900**
SCR Equipment & Installation Costs		
Total Equipment & Installation Costs	$143,000 per engine Includes catalyst element, urea injection system, and related installation equipment and costs	$143,000
Annualized SCR Capital Costs (10 years, 10%)	0.163 x Total SCR Capital Costs	**$23,309**
Annual Operating and Maintenance Costs		
Annual Reagent (urea) Cost	$2.5 per gallon; 1.2 gallon/hr Cost = $2.5 x 1.2 x 2500 hr	$7,500
Annual Increase in Fuel Cost (due to drop in fuel efficiency with SCR)	Fuel usage = 8,483.3 standard cubic feet per hour (scf/hr) (based on 33% HHV mechanical efficiency) Fuel cost (per 1,000 scf) = $8.39 Fuel cost (per hour) = (8,483.3 x $8.39) / 1,000) Fuel cost (per year) = hourly cost x 2,500 hr 2.5% drop in fuel efficiency Added Fuel Cost = Annual fuel cost x 2.5%	$3,711
Annual Electricity Cost (for compressor)	3 hp compressor = 2.24 kW power rating Electricity rate for industrial operations = $0.18462/kW-hr Hourly electricity cost = 2.24 kW x $0.18462/kW-hr Daily meter charge = $0 (no new electric meter installed) Annual electricity cost = hourly cost x 2,500 hr Total utility cost = Annual electricity cost + Annual meter charge	$1,034
Annual Catalyst Cost	Life of catalyst = 5 years Cost per catalyst = $20,000 Catalyst costs for 10 years = $20,000 x 2 Annualized cost = $40,000 x 0.163	$6,520
Annual Maintenance Cost	Maintenance = $0.015 per bhp per hour of operation Annual cost = $0.015 x 1,100 bhp x 2,500 hr	$41,250
Annual Operating & Maintenance (O&M) Costs	Annual O&M = Annual Reagent Cost+ Annual Increase in Fuel Cost + Annual Electricity Cost + Annual Catalyst Cost + Annual Maintenance Cost	**$60,015**
Annual Cost for Retrofit of LB Engine with SCR	Annual O&M = Annual Reagent Cost+ Annual Increase in Fuel Cost + Annual Electricity Cost + Annual Catalyst Cost + Annual Maintenance Cost	**$83,324**
Annual Cost for New LB Engine with SCR	Annualized Engine Capital Cost + Annualized SCR Capital Cost + Annual O&M Cost	**$132,224**

The emissions reductions are calculated below:

BHP = 1,100 bhp
HR = 2,500 hours/year (hr/yr)

EF1 = 0.838 g-NOx/bhp-hr (equivalent to 65 ppmvd NOx at 15% O2; assuming 33% mechanical efficiency)
EF2 = 0.142 g-NOx/bhp-hr (equivalent to 11 ppmvd NOx at 15% O2; assuming 33% mechanical efficiency)
Load factor (LF) = 0.8
CF = 453.59 grams/pound (g/lb)

Current NOx = (BHP x HR x EF1 x LF) / (CF)
= (1,100 bhp x 2,500 hr/yr x 0.838 g-NOx/bhp-hr x 0.8) / (453.59 g/lb)
= 4,064 lb-NOx/year

Potential NOx = (BHP x HR x EF2 x LF) / (CF)
= (1,100 bhp x 2,500 hr/yr x 0.142 g-NOx/bhp-hr x 0.8) / (453.59 g/lb)
= 689 lb-NOx/year

Potential Emissions Reduction = Current NOx – Potential NOx
Potential Emissions Reduction = (4,064-689 lb) x (1 ton / 2,000 lb)
Potential Emissions Reduction = 1.69 tons/year

Cost-effectiveness (Limited Use Lean-Burn Engines)
The cost-effectiveness is the added cost, in dollars per year, of the control technology, divided by the emissions reductions achieved, in tons per year. Based on the calculations above, the cost-effectiveness of retrofitting or replacing current limited use lean-burn spark-ignited engines is as follows:

- Retrofitted limited use lean-burn engine with SCR: $49,304/ton of NOx reduced
- New limited use lean-burn engine with SCR: $78,239/ton of NOx reduced

Limited Use Rich-Burn Engines
An existing rich-burn IC engine operating in this category must use advanced emission control technology such as a non-selective catalytic reduction (NSCR) system in order to operate at the already low NOx emissions level of 25 ppmv. When evaluating the ability to lower NOx emissions to 11 ppmv, an engine will already be equipped with the major components for the required NSCR system like three-way catalyst (three-way catalyst), air-to-fuel ratio controller, sensors, and ignition system. However, the existing three-way catalyst element will not likely be able to achieve further NOx reductions and will need to be replaced. It is likely that the other components like air-to-fuel ratio controller and sensors would also need to be replaced since the existing components may be worn or even outdated (e.g., an older, single-point air-to-fuel ratio controller may not be able to consistently maintain the much lower NOx limit as well as a more modern and advanced multi-point controller). Thus, the replacement of the entire NSCR system may be needed. For the purposes of evaluating both feasible scenarios, the following analysis includes retrofitting an existing engine with a replacement catalyst element and retrofitting an existing engine with an entirely new NSCR system.

Table C-18 Annual Costs for Retrofitting an Existing Limited Use Rich-Burn Engine

Item	Assumptions/Methodology	Cost
Average Engine Power Rating	1,400 bhp	n/a
Annual Operation	2,000 hours (hr)	n/a
New NSCR System Capital Costs		
New NSCR System	Includes: NSCR catalyst element, air-to-fuel ratio controller, sensors, ignition system, and installation equipment and costs	$21,000
Annualized Catalyst Capital Cost (10 years, 10%)	0.163 x New NSCR System	**$3,423**
New NSCR Catalyst Element Capital Costs		
New NSCR System	Includes: NSCR catalyst element and installation	$5,000
Annualized Catalyst Capital Cost (10 years, 10%)	0.163 x New NSCR Catalyst Element	**$815**
Annual Cost for Retrofit of RB Engine with New NSCR System	Annualized NSCR System Capital Cost	**$3,423**
Annual Cost for Retrofit of RB Engine with New NSCR Catalyst Element	Annualized NSCR Catalyst Element Capital Cost	**$815**

The emissions reductions are calculated below:

BHP = 1,400 bhp
HR = 2,000 hours/year (hr/yr)
EF1 = 0.322 g-NOx/bhp-hr (equivalent to 25 ppmvd NOx at 15% O2; assuming 33% mechanical efficiency)
EF2 = 0.142 g-NOx/bhp-hr (equivalent to 11 ppmvd NOx at 15% O2; assuming 33% mechanical efficiency)
Load Factor (LF) = 0.8
CF = 453.59 grams/pound (g/lb)

Current NOx = (BHP x HR x EF1 x LF) / (CF)
= (1,400 bhp x 2,000 hr/yr x 0.322 g-NOx/bhp-hr x 0.8) / (453.59 g/lb)
= 1,590 lb-NOx/year

Potential NOx = (BHP x HR x EF2 x LF) / (CF)
= (1,400 bhp x 2,000 hr/yr x 0.142 g-NOx/bhp-hr x 0.8) / (453.59 g/lb)
= 701 lb-NOx/year

Potential Emissions Reduction = Current NOx – Potential NOx
Potential Emissions Reduction = (1,590 - 701 lb) x (1 ton / 2,000 lb)

Potential Emissions Reduction = 0.44 tons/year

Cost-effectiveness (Limited Use Rich-Burn Engines)

The cost-effectiveness is the added cost, in dollars per year, of the control technology, divided by the emissions reductions achieved, in tons per year. Based on the calculations above, the cost-effectiveness of retrofitting or replacing current limited use rich-burn spark-ignited engines is as follows:

- Retrofitted limited use rich-burn engine with new NSCR system: $7,780/ton of NOx reduced
- Retrofitted limited use rich-burn engine with new NSCR catalyst element: $1,852/ton of NOx reduced

Two-Stroke, Gaseous Fueled Engines 50-100 bhp

There is no control technology compatible with two-stroke, gaseous fueled engines, including SCR, which will allow these units to achieve a NOx emission limit below 75 ppmv. An 11 ppmv NOx emission limit is not technologically feasible for these engines; the current limit implements BACM and MSM for two-stroke, gaseous fueled engines less than 100 bhp.

Lean-Burn Engines Used in Gas Compression

During the rule amendment in 2011, the District created this category of engines based on the technological infeasibility to control these types of engines. Lean-burn engines used in gas compression in the Valley are used in natural gas distribution and storage service, and these engines frequently experience changing load conditions. As noted in EPA's Stationary IC Engine Technical Support Document[75], SCR use is problematic for these engines due to the fluctuations over a broad range of conditions. For this reason, EPA states that there is an insufficient basis to conclude that SCR is an appropriate technology for large lean-burn engines used for gas compression. The current emission limit is achievable through low-NOx combustion technology, which includes changes to the engine's timing, enhanced control of the air-fuel ratio, and other changes that lower NOx emissions. Due to the technological complexities associated with lean-burn engines used in gas compression, the current emissions limit implements MSM for these units.

Lean-Burn "Not Listed Above"

During the rule amendments in 2011, the District identified categories of non-ag spark-ignited engines and corresponding NOx emission limits that took into account the differences between engines used for different applications. The "not listed above" category accounts for all engines other than those that fit into a specific named category and provides a NOx emissions limit of 11 ppmv for lean-burn engines.

Through complying with the current rule limit, engines in this category have already achieved significant NOx emissions reductions through use of advanced emissions

[75] EPA. (2003, October). *Stationary Reciprocating Internal Combustion Engines Technical Support Document for NOx SIP Call*.

controls like SCR systems. Since a lean-burn engine in this category will already be equipped with an SCR system, the engine will also already be equipped with the major components for the required SCR system like SCR catalyst element, air-to-fuel ratio controller, sensors, and urea injection system. However, the existing SCR catalyst element will not likely be able to achieve further NOx reductions and will need to be replaced. It is also likely that older engines in this category cannot reliably achieve the emissions reductions required to achieve a NOx emissions limit of 5 ppmv with just a replacement SCR catalyst element. In this case, an entirely new lean-burn engine with new SCR system will be required. For the purposes of evaluating both feasible scenarios, the following analysis includes retrofitting an existing engine with a replacement SCR catalyst element and installing an entirely new lean-burn engine with new SCR system.

Table C-19 Annual Costs for Replacing an Existing SCR Catalyst Element in a Lean-Burn Engine and Installing a New Lean-Burn Engine with SCR System

Item	Assumptions/Methodology	Cost
Average Engine Power Rating	4,157 brake horsepower (bhp)	n/a
Annual Operation	4,000 hours (hr)	n/a
New Engine Capital Costs		
New Engine Cost (without SCR)	Includes: engine, freight, installation, start-up, additional equipment (belt guards, fuel connection, etc.), and tax (SCR system is a separate cost)	$300,000
Annualized Engine Capital Costs (10 years, 10%)	0.163 x New Engine Capital Cost	**$48,900**
SCR System Capital Costs		
SCR System Cost	Includes catalyst element, urea injection system, catalyst housing, and related installation equipment and costs	$143,000
Annualized SCR System Capital Costs (10 years, 10%)	0.163 x SCR System Capital Costs	**$23,309**
Replacement SCR Catalyst Element Capital Costs		
SCR Catalyst Element	Includes catalyst element, catalyst housing, and related installation costs	$50,000
Annualized SCR Catalyst Element Capital Costs (10 years, 10%)	0.163 x SCR Catalyst Element Capital Costs	**$8,150**
Annual Cost for New LB IC Engine with New SCR System	Annualized Engine Capital Cost + Annualized SCR System Cost	**$72,209**
Annual Cost for New SCR Catalyst Element	Annualized SCR Catalyst Element Capital Cost	**$8,150**

The emissions reductions are calculated below:

BHP = 4,157 bhp
HR = 4,000 hours/year (hr/yr)
EF1 = 0.142 g-NOx/bhp-hr (equivalent to 11 ppmvd NOx at 15% O2; assuming 33% mechanical efficiency)
EF2 = 0.063 g-NOx/bhp-hr (equivalent to 5 ppmvd NOx at 15% O2; assuming 33% mechanical efficiency)
Load Factor (LF) = 0.8
CF = 453.59 grams/pound (g/lb)

Current NOx = (BHP x HR x EF1 x LF) / (CF)
= (4,157 bhp x 4,000 hr/yr x 0.142 g-NOx/bhp-hr x 0.8) / (453.59 g/lb)
= 4,164 lb-NOx/year

Potential NOx = (BHP x HR x EF2 x LF) / (CF)
= (4,157 bhp x 4,000 hr/yr x 0.063 g-NOx/bhp-hr x 0.8) / (453.59 g/lb)
= 1,848 lb-NOx/year

Potential Emissions Reduction = Current NOx – Potential NOx
Potential Emissions Reduction = (4,164 - 1,848 lb) x (1 ton / 2,000 lb)
Potential Emissions Reduction = 1.16 tons/year

Cost-effectiveness (Lean-Burn "Not Listed Above", 5 ppmv)
The cost-effectiveness is the added cost, in dollars per year, of the control technology, divided by the emissions reductions achieved, in tons per year. Based on the calculations above, the cost-effectiveness of retrofitting or replacing current limited use lean-burn spark-ignited engines is as follows:

- New lean-burn engine with new SCR system: $62,249/ton of NOx reduced
- New SCR Catalyst Element: $7,026/ton of NOx reduced

Rich Burn "Not Listed Above"
During the rule amendments in 2011, the District identified categories of non-ag spark-ignited engines and corresponding NOx emission limits that took into account the differences between engines used for different applications. The "not listed above" category accounts for all engines other than those that fit into a specific named category and provides a NOx emissions limit of 11 ppmv for rich-burn engines.

Through complying with the current rule limit, engines in this category have already achieved significant NOx emissions reductions through use of advanced emissions controls such as a NSCR systems. When evaluating the feasibility of achieving additional reductions to meet a NOx emissions limit of 7 ppmv, an engine will already be equipped with the major components for the required NSCR system like three-way catalyst (three-way catalyst), air-to-fuel ratio controller, sensors, and ignition system. However, the existing three-way catalyst will not likely be able to achieve further NOx reductions and will need to be replaced. It is likely that the other components like air-to-fuel ratio controller and sensors would also need to be replaced since the existing

components may be worn or even outdated (e.g., an older, single-point air-to-fuel ratio controller may not be able to consistently maintain the much lower NOx limit as well as a more modern and advanced multi-point controller). Thus, the replacement of the entire NSCR system may be needed. For the purposes of evaluating both feasible scenarios, the following analysis includes retrofitting an existing engine with a replacement catalyst element and retrofitting an existing engine with an entirely new NSCR system.

Table C-20 Annual Cost for Installing a New Rich-Burn Engine with an NSCR System

Item	Assumptions/Methodology	Cost
Average Engine Power Rating	162 bhp	n/a
Annual Operation	4,000 hr	n/a
New NSCR System Capital Costs		
NSCR System	Includes: NSCR catalyst element, air-to-fuel ratio controller, sensors, ignition system, and installation equipment and costs	$21,000
Annualized NSCR System Capital Costs (10 years, 10%)	0.163 x Total NSCR System Capital Costs	**$3,423**
New NSCR Catalyst Element Capital Costs		
New NSCR System	Includes: NSCR catalyst element and installation	$5,000
Annualized Catalyst Capital Cost (10 years, 10%)	0.163 x New NSCR Catalyst Element	**$815**
Annual Cost for Retrofit of RB Engine with New NSCR System	Annualized NSCR System Capital Cost	**$3,423**
Annual Cost for Retrofit of RB Engine with New NSCR Catalyst Element	Annualized Three-Way Catalyst Element Capital Cost	**$815**

The emissions reductions are calculated below:

BHP = 162 bhp
HR = 4,000 hours/year
EF1 = 0.142 g-NOx/bhp-hr (equivalent to 11 ppmv at 30% HHV mechanical efficiency)
EF2 = 0.089 g-NOx/bhp-hr (equivalent to 7 ppmv at 30% HHV mechanical efficiency)
Load Factor (LF) = 0.80
CF = 453.59 grams/pound

Current NOx = (BHP x HR x EF1 x LF) / (CF)
= (162 bhp x 4,000 hr/yr x 0.142 g-NOx/bhp-hr x 0.8) / (453.59 g/lb)
= 162 lb-NOx/year

Potential NOx = (BHP x HR x EF2 x LF) / (CF)
= (162 bhp x 4,000 hr/yr x 0.089 g-NOx/bhp-hr x 0.8) / (453.59 g/lb)
= 102 lb-NOx/year

Potential Emissions Reduction = Current NOx – Potential NOx
Potential Emissions Reduction = (162 - 102 lb) x (1 ton / 2,000 lb)
Potential Emissions Reduction = 0.03 tons/year

Cost-effectiveness (Rich-Burn "Not Listed Above", 7 ppmv)
The cost-effectiveness is the added cost, in dollars per year, of the control technology, divided by the emissions reductions achieved, in tons per year. Based on the calculations above, the cost-effectiveness of replacing current engines in the rich-burn "not listed above" category is as follows:

- Retrofitted rich-burn engine with new NSCR system: $114,100/ton of NOx reduced
- Retrofitted rich-burn engine with new three-way catalyst element: $27,167/ton of NOx reduced

NOx Emission Limitation for Agricultural Operation (AO) Spark-Ignited Engines:

Feasibility Considerations: AO Spark-Ignited Engines
Over the past decade, AOs have invested significant capital to retrofit and replace thousands of irrigation pump and other engines reducing emissions by over 80% in this category, and continue to do so as emission limitations and associated compliance deadlines materialize under Rule 4702. In addition to the high cost-effectiveness and potential technical infeasibility associated with retrofitting or replacing existing AO spark ignited engines, requiring additional costly controls on existing AO engines is economically challenging and potentially infeasible.

Retrofitting existing spark-ignited engines poses several challenges that are not present when installing new, replacement engines. The District had to overcome many obstacles and challenges in retrofitting existing AO engines when the District adopted its current emission limit of 90 ppm and has worked closely with AO engine owners and operators and control system manufacturers to ensure compliance with this stringent emission limit. Efforts to ensure compliance with the current rule limit are continuing today. Lowering the emission limit from 90 ppmv 11 ppm, results in even greater challenges for existing engines to consistently meet because of the much lower tolerance for being out of compliance. These challenges are outlined in the following list. Details are provided below:

Challenges with retrofitting existing engines:

1. Engine power losses from adding controls
2. Existing engines may require overhaul
3. Existing engines cannot meet lower emissions levels due to narrower margin of compliance
4. Control systems must be custom designed
5. Errors generated during control system installation
6. Retrofit controls can damage an engine
7. Engine can damage a control system
8. Compliance costs
9. Engines operated in remote locations

1. Engine power losses from adding controls

An engine is chosen based on its ability to provide the required power output at a reasonable engine speed (rpm) that will not over-stress the engine over its expected service life. Add-on emission control systems result in additional loads that the engine may not have been originally designed to accommodate.
In addition, due to the extreme drought conditions, engine owners and operators have needed to increase the power output for well pump engines as the water table has dropped. As the engines work harder to pump water, there is less power output available to accommodate emission control systems.

2. Existing engines may require overhaul

The engines in use at AOs have been in service for many years, even decades, and are heavily worn. A worn engine can burn oil, leak fluids, and run rough. For an uncontrolled engine, some of the effects of engine wear do not have a major effect on the engine's ability to do its job (e.g. pumping water). However, the operation of a catalytic emission control system requires that the engine be operated consistently smooth. An expensive major engine overhaul or rebuild would be necessary to ensure smooth engine operation prior to installing a catalytic emission control system. Many AOs do not have the resources (e.g., staff, experience, technical training, etc.) to complete an engine overhaul or rebuild without outside assistance. Meeting more stringent/lower emission standards increases the need for the engine to operate properly.

3. Existing engines cannot meet lower emissions levels due to narrower margin of compliance

As emission limits are lowered, there is a narrower margin of compliance and proper engine operation becomes more critical. AOs in the District have to constantly ensure that their engine is properly maintained and within all the appropriate specifications to ensure compliance with the current emission limit, more so than newer engines. The lower emissions levels will result in additional stresses on the engine and increased maintenance and monitoring efforts that result from operating a retrofitted engine. Even then, due to the age of the engine

and based on engine not appropriately designed for additional add-on systems and the associated loads, engines will not be able to meet the lower limits.

4. Control systems must be custom designed
For proper control system design, the engine condition, make, model, power output, and exhaust gas flow rate and temperature must be considered. There are not universal, off-the-shelf, one size-fits-all systems available for purchase. Control system design also assumes that an engine is operating properly and smoothly per the engine manufacturer's specifications. To ensure proper operation of the control system, an engine may need to be overhauled or rebuilt prior to installation of the control system.

A common problem with many retrofit emission control systems is installation of a system on an engine that is not operating smoothly or to engine manufacturer specifications. Installing a control system on a rough running engine will result in poor control system operation and eventually system and engine damage. Proper system design and engine operation is more important as emission limits are lowered since the margin of compliance will be much less.

5. Errors generated during control system installation
Site conditions like gas supply pressure can cause an existing engine to operate rough. If site issues are not addressed prior to installation of a control system, the control system will not operate correctly. An installer may attempt to correct rough engine operation by making the combustion more fuel rich; however, this technique will not provide lasting results and will cause accelerated engine and control system wear and eventually failure. An emission control system that is designed to meet lower emission limits will require a larger catalyst element which will be more expensive to replace if permanently damaged.

6. Retrofit controls can damage an engine
For proper control of exhaust pollutants, a catalyst must be operated at a certain temperature range that is higher than normal exhaust temperatures. Additional fuel is often injected into the engine with the intent that the additional fuel will pass through the combustion chamber and ignite in the exhaust system prior to the catalyst (the high catalyst temperature ignites the fuel). This extra fuel results in higher engine operating temperatures since some of the extra fuel is combusted during normal engine combustion. The increased engine temperature leads to accelerated engine wear and reduced engine reliability. Due to wear and older design, increased combustion temperatures lead to engine failure and permanent engine damage.

7. Engine can damage a control system
An existing, worn engine can burn oil and run rough. Oil in the exhaust stream will foul/mask a catalyst which will result in reduced emission control efficiency and likely permanent damage to a catalyst element. The air-fuel ratio controller will attempt to adjust engine operation (e.g., injecting more fuel) to keep the

control system operating within the specified parameters; however, adjusting engine operation will not correct a fouled catalyst. Continued operation with a damaged catalyst will lead to permanent catalyst damage. An emission control system that is designed to meet lower emission limits will require a larger catalyst element which will be more expensive to replace if permanently damaged and this cycle will be repeated further adding to the cost.

8. Compliance costs

Unlike many industries, AOs compete on an international basis and cannot pass increased production costs on to consumers. AOs must absorb the compliance costs associated with lower emission standards, for example: retrofit and replacement costs; additional maintenance costs; additional monitoring costs; and additional testing costs. These additional regulatory costs put them at an economic disadvantage to their competitors.

9. Engines operated in remote locations

AO spark-ignited engines are generally located in rural, hard to access areas with minimal oversight since AOs have limited resources and staffing. With seasonal labor and minimal year-round staffing, it is difficult for AOs to provide the frequent and complex maintenance required for retrofitted or new engines equipped with advanced emission controls. Lower emission limits are achieved only through well maintained engines and control systems. Lower emissions limits lead to increased maintenance and monitoring efforts. The oil production industry is the only other major industry in the Valley that has IC engines located in remote locations; however, with the highly technical nature of oil production and refining as compared to agricultural production and additional economic resources, it is feasible for the oil and gas production industry to hire qualified staff dedicated to maintaining and operating IC engines and other equipment on-site.

Retrofitting AO engines with emission control systems to meet increasingly stringent emission limits poses unique challenges that are not applicable when installing replacement engines. Based on the challenges outlined above, meeting 25 ppm or even 11 ppm with existing AO engines is not practicable. The additional maintenance, monitoring, and testing, along with the cost of rebuilding engines and the cost of the emission control system, may even be more costly than installing a replacement engine.

Despite the technological feasibility issues associated with retrofitting or replacing existing AO spark-ignited engines, the District evaluated the cost-effectiveness and feasibility of achieving an 11 ppmv NOx emission limit for the following scenarios:

- Installing a new IC lean-burn engine with SCR as a replacement for an existing unit
- Retrofitting an existing lean-burn IC engine with SCR
- Installing a new rich-burn engine with a three-way catalyst system as a replacement for an existing unit

The District gathered costs information from District's Permits database, IC engine manufacturers, emission control system manufacturers and suppliers, and agricultural industry representatives to determine the costs in the analyses below.

AO Lean-Burn Engines (11 ppmv)

When evaluating the ability to lower NOx emissions to 11 ppmv, an agricultural operator can either retrofit the existing lean-burn IC engine with a selective catalytic reduction (SCR) system or install a new lean-burn engine with an SCR system.

Table C-21 Annual Costs for Retrofitting an Existing AO Lean-Burn Engine with SCR and Installing a New AO Lean-Burn Engine with SCR

Item	Assumptions/Methodology	Cost
Average Engine Power Rating	241 brake horsepower (bhp)	n/a
Annual Operation	2500 hours (hr)	n/a
Capital Costs (Engine)		
New Engine Cost (without SCR)	Includes: engine, freight, installation, start-up, additional equipment (belt guards, fuel connection, etc.), and tax	$109,480
Annualized Engine Capital Costs (10 years, 10%)	0.163 x New Engine Cost	**$17,845**
SCR Equipment & Installation Costs		
Total SCR Equipment and Installation Costs	$100,000 per engine, includes catalyst element, urea injection system, and related installation equipment and costs	$100,000
Annualized SCR Capital Costs (10 years, 10%)	0.163 x Total SCR Capital Costs	**$16,300**
Annual Operating and Maintenance Costs (SCR)		
Annual Reagent (urea) Cost	$2.5 per gallon; 0.3 gallon/hr Cost = $2.5/gal x 0.3 gal/hr x 2,500 hr	$1,875
Annual Increase in Fuel Cost (due to drop in fuel efficiency with SCR)	Fuel usage = 2,044.5 standard cubic feet per hour (scf/hr) Fuel cost (per 1,000 scf) = $8.39 Fuel cost (per hour) = (2,044.5 scf/hr x $8.39) / 1,000 scf Fuel cost (per year) = hourly cost x 2,500 hr 2.5% drop in fuel efficiency Added Fuel Cost = Annual fuel cost x 2.5%	$1,072
Annual Electricity Cost (for compressor)	3 hp compressor = 2.24 kW power rating Electricity rate for AO = $0.18462/kW-hr Hourly electricity cost = 2.24 kW x $0.18462/kW-hr Annual electricity cost = hourly cost x 2,500 hr	$1,034
Annual Catalyst Cost	Life of catalyst = 5 years Cost per catalyst = $5,000 Catalyst costs for 10 years = $5,000 x 2 Annualized cost = $10,000 x 0.163	$1,630

Item	Assumptions/Methodology	Cost
Annual Maintenance Cost	Maintenance = $0.018 per bhp per hour of operation Annual cost = $0.018 x 241 bhp x 2,500 hr	$10,845
Annual Operating & Maintenance (O&M) Costs	Annual O&M = Annual Reagent Cost+ Annual Increased Fuel Cost + Annual Electricity Cost + Annual Catalyst Cost + Annual Maintenance Cost	**$16,456**
Annual Cost for Retrofit of LB Engine with SCR	Annualized SCR Capital Cost + Annual O&M Cost	**$32,756**
Annual Cost for New LB Engine with SCR	Annualized Engine Capital Cost + Annualized SCR Capital Cost + Annual O&M Cost	**$50,601**

The emissions reductions are calculated below:

BHP = 241 bhp
HR = 2,500 hours/year (hr/yr)
EF1 = 2.126 g-NOx/bhp-hr (equivalent to 150 ppmv at 30% mechanical efficiency)
EF2 = 0.156 g-NOx/bhp-hr (equivalent to 11 ppmv at 30% mechanical efficiency)
Load Factor (LF) = 0.80
CF = 453.59 grams/pound (g/lb)

Current NOx = (BHP x HR x EF1 x LF) / (CF)
= (241 bhp x 2,500 hr/yr x 2.126 g-NOx/bhp-hr x 0.80) / (453.59 g/lb)
= 2,259 lb-NOx/year

Potential NOx = (BHP x HR x EF2 x LF) / (CF)
= (241 bhp x 2,500 hr/yr x 0.156 g-NOx/bhp-hr x 0.80) / (453.59 g/lb)
= 166 lb-NOx/year

Potential Emissions Reduction = Current NOx – Potential NOx
Potential Emissions Reduction = (2,259-166 lb) x (1 ton / 2,000 lb)
Potential Emissions Reduction = 1.05 tons/year

Cost-effectiveness (AO Lean-Burn, 11 ppmv)

The cost-effectiveness is the added cost, in dollars per year, of the control technology, divided by the emissions reductions achieved, in tons per year. Based on the calculations above, the cost-effectiveness of retrofitting or replacing current AO lean-burn spark-ignited engines is as follows:

- Retrofitted lean-burn engine with SCR: $31,196/ton of NOx reduced[76]
- New lean-burn engine with SCR: $48,191 of NOx reduced

[76] Due to the remoteness of these engines, it is likely that most sites will not have existing electricity to power the electrical compressor for the urea injection system. The costs provided in this section do not include costs to bring electricity to the site. Overall costs will be significantly higher if this additional cost is added.

AO Rich-Burn Engines (11 ppmv)

When evaluating the ability to lower NOx emissions to 11 ppmv, an agricultural operator can install a new rich-burn engine with 3-way catalyst.

Table C-22 Annual Cost for Installing a New AO Rich-Burn Engine with a 3-way Catalyst

Item	Assumptions/Methodology	Cost
Average Engine Power Rating	256 bhp	n/a
Annual Operation	2,500 hr	n/a
Total Capital Costs		
New Engine Cost	Includes: engine with 3-way catalyst, freight, installation, and tax	$95,000
Annualized Engine Capital Costs (10 years, 10%)	0.163 x New Engine Cost	**$15,485**
Annual Operating and Maintenance Costs (SCR)		
Annual Added Fuel Cost (due to drop in fuel efficiency with catalyst)	Fuel usage = 2,171.7 scf/hr Fuel cost (per 1,000 scf) = $8.39 Fuel cost (per hour) = (2,171.7 scf/hr x $8.39) / 1,000 scf Fuel cost (per year) = hourly cost x 2,500 hr Assume 2.5% drop in fuel efficiency Added Fuel cost = Annual fuel cost x 2.5%	$1,139
Annual Catalyst Cost	Life of catalyst = 5 years Cost per catalyst = $5,000 Catalyst costs for 10 years = $5,000 x 2 Annualized Catalyst Cost = $10,000 x 0.163	$1,630
Annual Maintenance Cost	Maintenance = $0.018 per bhp per hour of operation Annual Maintenance Cost = $0.018/bhp-hr x 256 bhp x 2500 hr	$11,520
Annual Operating & Maintenance (O&M) Costs	Annual O&M = Annual Added Fuel Cost + Annual Catalyst Cost + Annual Maintenance Cost	**$14,289**
Annual Cost for New RB Engine with 3-way	Annualized Engine Capital Cost + Annual O&M Cost	**$29,774**

The emissions reductions are calculated below:

BHP = 256 bhp
HR = 2,500 hours/year
EF1 = 1.276 g-NOx/bhp-hr (equivalent to 90 ppmv at 30% HHV mechanical efficiency)
EF2 = 0.156 g-NOx/bhp-hr (equivalent to 11 ppmv at 30% HHV mechanical efficiency)
Load Factor (LF) = 0.80
CF = 453.59 grams/pound

Current NOx = (BHP x HR x EF1 x LF) / (CF)
= (256 bhp x 2,500 hr/yr x 1.276 g-NOx/bhp-hr x 0.80) / (453.59 g/lb)
= 1,440 lb-NOx/year

Potential NOx = (BHP x HR x EF2 x LF) / (CF)
= (256 bhp x 2,500 hr/yr x 0.156 g-NOx/bhp-hr x 0.80) / (453.59 g/lb)
= 176 lb-NOx/year

Potential Emissions Reduction = Current NOx – Potential NOx
Potential Emissions Reduction = (1,440-176 lb) x (1 ton / 2,000 lb)
Potential Emissions Reduction = 0.63 tons/year

Cost-effectiveness (AO Rich-Burn, 11 ppmv)

The cost-effectiveness is the added cost, in dollars per year, of the control technology, divided by the emissions reductions achieved, in tons per year. Based on the calculations above, the cost-effectiveness of replacing current AO rich-burn engines is as follows:

- New rich-burn engine with a 3-way catalyst to meet 11 ppmv: $47,260/ton of NOx reduced

AO Spark-Ignited Engines (Replace with Electric Motors or Tier 4-Equivalent Engines through Incentive/Regulatory Measure)

As demonstrated above, the replacement of agricultural operation rich-burn and lean-burn engines with new engines and control systems is not cost-effective or feasible. Building on the prior successful model of pursuing transition to advanced engine technologies through an incentive-based approach, it may be possible to achieve additional cost-effective reductions through the transition of spark-ignited to electric motors where access to electricity is available, or Tier 4-equivalent engine technologies (0.30 g/hp-hr, ~20 ppmv NOx). This approach would rely on strong incentives for both the motor/engine costs and electrical infrastructure, outreach through a collaborative effort with affected sources, USDA-NRCS, and other stakeholders and would potentially be coupled with a regulatory backstop to encourage participation. In partnership with agricultural stakeholders, the District has been in discussions with utilities to explore the potential of developing enhance rate structures to further incentivize the transition to electrification where feasible.

AO Compression-Ignited Engines (Replace with Electric Motors or Tier 4-Equivalent Engines through Incentive Measure)

Working closely with the agricultural community, publically owned utilities, USDA-NRCS, and other stakeholders, emissions from agricultural compression-ignited engines have been reduced by up to 80% through a whole-scale transition from uncontrolled Tier 0 engines to lower-emitting Tier 1 and Tier 2 engines, and then again through transition to even lower-emitting Tier 3, Tier 4, and electric engines/motors. While the current

stringent requirements satisfy all federal requirements for RACM, BACM, and MSM, additional reductions may be possible through an incentive-based approach. Building on the prior successful model of pursuing transition to advanced engine technologies through an incentive-based approach, it may be possible to achieve additional cost-effective reductions through the transition of compression-ignited engines to electric motors where access to electricity is available, or Tier 4-equivalent engine technologies (0.30 g/hp-hr, ~20 ppmv NOx). This approach would rely on strong incentives for both the motor/engine costs and electrical infrastructure, and outreach through a collaborative effort with affected sources, USDA-NRCS, and other stakeholders. In partnership with agricultural stakeholders, the District has been in discussions with utilities to explore the potential of developing enhanced rate structures to further incentivize the transition to electrification where feasible.

SOx and PM limitations

Rule 4702 contains stringent requirements requiring the combustion of Public Utilities Commission (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 emissions through the use of particulate filters. Given the low PM2.5 and SOx emissions from IC engines and existing rule requirements, the District determined that no further requirements were needed to address PM2.5 and SOx emissions.

EVALUATION FINDINGS

The District has evaluated all potential control technologies and all control technologies achieved in practice in other areas or included in other state implementation plans for emissions from internal combustion engines. As demonstrated above, Rule 4702 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds RACM, BACM, and MSM requirements for this source category.

While the District meets or exceeds RACM, BACM, and MSM requirements for this source category, given the enormity of reductions needed to demonstrate attainment with the latest PM2.5 standards, the District will pursue the following potential opportunities:

- Non-Agricultural IC Engines: Work with affected operators to further reduce NOx emissions from non-ag IC engines to the extent that such controls are technologically achievable and economically feasible. Technologies evaluated with the potential to further reduce emissions include the installation of 3-way catalytic reduction for rich-burn IC engines and selective catalytic reduction for lean-burn IC engines. While the analysis above shows that many control technologies are not cost-effective, potential emission reduction opportunities for further evaluation include:
  - Rich Burn Engines (“not listed above” category): Lower existing limit of 11 ppmv to as low as 7 ppmv

  - Lean Burn Engines ("not listed above" category): Lower existing limit of 11 ppmv to as low as 5 ppmv
  - Limited Use Rich/Lean Burn: Lower existing limits of 25 and 65 ppmv to as low as 11 ppmv

- Agricultural IC Engines: Work with agricultural sources to further reduce NOx emissions through incentive-based/regulatory approach as technologically and economically feasible. While the analysis above demonstrates that the various control technologies are generally not cost-effective without financial assistance, and may not be technologically feasible for remote agricultural installations, potential emission reduction opportunities for further evaluation include:
  - Replacement of spark-ignited agricultural engines with electric motors where access to electricity is available, or Tier 4-equivalent engine technologies through incentive-based approach coupled with regulatory backstop to encourage participation.
  - Replacement of Tier 3 compression-ignited agricultural engines with electric motors where access to electricity is available, or Tier 4-equivalent engine technologies through incentive-based approach to achieve additional emissions reductions where cost-effective.

C.18 RULE 4703 (NOX EMISSIONS FROM STATIONARY GAS TURBINES)

DISCUSSION

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.

EMISSIONS INVENTORY

POLLUTANT	2013	2017	2019	2020	2022	2023	2024	2025	2026	2028
	Annual Average - Tons per day									
PM2.5	1.30	1.15	1.16	1.12	1.13	1.13	1.14	1.15	1.15	1.16
NOX	3.29	2.95	2.98	2.87	2.90	2.92	2.94	2.95	2.97	3.00
	Winter Average - Tons per day									
PM2.5	1.29	1.15	1.15	1.11	1.12	1.13	1.13	1.14	1.15	1.16
NOX	3.20	2.88	2.90	2.80	2.84	2.85	2.87	2.88	2.90	2.93

SOURCE CATEGORY

The requirements of rule 4703 affect owners and operators of stationary gas turbine systems used to pump, compress, generate electricity, or perform other tasks. The four major industry groups using this type of equipment are oil and gas production, utilities, manufacturing, and government.

In complying with this rule, all affected entities are required to control NOx and CO emissions by installing approved emissions control devices. Early in the rule development process, the District identified four different emissions control technologies that could be used to achieve proposed limits for stationary gas turbines. Of the four options, three mainly control NOx emissions, while the other one controls CO emissions. The three NOx control technologies are:

- Diluent (water or steam) injection systems,
- Dry, low-NOx, and
- Selective Catalytic reduction

Emissions limits vary by size, cycle, annual operating hours, and fuel type. The emissions limits in this rule by category are summarized in the tables below.

HOW DOES DISTRICT RULE4703 COMPARE WITH FEDERAL AND STATE RULES AND REGULATIONS?

Federal Regulations

There are no EPA CTG requirements for this source category.

Alternative Control Techniques (ACT)

- EPA–453/R-93-007 (Alternative Control Techniques Document—NOx Emissions from Stationary Gas Turbines)

The District evaluated the requirements contained within the ACT for NOx Emissions from Stationary Gas Turbines and found no requirements that were more stringent than those already in Rule 4703.

New Source Performance Standards (NSPS)

- 40 CFR 60 Subpart GG (Standards of Performance for Stationary Gas Turbines)

The District evaluated the requirements contained within Subpart GG and found no emission requirements that were more stringent than those already in Rule 4703.

- 40 CFR 60 Subpart KKKK (Standards of Performance for Stationary Combustion Turbines)

The District evaluated the requirements contained within Subpart KKKK and found no emission requirements that were more stringent than those already in Rule 4703.

National Emissions Standards for Hazardous Air Pollutants (NESHAP)/Maximum Achievable Control Technology (MACT)

- 40 CFR 63 Subpart YYYY (National Emission Standards for Hazardous Air Pollutants for Stationary Combustion Turbines)

40 CFR 63 Subpart YYYY was last amended on April 20, 2006; however, this NESHAP only contains emission limits and regulations to reduce formaldehyde emissions. Formaldehyde is an organic compound which is most closely related to VOC emissions. This control measure analysis does not apply to VOC emissions. Therefore, the requirements of Subpart YYYY have not been included as a part of this control measure source category evaluation.

State Regulations

There are no state regulations applicable to this source category.

HOW DOES DISTRICT RULE 4703 COMPARE TO RULES IN OTHER AIR DISTRICTS?

There are no analogous rules for this source category in SMAQMD

BAAQMD

- BAAQMD Regulation 9 Rule 9 (Nitrogen Oxides from Stationary Gas Turbines *(Amended December 6, 2006)*

The District evaluated the requirements contained within BAAQMD's Rule 9-9 and found no requirements that were more stringent than those already in Rule 4703.

	SJVAPCD	BAAQMD
Applicability	Gas turbines ≥ 0.3 MW or a maximum heat input rating of 3 MMBtu/hr	Gas turbines ≥ 5.0 MMBtu/hr
Exemption	• Laboratory turbines used in research and testing for the advancement of gas turbine technology. • Units limited by permit condition to be operated exclusively for firefighting and/or flood control. • Emergency standby turbines limited by permit condition to operate less than 100 hours per calendar year for maintenance and testing purposes.	• Testing of aircraft gas turbine engines for flight certification. • Gas turbines used solely for firefighting and/or flood control. • Gas turbines used solely for firefighting and/or flood control. Gas turbines rated less than 50 MMBtu/hr heat input that operate less than 877 hours in any 12-month period.
Requirements	The operator of any stationary gas turbine shall not operate a unit in such a manner that results in NO_X emissions, referenced at 15% O_2, shall not exceed the following limits:	A person shall not operate a stationary gas turbine unless NO_X emission concentrations, referenced at 15% O_2, do not exceed the following limits:
	Units Rated < 3 MW	
	Gas Fuel - 9 ppm Liquid Fuel - 25 ppm	Natural Gas - 42 ppm Refinery, Waste, or LPG - 50 ppm Non-Gaseous – 65 ppm
	Units Rated ≥ 3 MW and < 10 MW	
	• *Pipeline Gas:* Steady State Operation – 8 ppm Non-Steady State Operation – 12 ppm Liquid Fuel – 25 ppm • *< 877 hr/yr:* Gas Fuel - 9 ppm Liquid Fuel - 25 ppm • *≥ 877 hr/year and not listed above:* Gas Fuel - 5 ppm Liquid Fuel - 25 ppm	• *Units without Water Injection, Steam Injection, or Dry Low NO_X (DLN) Technology Available :* Natural Gas - 42 ppm Refinery, Waste, or LPG - 50 ppm Non-Gaseous – 65 ppm • *Units with Water Injection or Steam Injection Available :* Natural Gas - 35 ppm Refinery, Waste, or LPG - 50 ppm Non-Gaseous – 65 ppm • *Units with DLN Technology Available:* Natural Gas - 25 ppm Refinery, Waste, or LPG - 50 ppm Non-Gaseous – 65 ppm
	Units Rated ≥ 10 MW	

	SJVAPCD	BAAQMD
	• *Combined Cycle:* Gas Fuel - 5 ppm (standard) Gas Fuel – 3 ppm (enhanced) Liquid Fuel – 25 ppm • *Simple Cycle and ≥ 877 hr/yr:* Gas Fuel - 5 ppm (standard) Gas Fuel - 3 ppm (enhanced) Liquid Fuel – 25 ppm • *Simple Cycle and > 200 hr/yr and < 877 hr/yr:* Gas Fuel - 5 ppm Liquid Fuel – 25 ppm • *Simple Cycle and ≤ 200 hr/yr:* Gas Fuel - 25 ppm Liquid Fuel – 42 ppm	• *≥ 10 and < 19 MW:* Natural Gas - 15 ppm Refinery, Waste, or LPG 15 ppm Non-Gaseous – 42 ppm • *≥ 19 and < 40 MW:* Natural Gas - 9 ppm Refinery, Waste, or LPG 9 ppm Non-Gaseous – 25 ppm • *≥ 40 MW:* Natural Gas - 5 ppm Refinery, Waste, or LPG 9 ppm Non-Gaseous – 25 ppm

SCAQMD

- SCAQMD Rule 1134 (Emissions of Oxides of Nitrogen from Stationary Gas Turbines) *(Amended August 8, 1997)*

The District evaluated the requirements contained within SCAQMD's Rule 1134 and found that overall rule 4703 is more stringent than SCAQMD Rule 1134.

	SJVAPCD	SCAQMD
Applicability	Gas turbines rated ≥ 0.3 MW or with a maximum heat input rating of > 3 MMBtu/hr	Gas turbines rated ≥ 0.3 MW output or with a maximum heat input rating of > 3 MMBtu/hr and operated on gaseous and/or liquid fuel
Exemption	• Laboratory turbines used in research and testing for the advancement of gas turbine technology. • Units limited by permit condition to be operated exclusively for firefighting and/or flood control. • Emergency standby turbines limited by permit condition to operate less than 100 hours per calendar year for maintenance and testing purposes.	• Emergency standby units used to provide electrical power, water pumping for flood control or firefighting, potable water pumping, or sewage pumping provided the following are met: - Maintenance operation shall not exceed 100 hr/yr, and - Total operation of the unit shall be limited to 200 hr/yr, and - Operation of the unit shall not be for supplying power to a serving utility for distribution on the grid, and - Operation of the unit for other than maintenance purposes shall be limited to emergency situations only. • Laboratory units used in research and testing for the advancement of gas turbine technology.

	SJVAPCD	SCAQMD
Requirements	The operator of any stationary gas turbine shall not operate a unit in such a manner that results in NO_X emissions, referenced at 15% O_2, shall not exceed the following limits:	A person shall not operate a stationary gas turbine unless NO_X emission concentrations, referenced at 15% O_2, do not exceed the following limits:
	Units Rated < 3 MW	
	Gas Fuel - 9 ppm Liquid Fuel - 25 ppm	Gas Fuel – 42.0 ppm Liquid Fuel – 65.0 ppm
	Units Rated ≥ 3 MW and < 10 MW	
	• *Pipeline Gas:* Steady State Operation – 8 ppm Non-Steady State Operation – 12 ppm Liquid Fuel – 25 ppm • *< 877 hr/yr:* Gas Fuel - 9 ppm Liquid Fuel - 25 ppm • *≥ 877 hr/year and not listed above:* Gas Fuel - 5 ppm Liquid Fuel - 25 ppm	• *< 877 hr/yr:* Gas Fuel – 42.0 ppm Liquid Fuel – 65.0 ppm • *≥ 877 hr/year:* Gas Fuel – 25.0 ppm Liquid Fuel – 65.0 ppm
	Units Rated ≥ 10 MW	
	• *Combined Cycle:* Gas Fuel - 5 ppm (standard) Gas Fuel – 3 ppm (enhanced) Liquid Fuel – 25 ppm • *Simple Cycle and ≥ 877 hr/yr:* Gas Fuel - 5 ppm (standard) Gas Fuel - 3 ppm (enhanced) Liquid Fuel – 25 ppm • *Simple Cycle and > 200 hr/yr and < 877 hr/yr:* Gas Fuel - 5 ppm Liquid Fuel – 25 ppm • *Simple Cycle and ≤ 200 hr/yr:* Gas Fuel - 25 ppm Liquid Fuel – 42 ppm	• *< 877 hr/yr:* Gas Fuel – 42.0 ppm Liquid Fuel – 65.0 ppm • *≥ 10 MW, no SCR:* Gas Fuel – 15.0 ppm Liquid Fuel – 42.0 ppm • *≥ 10 MW, with SCR:* Gas Fuel – 9.0 ppm Liquid Fuel – 25.0 ppm

VCAPCD

- VCAPCD Rule 74.23 (Stationary Gas Turbines) *(Amended January 8, 2002)*

The District evaluated the requirements contained within VCAPCD's Rule 74.23 and found no requirements that were more stringent than those already in Rule 4703.

	SJVAPCD	VCAPCD
Applicability	Gas turbines rated ≥ 0.3 MW or with a maximum heat input rating of > 3 MMBtu/hr	Gas turbines rated ≥ 0.3 MW and operated on gaseous and/or liquid fuel
Exemption	• Laboratory turbines used in research and testing for the advancement of gas turbine technology. • Units limited by permit condition to be operated exclusively for firefighting and/or flood control. • Emergency standby turbines limited by permit condition to operate less than 100 hours per calendar year for maintenance and testing purposes.	• Laboratory units used in research and testing for the advancement of gas turbine technology. • Units operated exclusively for firefighting and/or flood control. • Units operated less than 200 hours per calendar year. • Emergency standby units operating during either an emergency or maintenance operation. Maintenance operation is limited to 104 hours per calendar year.
Requirements	The operator of any stationary gas turbine shall not operate a unit in such a manner that results in NO_X emissions, referenced at 15% O_2, shall not exceed the following limits:	A person shall not operate a stationary gas turbine unless NOx emission concentrations, referenced at 15% O2, do not exceed the following limits:
	Units Rated < 3 MW	
	Gas Fuel - 9 ppm Liquid Fuel - 25 ppm	Gas Fuel – 42.0 ppm Liquid Fuel – 65.0 ppm
	Units Rated ≥ 3 MW and < 10 MW	
	• *Pipeline Gas:* Steady State Operation – 8 ppm Non-Steady State Operation – 12 ppm Liquid Fuel – 25 ppm • *< 877 hr/yr:* Gas Fuel - 9 ppm Liquid Fuel - 25 ppm • *≥ 877 hr/year and not listed above:* Gas Fuel - 5 ppm Liquid Fuel - 25 ppm	• *< 877 hr/yr:* Gas Fuel – 42.0 ppm Liquid Fuel – 65.0 ppm • *≥ 877 hr/year:* Gas Fuel – 25.0 ppm Liquid Fuel – 65.0 ppm
	Units Rated ≥ 10 MW	

	SJVAPCD	VCAPCD
	• *Combined Cycle:* Gas Fuel - 5 ppm Liquid Fuel – 25 ppm • *Simple Cycle and ≥ 877 hr/year:* Gas Fuel - 5 ppm Liquid Fuel – 25 ppm • *Simple Cycle and > 200 hr/yr and < 877 hr/yr:* Gas Fuel - 5 ppm Liquid Fuel – 25 ppm • *Simple Cycle and ≤ 200 hr/yr:* Gas Fuel - 25 ppm Liquid Fuel – 42 ppm	• *< 877 hr/yr:* Gas Fuel – 42.0 ppm Liquid Fuel – 65.0 ppm • *≥ 10 MW, no SCR:* Gas Fuel – 15.0 ppm Liquid Fuel – 42.0 ppm • *≥ 10 MW, with SCR:* Gas Fuel – 9.0 ppm Liquid Fuel – 25.0 ppm

Additional 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 NOx from turbines has been reduced from 31.9 tpd in 1994 to 2.8 tpd in 2017. 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. 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.

Evaluation Findings

The District has evaluated all potential control technologies and all control technologies achieved in practice in other areas or included in other state implementation plans for stationary gas turbines. As demonstrated above, Rule 4703 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds RACM, BACM, and MSM requirements for this source category.

C.19 Rule 4901 (Wood Burning Fireplaces and Wood Burning Heaters)

Discussion

The District takes a multidimensional and proactive approach to reducing emissions in the Valley. This philosophy is especially true for reducing emissions from residential wood burning, with a combination of regulatory controls through Rule 4901, rigorous public outreach and education efforts, Check Before You Burn program, and the District's Burn Cleaner Wood Stove Change-out Program (Burn Cleaner Program). The District's approach to reducing emissions from residential wood burning empowers Valley residents to play a major role in reducing emissions at almost no increased cost, and, in many cases, with savings in heating-related energy costs. Valley residents are encouraged to transition from older, more polluting wood burning heaters and wood burning fireplaces (also commonly called open hearth fireplaces) to cleaner alternatives, by decreasing the number of allowable burn days for high polluting wood burning heaters and fireplaces while at the same time increasing the number of burn days allowed for registered clean wood burning heaters through a tiered episodic wood burning curtailment program.

Through the District's 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 PM2.5 when and where those reductions are most needed, in impacted urbanized areas when the local weather is forecast to hamper particulate matter dispersion.

Rule 4901 was first adopted in 1993, and has been subsequently amended three times. The 1993 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.

The 2003 rule amendments added 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 PM2.5 concentration of 65 µg/m³, and added restrictions on the installation of wood burning devices in new residential developments, based on housing density. The 2008 rule amendments lowered the mandatory curtailment level to a PM2.5 concentration of 30 µg/m³, and added an attainment plan contingency measure that would lower the wood burning curtailment level to 20 µg/m³ if EPA were to find that the Valley did not attain the 1997 PM2.5 NAAQS in 2014.

In September 2014, the District amended Rule 4901 continuing to solidify its standing as the most comprehensive wood burning curtailment program in the nation. Amendments to Rule 4901 imposed a virtual ban on the use of dirty wood burning devices for significant portions of the winter season while allowing more burn days for Valley residents who have invested in cleaner burning devices that are 20-50 times cleaner. The enhanced Burn Cleaner program provides meaningful financial assistance to

encourage Valley residents to upgrade to cleaner devices. Successful implementation not only reduces particulate emissions on "No Burn Days", but also reduces emissions on "Burn Days" as more dirty units are replaced with cleaner devices. The 2014 amendments eliminated the attainment plan contingency measure to lower the curtailment level to 20 μg/m³ because the rule now requires it for high polluting devices.

Encouraging the Transition to Clean Burning Heaters through Non-Regulatory Measures

Upgrading a home's wood burning device reduces directly emitted PM2.5 emissions on days when wood burning is allowed. By operating more efficiently, these devices can also lower the overall home heating cost. 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 gas or propane gas devices, to certified wood stoves or inserts, or to pellet devices. The District's webpage[77] 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, and in future years the EPA certified devices will emit even less.

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.

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 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. While these devices reduce emissions relative to uncontrolled fireplaces, their emissions are still relatively higher than certified wood stoves and pellet stoves.

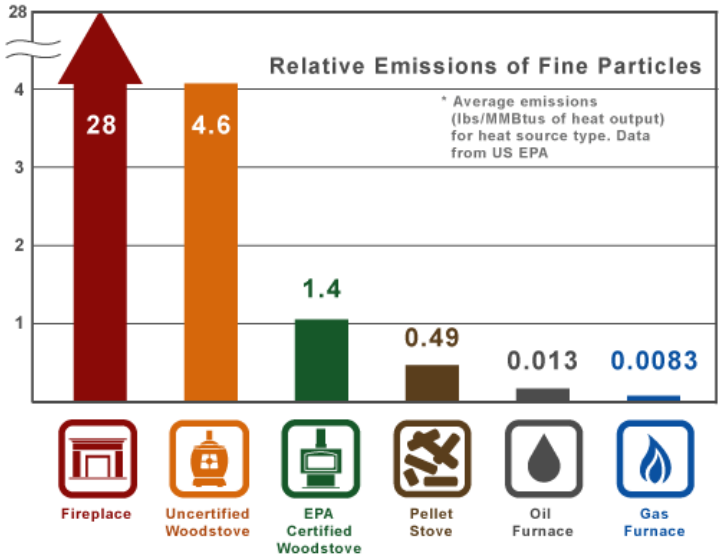
Gas stoves and gas fireplaces burn natural gas or propane, emit very little air pollution, and require little maintenance. Gas devices are not subject to the requirements of Rule

[77] www.valleyair.org/Grant_Programs/GrantPrograms.htm#WoodStoveChangeOut

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 webpages[78].

The following Figure C-3 illustrates the average PM2.5 emissions based on various heat sources.

Figure C 3 Average PM2.5 Emissions Based on Wood Burning Heater Type[79]



Residential Wood Burning Survey

The District hired a third party company, Gomez Research, to survey Valley residents to gauge the District's current efforts, including Check Before You Burn and Burn Cleaner programs, and evaluate potential future strategies that will continue to reduce pollution from residential wood burning. Gomez Research surveyed over 1,500 Valley residents by November 2017. The survey consisted of both a general, random population of residents throughout the Valley as well as a supplemental sample, or "high-incidence area," of 500 residents living in targeted zip codes believed to have higher concentrations of wood burning devices in Fresno and Kern Counties, where the Valley's peak PM2.5 air monitoring stations are located. The general sample was designed to capture a broad understanding of public awareness and perception of the District's wood burning program, while the supplemental sample was designed to elicit more information about regional wood burning control strategies. Overall, the large survey response by Valley residents provides statistically significant results that can be relied upon to enhance our understanding of residential wood burning behavior in the San Joaquin Valley.

[78] www.epa.gov/burnwise

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

The significant findings from the survey are categorized and summarized as follows:

A. Public Knowledge and General Beliefs about Wood Smoke

1. A total of 36% of residents who use their wood-burning devices reported that they believe wood smoke is dangerous. One-in-five Valley residents (20%) who burn do not believe wood smoke is dangerous to their health, and 8% believe it actually provides health benefits.
2. Ten percent of residents believe that someone in their household experiences health problems as a result of wood burning.
3. Findings suggest that residents who know that wood smoke is dangerous to their health tend to be English-speakers with above median incomes (greater than $50,000), although a larger sample would be needed to confirm this demographic profile statistically.

B. Presence and Use of Wood Burning Devices

1. A total of 29% of the general population surveyed reported having some type of wood burning device.
2. A total of 41% of residents living in the supplemental sample zip codes in Fresno and Bakersfield urban areas reported having some type of woodburning device. Of this population, 88% reported having an open-hearth fireplace.
3. For residents who have a wood burning device, 52% do not use their device, followed by 16% who use their device less than once a week, 14% several days a week, 9% nearly every day, and 7% once a week.
4. A total of 18% of residents living in the Fresno and Bakersfield metropolitan areas reported that they burn wood once a week or more, compared to 34% among the general population, a statistically significant difference.
5. Most residents typically burn in the evenings. Nearly two-thirds of residents typically burn in the evening (63%), followed by 17% who typically burn throughout the day, 8% who typically burn in the morning, and 7% who typically burn in the afternoon.
6. Once started, wood-burning devices in the Fresno and Bakersfield metropolitan areas were used for 3.96 hours, compared to 6.16 hours in other areas.
7. Nearly a third (32%) of all English speakers reported having a wood-burning device at their residence compared to 11% among Spanish speakers.
8. One third (33%) of residents with household incomes of $50,000 or higher were more likely to report that they had wood-burning devices compared to 23% of those below-median income.
9. Only 9% of the respondents in the general population who use a wood burning device indicated that it is their sole source of heat.

C. Awareness and Compliance with District Wood Burning Prohibitions

1. Among residents in the Fresno and Bakersfield metropolitan areas, 85% reported that they had heard of Check Before You Burn, compared to 63% among residents living elsewhere in the Valley.
2. More than half of all residents surveyed (58%) are aware of checking the burn day status using the toll-free hotline or website. Over one third (36%) of all residents

were aware of email and text notifications for burn status. These figures do not include a larger segment of the population that obtains burn status information from television, radio, and other mass media.

3. Nearly 97% of the respondents who checked for no-burn restrictions "all the time" or "most of the time" replied that they always comply with the rule. The sample size for this question was smaller and therefore the statistical significance is questionable.

D. Awareness and Interest in District *Burn Cleaner* Incentive Program

1. A total of 61% of Valley residents believe the District should provide financial assistance to encourage people to switch to cleaner-burning devices rather than institute a Valleywide ban on residential wood-burning.
2. A total of 29% of higher-income residents were aware of the Burn Cleaner incentive program, compared to 17% among lower-income residents.
3. More than 27% of English-speakers were aware of the Burn Cleaner incentive program, compared to 10% of Spanish-speakers.
4. Approximately 17% of residents with wood-burning devices would participate in the Burn Cleaner incentive program if the rebate were offered at 25%.
5. An additional 12% of residents with wood-burning devices would participate in the Burn Cleaner incentive program if the incentives was at least 50%.
6. An additional 15% of residents were willing to participate in the Burn Cleaner Burn Cleaner incentive program if a 75% rebate level was offered, for a total of 44% of residents willing to participate at or below this incentives level. Similar results were seen for the supplemental sample.

E. Public Opinion and Sentiments Related to Possible Changes to Wood Burning Program

1. Two-thirds of Valley residents (67%) believe the current burn restrictions are reasonable, followed by 14% believing current restrictions are too aggressive and should be relaxed, and 10% believing that current restrictions are too lenient.
2. Less than one third (29%) of residents surveyed in the Fresno and Bakersfield areas say they would be willing to replace their traditional devices if they could burn wood on some no-burn days, compared to 39% of residents in the rest of the Valley.
3. Only 6% of residents in the Northern Region reported that the "current restrictions don't go far enough" compared to 12% of residents in the Central Region and 13% in the Southern Region, a statistically significant difference.
4. Residents who believe wood smoke causes air pollution are more likely to support tougher burn restrictions. Among residents who recognize a correlation between wood burning and air quality, 15% reported that the current burn restrictions "don't go far enough," compared to 6% among other residents.

Burn Cleaner Incentive Program

The District's Burn Cleaner Wood Stove Change-out Program (Burn Cleaner) program plays a key role in the success of the transition from older more polluting wood burning heaters and fireplaces to cleaner wood burning heaters. Since 2006, the Burn Cleaner

program has been helping residents overcome some of the financial obstacles in purchasing cleaner alternatives providing $20 million to replace nearly 15,000 wood burning devices throughout the Valley. There are currently more than 30 hearth retailers in the Valley that have partnered with the District to successfully implement the Burn Cleaner program.

The Burn Cleaner program offers multiple levels of incentive funding, increased as of the 2014-2015 wood burning season:

Table C-23 Multiple Levels of Incentive Funding for Burn Cleaner Program

NEW DEVICE TO BE PURCHASED	INCENTIVE AMOUNT
Certified wood insert/freestanding stove	Up to $1,000
Certified pellet insert/freestanding stove	Up to $1,000
Natural gas insert/freestanding stove	Up to $1,000
Any eligible device if applicant is eligible for low-income	Up to $2,500
Additional incentive towards gas device (for both Standard and Low-income)	Up to $500*

**Applies only to eligible installation costs beyond the funding amount*

Table C-24 Eligibility Requirements for Burn Cleaner Program

ELIGIBILITY

The old device must be located at a residence within the District boundaries. Applicants must submit an application and obtain an approved voucher from the District prior to purchasing the new device.

The following table outlines the eligibility of the new device based on the old device type.

	NEW DEVICE	(YES =	ELIGIBLE,	NO =	NOT ELIGIBLE)	
OLD DEVICE	FREESTANDING GAS STOVE	GAS INSERT OR GAS FIREPLACE1	FREESTANDING CERTIFIED PELLET STOVE	CERTIFIED PELLET INSERT	FREESTANDING CERTIFIED WOOD STOVE	CERTIFIED WOOD INSERT
Open hearth wood fireplace	Yes	Yes	Yes	Yes	Yes	Yes
Non-certified wood fireplace/insert/stove	Yes	Yes	Yes	Yes	Yes	Yes
Certified wood fireplace/insert/stove	Yes	Yes	No	No	No	No
Pellet stove/insert	Yes	Yes	No	No	No	No
Gas stove/insert, Gas fireplaces, Gas logs	No	No	No	No	No	No

New gas fireplaces must be certified as heater-rated. Gas fireplaces designed exclusively for aesthetic and decorative use are not eligible.

The District continuously re-evaluates the Burn Cleaner program and implements enhancements to the program. In addition to increased incentive amounts, the District has also recently implemented the following enhancements:

- Reducing a substantial portion of the upfront, out-of-pocket cost of a new qualifying unit for low-income qualified applicants. The District has partnered with contracted hearth retailers to allow low-income qualified applicants to make the purchase at a reduced price by deducting the incentive amount from the invoice at the point of purchase. Allowing the incentive funding to be directly applied at the time of purchase makes it more feasible for additional low-income applicants to take advantage of the program.
- Refining the low-income eligibility form to streamline the determination process and identifying the hearth retailers that provide the reduced upfront cost option.
- Program documents are now available in Spanish to further extend the outreach efforts to the local community.
- Updates to program documents to make them more user-friendly and to improve the process during the application, installation, and claim for payment request phases.

- The document submittal process has been updated to allow applications and claim for payment requests to now be emailed to the District for faster processing. Also, supplemental forms have been developed further streamline the review process and help keep the retailers and applicants informed on the status of projects.

Given this program's critical role in supporting the District's efforts to reduce the impact of residential wood burning and continued high demand in the program the District has allocated $12,821,900 in funding for the Burn Cleaner program in the District's 2018-19 Budget.

Collaboration with participating hearth retailers

As part of the District's initiative to increase the effectiveness of the Burn Cleaner program, District staff has worked closely with participating hearth retailers on outreach efforts and provided them with promotional tools, such as flyers and quick screens with information about the program.

Public Outreach and Education

The District has an extremely successful outreach and education program with regards to residential wood burning and educating Valley residents about air quality, the effects of air pollution on the population's health, and on options they can take to reduce emissions. In the latest wood-burning season the District took part in 82 media interviews about extreme weather and wood burning.

The District's informational *Check Before You Burn* program minimizes elevated PM2.5 concentrations throughout winter. The PM2.5 air quality improvements that the Valley has experienced since the adoption of Rule 4901 have been assisted by strong multimedia outreach by the District and a resultant increase in public awareness and participation in winter District programs.

During each wood-burning season, the District Outreach staff receives hundreds of public calls and emails specific to residential wood burning. An interesting new trend has surfaced regarding public opinion, an increased number of the phone calls were in support of an outright ban on residential wood burning year-round (with the exception of residents for whom wood burning is the sole source of heat). This is attributed to heightened awareness among the general population of the deleterious effects of wood burning on public health.

Since the inception of *Check Before You Burn*, the District's complementary tools, such as the Real-time Air Advisory Network (RAAN) and the "Valley Air" app, have continued to gain in popularity. Annual public calls and website "hit" statistics, plus growth in the District's social media pages, also illustrate continued growth in wood-burning awareness. Survey results also showed an increased public awareness with eight out of ten respondents being aware of the District's *Check Before You Burn* program, 78% of whom confirmed reduced wood-burning activities as a direct result of the program.

The District also incorporates wood-burning messaging into other public outreach products, including Healthy Air Living Schools materials, Healthy Air Heroes elementary kids' kits and other materials.

Multimedia Advertising Campaigns

The District's seasonal public outreach advertising campaigns are retooled each year to include timely and relevant messaging. In the past few seasons, this messaging has been delivered by the District's Governing Board members, with billboards in English and Spanish strategically placed throughout the Valley, radio and TV spots, and value-added messaging delivered by media throughout the Valley. The messaging of these campaigns reminds residents of the *Check Before You Burn* program and encourages them to take advantage of the *Burn Cleaner* grant program.

Expanding New Media Outreach

The most significant evolution of *Check Before You Burn* messaging has occurred with the expanded and accelerated use of new media for advertising. Specific wintertime campaigns have been used to reach a new audience within the District's geographic boundaries. This has proven to be a valuable way to deliver immediate messaging regarding the wood-burning rule, and the benefits of clean burning devices, in addition to providing a platform for direct, two-way interaction with the public.

Strengthening Media Partnerships

The District maintains partnerships with television, newspaper, radio, outdoor and print, as well as internet advertising. During seasonal *Check Before You Burn* campaigns, the District runs media on broadcast television stations in the Fresno and Bakersfield markets, including Spanish stations, as well as networks in four cable markets including zoned cable in Stockton, Modesto, Turlock and Manteca.

With these purchases come added value in the form of bonus spots, news sponsorships, and extra billboards and overages in outdoor messaging. Outdoor messaging is strategically placed in high-traffic areas as well as neighborhood and rural communities to ensure a wide reach in those areas where residential wood burning might be common.

The District has also found tremendous benefit from creating a versatile campaign utilizing new media trends like Pandora (digital radio) and internet/digital advertising to reach Valley audiences. Both Pandora and digital web campaign messaging allow the District to target certain listener demographics and behaviors in specific geographic areas and allow listeners to respond to the message by actively clicking through to the valleyair.org site to check their county's wood burning status.

EMISSIONS INVENTORY

POLLUTANT	2013	2017	2019	2020	2022	2023	2024	2025	2026	2028
	Annual Average - Tons per day									
PM2.5	3.26	2.82	2.82	2.82	2.82	2.82	2.82	2.82	2.82	2.82
NOX	0.49	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42
	Winter Average - Tons per day									
PM2.5	6.35	5.49	5.49	5.49	5.49	5.49	5.49	5.49	5.49	5.49
NOX	0.95	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82

SOURCE CATEGORY

The wood burning fireplaces and wood burning heaters source category includes emissions from wood burning fireplaces, wood burning heaters, and outdoor wood burning devices. Rule 4901 reduces emissions from this source category through wood burning curtailments in areas with natural gas service. 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.

HOW DOES DISTRICT RULE 4901 COMPARE WITH FEDERAL AND STATE RULES AND REGULATIONS?

There are no federal EPA CTGs, ACTs, NESHAPs, or MACT guidelines for this source category.

NSPS

- 40 CFR Part 60 Subpart AAA (Standards of Performance for New Residential Wood Heaters)

EPA published in the Federal Register on March 16, 2015, and effective May 15, 2015, amendments to 40 CFR Part 60 Subpart AAA.[80] District Rule 4901 points to the New Source Performance Standards (NSPS) for emission limits and is therefore as stringent as the newly promulgated NSPS.

The 2015 NSPS significantly lowered the certification emission limits for wood-burning heaters that are required to be certified and sets certification limits for a broader range of wood-burning heaters by removing the existing certification criteria from the 1988 version of the rule. Standards apply not only to adjustable burn rate wood heaters (the focus of the original regulation), but also to single burn rate wood heaters/stoves, pellet heaters/stoves, and any other affected appliance as defined in revised Subpart AAA as a "room heater."

Although pellet stoves did not require EPA certification under the 1988 NSPS, 96% of pellet heaters meet the new Step 1 PM emissions limit of 4.5 grams per hour. Single burn rate wood heaters are incapable of operating at the lowest burn rates, and it is the lower burn rates that result in the highest level of PM emissions; therefore, most single

[80] Standards of Performance for New Residential Wood Heaters, New Residential Hydronic Heaters and Forced-Air Furnaces. Final Rule. 80 FR 3672. https://www.gpo.gov/fdsys/pkg/FR-2015-03-16/pdf/2015-03733.pdf

burn rate wood heaters also meet the Step 1 PM emissions limit. Manufacturers of such units were not initially required to modify their design if they already met the emissions standard and will automatically be deemed as certified to meet the Step 1 emission limits.

EPA promulgated a two-step compliance approach that applies to all new adjustable burn rate wood heaters, single burn rate wood heaters and pellet heaters/stoves. Under this approach, Step 1 emission limits for these sources apply to each unit manufactured on or after the effective date of the final rule (May 15, 2015) or sold at retail on or after December 31, 2015. Step 2 emission limits for these units apply to each heater manufactured or sold at retail on or after May 15, 2020. EPA is allowing an alternative compliance option for manufacturers who choose to certify using cord wood (rather than crib wood) to meet the Step 2 limits.

Subpart AAA PM Emissions Limits

2-Step, 5-Year Phase-In		
Step	**PM limit**	**Compliance deadline**
1	4.5 g/hr	May 15, 2015
2	2.0 g/hr	May 15, 2020
	2.5 g/hr (Cord wood alternative compliance option)	

State Regulations

- **Puget Sound Clean Air Agency Article 13: (Solid Fuel Burning Device Standards)**

The District evaluated the requirements contained within Puget Sound Clean Air Agency Article 13 and found that District rule 4901 when evaluated holistically is more stringent.

	SJVAPCD Rule 4901 Wood Burning Fireplaces and Wood Burning Heaters	Puget Sound Clean Air Agency Article 13: (Solid Fuel Burning Device Standards)
Last Amended	9/18/2014	10/25/2012
Sole Source Exemption	Those for whom a wood burning fireplace or wood burning heater is the sole available source of heat in a residence. This includes times of temporary service outages, as determined by the gas or electrical utility service are exempt from wood burning curtailments.	A residence or commercial building that has no adequate source of heat other than a solid fuel heating device and the building: i. was constructed or substantially remodeled after July 1, 1992; and ii. is outside an urban growth area, as defined in RCW 36.70A; and iii. is outside an area designated by EPA as a PM2.5 or PM10 particulate nonattainment area.
No Burn Day (Nov-Feb)	Level 1 Curtailment called when PM2.5 is 20-65 µg/m^3 • Wood burning fireplace, low mass fireplace, masonry heater, outdoor wood burning device, or nonregistered wood burning heater shall not be operated. • Registered wood burning heater may be operated provided it's fired on approved fuel, maintained, operated according to manufacturer instructions, and has no visible smoke.	No person in a residence or commercial establishment shall operate a solid fuel burning device under any of the following conditions: • Whenever the Agency has declared the **first stage** of impaired air quality for a geographical area • New solid fuel shall be withheld from any solid fuel burning device already in operation for the duration of the first stage of impaired air quality if that device is restricted from operating.

	SJVAPCD Rule 4901 Wood Burning Fireplaces and Wood Burning Heaters	Puget Sound Clean Air Agency Article 13: (Solid Fuel Burning Device Standards)

	Level 2 Curtailment called when PM is >65 µg/m^3 for all Units	• Smoke visible from a chimney, flue, or exhaust duct after three hours has elapsed from the declaration of a first stage of impaired air quality shall constitute prima facie evidence of unlawful operation of a solid fuel burning device if that solid fuel burning device is restricted from operating during a first stage of impaired air quality. This presumption may be refuted by demonstration that the smoke was not caused by a solid fuel burning device.
		• Whenever the Agency has declared the **second stage** of impaired air quality for a geographical area
		  • New solid fuel shall be withheld from any solid fuel burning device already in operation for the duration of the second stage of impaired air quality if that device is restricted from operating.
		  • Smoke visible from a chimney, flue, or exhaust duct after three hours has elapsed from the declaration of a second stage of impaired air quality shall constitute prima facie evidence of unlawful operation of a solid fuel burning device if that solid fuel burning device is restricted from operating during a second stage of impaired air quality. This presumption may be refuted by demonstration that the smoke was not caused by a solid fuel burning device.

Sale, Resale, or Installation of Wood-Burning Devices	Sale or transfer of wood burning heaters • New. No person shall advertise, sell, offer for sale, supply, install, or transfer a new wood burning heater unless it is EPA Phase II or more stringent certification as currently enforced by NSPS at time of sale or transfer or a pellet-fueled heater exempt from certification until such time NSPS removes exemption, then it must comply with NSPS. • Used. No person shall advertise, sell, offer for sale, supply, install, or transfer a used wood burning heater unless it has been rendered permanently inoperable, satisfies NSPS, or is a low mass fireplace, masonry heater, or other wood burning device of a make and model that meets all federal requirements and has been approved in writing by the APCO.	Solid fuel burning devices. A person shall not advertise to sell, offer to sell, sell, bargain, exchange, give away, or install a solid fuel burning device unless it meets both subsections (1) and (2): • It has been certified and labeled in accordance with procedures and criteria specified in "40 CFR 60 Subpart AAA - Standards of 12/12 13-7 Regulation I Performance for Residential Wood Heaters" as amended through July 1, 1990; and • It meets the following particulate air contaminant emission standards and the test methodology of EPA in effect on January 1, 1991, or an equivalent standard under any test methodology adopted by EPA subsequent to such date: (A) Two and one-half grams per hour for catalytic woodstoves; and (B) Four and one-half grams per hour for all other solid fuel burning devices. **Fireplaces.** A person shall not advertise to sell, offer to sell, sell, bargain, exchange, give away, or install a factory-built fireplace unless it meets the 1990 EPA standards for wood stoves or an equivalent standard that may be established by the state building code council by rule.

	SJVAPCD Rule 4901 Wood Burning Fireplaces and Wood Burning Heaters	Puget Sound Clean Air Agency Article 13: (Solid Fuel Burning Device Standards)
Requirements for Non-Certified Units	Rule requires only EPA certified units be sold in the area.	(1) Any person who owns or is responsible for a wood stove that is both (a) not a certified wood stove and (b) is located in the Tacoma, Washington fine particulate nonattainment area must remove and dispose of it or render it permanently inoperable by September 30, 2015. (2) Any person who owns or is responsible for a coal-only heater located in the Tacoma, Washington fine particulate nonattainment area must remove and dispose of it or render it permanently inoperable by September 30, 2015. 12/12 13-8 Regulation I (3) Subsection (1) above does not apply to: (A) A person in a residence or commercial establishment that does not have an adequate source of heat without burning wood; or (B) A person with a shop or garage that is detached from the main residence or commercial establishment that does not have an adequate source of heat in the detached shop or garage without burning wood. (4) The owner or person responsible for removing or rendering permanently inoperable a wood stove or a coal-only heater must provide documentation of the removal and disposal or rendering permanently inoperable to the Agency using the Agency's procedures within 30 days of the removal or rendering permanently inoperable. (b) PM10. Subsection (b) of this section is established for the sole purpose of a contingency measure for PM10 nonattainment and maintenance areas. If the EPA makes written findings that: (1) an area has failed to attain or maintain the National Ambient Air Quality Standard for PM10, and (2) in consultation with Ecology and the Agency, finds that the emissions from solid fuel burning devices are a contributing factor to such failure to attain or maintain the standard, the use of wood stoves not meeting the standards set forth in RCW 70.94.457 shall be prohibited within the area determined by the Agency to have contributed to the violation. This provision shall take effect one year after such a determination.
Visible Emissions	A registered EPA unit may be operated if it has no visible smoke when operated under normal operating conditions may be used during a Level 1 curtailment.	A person shall not cause or allow emission of a smoke plume from any solid fuel burning device to exceed an average of twenty percent opacity for six consecutive minutes in any one-hour period.

	SJVAPCD Rule 4901 Wood Burning Fireplaces and Wood Burning Heaters	Puget Sound Clean Air Agency Article 13: (Solid Fuel Burning Device Standards)
Prohibited Fuels	No person shall cause or allow any of the following materials to be burned in a wood burning fireplace, wood burning heater, or outdoor wood burning device: garbage, treated wood, plastic products, rubber products, waste petroleum products, paints and paint solvents, coal, or any other material not intended by a manufacturer for use as a fuel in a wood burning fireplace, wood burning heater, or outdoor wood burning device.	A person shall cause or allow only the following materials to be burned in a solid fuel burning device: • Properly seasoned fuel wood; or • An amount of paper necessary for starting a fire; or • Wood pellets; or • Biomass fire logs intended for burning in a wood stove or fireplace; or • Coal with sulfur content less than 1.0% by weight burned in a coal-only heater. All other materials are prohibited from being burned.

- **Albuquerque City Ordinance § 9-5**

The District evaluated the requirements contained within Albuquerque City Ordinance § 9-5 and found that District rule 4901 when evaluated holistically is more stringent.

	SJVAPCD Rule 4901 Wood Burning Fireplaces and Wood Burning Heaters	Albuquerque City Ordinance § 9-2
Last Amended	9/18/2014	Unknown
EPA Certified Exemption	EPA certified units are not exempt from rule requirements.	Certified heaters may be operated during a no burn period provided that no visible emissions are produced beyond a 20-minute startup period.
Sole Source Exemption	Those for whom a wood burning fireplace or wood burning heater is the sole available source of heat in a residence. This includes times of temporary service outages, as determined by the gas or electrical utility service are exempt from wood burning curtailments.	The following are exempt: If the wood burning device is the sole source of heat Medical necessity of a wood burning device Low income status
Limited Exemption: Loss of NG and/or Electrical Power	Those for whom a wood burning fireplace or wood burning heater is the sole available source of heat in a residence. This includes times of temporary service outages, as determined by the gas or electrical utility service are exempt from wood burning curtailments.	Emergency situations such as failure of residence's primary heating system.
Wood Burning Season	November through February	October through February

	SJVAPCD Rule 4901 Wood Burning Fireplaces and Wood Burning Heaters	Albuquerque City Ordinance § 9-2
No Burn Day	Level 1 Curtailment called when PM2.5 is 20-65 µg/m3 • Wood burning fireplace, low mass fireplace, masonry heater, outdoor wood burning device, or nonregistered wood burning heater shall not be operated. • Registered wood burning heater may be operated provided it's fired on approved fuel, maintained, operated according to manufacturer instructions, and has no visible smoke.	No burn periods shall be declared by the Director upon review of available meteorological data and a determination that expected atmospheric conditions will not reasonably disperse wood smoke.
	Level 2 Curtailment called when PM is >65 µg/m3 for all Units	
Visible Emissions	A registered EPA unit may be operated if it has no visible smoke when operated under normal operating conditions may be used during a Level 1 curtailment.	Certified wood heaters may be operated during a no burn period provided that no visible emissions are produced beyond a 20-minute start up period.

HOW DOES DISTRICT RULE 4901 COMPARE TO RULES IN OTHER AIR DISTRICTS?

There are no analogous rules for this source category in VCAPCD.

SCAQMD

- SCAQMD Rule 445 (Wood Burning Devices)

The District evaluated the requirements contained within SCAQMD Rule 445 and found that District rule 4901 when evaluated holistically is more stringent.

	SJVAPCD Rule 4901 Wood Burning Fireplaces and Wood Burning Heaters	SCAQMD Rule 445 (Wood Burning Devices)
Last Amended	9/18/2014	5/3/2013
Applicability	Rule 4901 applies to any person who manufactures, sells, offers for sale, or operates a wood burning fireplace, wood burning heater, or outdoor wood burning device. Any person who sells, offers for sale, or supplies wood intended for burning in a wood burning fireplace or wood burning heater. Any person who transfers or receives a wood burning heater as part of a real property sale or transfer. Any person who installs a wood burning fireplace or wood burning heater in a new residential development.	The provisions of this rule shall apply to specified persons or businesses within the South Coast Air Basin portion of the South Coast Air Quality Management District: any person that manufacturers, sells, offers for sale, or installs a wood-burning device; any commercial firewood seller that sells, offers for sale, or supplies wood or other wood-based fuels intended for burning in a wood burning-device or portable outdoor wood-burning device; and any property owner or tenant that operates a wood-burning device or portable outdoor wood-burning device.

	SJVAPCD Rule 4901 Wood Burning Fireplaces and Wood Burning Heaters	SCAQMD Rule 445 (Wood Burning Devices)
General Exemption	The following devices are exempt from the provisions of this rule: devices that are exclusively gaseous-fueled. Cook stoves, as described in Code of Federal Regulations 60.531. Any burning occurring on the ground is open burning and is subject to requirements of District Rule 4103.	The provisions of this rule shall not apply to wood-fired cooking devices designed and used for commercial purposes. The provisions of paragraph (d)(2) shall not apply to an indoor or outdoor wood-burning device that is permanently installed and included in the sale or transfer of any existing development. The provisions shall not apply to properties that are registered as a historical site, or are contributing structures located in a Historic Preservation Overlay Zone, as determined by the applicable, federal, State, or local agency. Contributing structures are those buildings which are examples of the predominate styles of the area, built during the time period when the bulk of the structures were built in the Historic Preservation Overlay Zone. The provisions of (d)(3) shall not apply to manufactured firelogs. The provisions of (d)(5) shall not apply to wood-based fuel intended for the cooking, smoking, or flavoring of food. The provisions of subdivision (e) shall not apply under the following circumstances: A low income household; or Residential or commercial properties located 3,000 or more feet above mean sea level; or Ceremonial fires exempted under Rule 444 - Open Burning.
Natural Gas Exemption	Locations where natural gas is not available are not subject to episodic curtailments (propane & butane are not considered natural gas).	Residential or commercial properties where there is no existing infrastructure for natural gas service within 150 feet of the property line or those 3,000 or more feet above mean sea level.

	SJVAPCD Rule 4901 Wood Burning Fireplaces and Wood Burning Heaters	SCAQMD Rule 445 (Wood Burning Devices)
Sole Source Exemption	Those for whom a wood burning fireplace or wood burning heater is the sole available source of heat in a residence. This includes times of temporary service outages, as determined by the gas or electrical utility service are exempt from wood burning curtailments.	Residential or commercial properties where a wood-burning device is the sole source of heat.
No Burn Day **(Nov-Feb)**	Level 1 Curtailment called when PM2.5 is 20-65 µg/m3 • Wood burning fireplace, low mass fireplace, masonry heater, outdoor wood burning device, or nonregistered wood burning heater shall not be operated. • Registered wood burning heater may be operated provided it's fired on approved fuel, maintained, operated according to manufacturer instructions, and has no visible smoke.	No person shall operate an indoor or outdoor wood-burning device, portable outdoor wood-burning device, or wood-fired cooking device during the wood burning season when a mandatory winter burning curtailment is forecast for the specific region where the device is located if the PM2.5 is forecast to exceed 30 µg/m³; or on a basin wide basis with a forecast > 30 µg/m³ is predicted for a source receptor area containing a monitoring station that has recorded a violation of the federal 24-hour PM2.5 National Ambient Air Quality Standard for either of the two previous three-year design value periods. The design value is the three-year average of the annual 98th percentile of the 24-hour values of monitored ambient PM2.5 data.
	Level 2 Curtailment called when PM is >65 µg/m3 for all units	
Sale, Resale, or Installation of	Sale or transfer of wood burning heaters	

	SJVAPCD Rule 4901 Wood Burning Fireplaces and Wood Burning Heaters	SCAQMD Rule 445 (Wood Burning Devices)
Wood-Burning Devices	• New. No person shall advertise, sell, offer for sale, supply, install, or transfer a new wood burning heater unless it is EPA Phase II or more stringent certification as currently enforced by NSPS at time of sale or transfer or a pellet-fueled heater exempt from certification until such time NSPS removes exemption, then it must comply with NSPS. • Used. No person shall advertise, sell, offer for sale, supply, install, or transfer a used wood burning heater unless it has been rendered permanently inoperable, satisfies NSPS, or is a low mass fireplace, masonry heater, or other wood burning device of a make and model that meets all federal requirements and has been approved in writing by the APCO.	No person shall sell, offer for sale, supply, or install, a new or used permanently installed indoor or outdoor wood-burning device or gaseous-fueled device unless it is one of the following: A) USEPA Certified wood-burning heater; or B) Pellet-fueled wood-burning heater; or C) A masonry heater; or D) A dedicated gaseous-fueled fireplace
Requirements for Real Property	5.2.1 No person shall sell or transfer any real property which contains a wood burning heater without first assuring it complies with NSPS, is pellet-fueled, or is permanently inoperable. 5.2.2 Upon the sale or transfer, the seller shall provide to the recipient, and the APCO, documentation with compliance to 5.2.1.	EPA certification requirements do not apply to: 1) Indoor or outdoor wood-burning device that is permanently installed and included in the sale or transfer of any existing development. 2) Properties that are registered as a historical site, or are contributing structures located in a Historic Preservation Overlay Zone, as determined by the applicable, federal, State, or local agency. Contributing structures are those buildings which are examples of the predominate styles of the area, built during the time period when the bulk of the structures were built in the Historic Preservation Overlay Zone.

	SJVAPCD Rule 4901 Wood Burning Fireplaces and Wood Burning Heaters	SCAQMD Rule 445 (Wood Burning Devices)
Requirements for New Building Construction	Limitations on wood burning fireplaces or wood burning heaters in new residential developments - No wood burning fireplace in a new residential development with density >2 dwelling units per acre - No more than 2 EPA units per acre in a new residential development with density >2 dwelling units per acre - No more than 1 fireplace or EPA unit in a new residential development with density ≤2 dwelling units per acre New Residential Development: any single or multi-family housing unit, for which construction began on or after 1/1/2004. Construction began when the foundation for the structure was constructed.	No person shall permanently install a wood-burning device into any new development.

	SJVAPCD Rule 4901 Wood Burning Fireplaces and Wood Burning Heaters	SCAQMD Rule 445 (Wood Burning Devices)
Solid Wood Fuel or Wood Sale	Advertising Requirements for Sale of Wood - No person shall sell, offer for sale, or supply any wood which is orally or in writing, advertised, described, or in any way represented to be "seasoned wood" unless the wood has a moisture content of ≤ 20% by weight. - The APCO may delegate another person or agency the authority to test wood for moisture content and determine compliance.	A commercial firewood seller shall only sell seasoned wood from July 1 through the end of February the following year. Any commercial firewood seller may sell seasoned as well as non-seasoned wood during the remaining months. No commercial firewood seller shall sell, offer for sale, or supply wood-based fuel without first attaching a permanently affixed indelible label to each package or providing written notice to each buyer at the time of purchase of bulk firewood that at a minimum states the following: "Use of this and other solid fuel products may be restricted at times by law. Please check (1-877-4NO-Burn) or (www.8774NOBURN.org) before burning." Labeling requirements do not apply to wood-based fuel intended for cooking, smoking, or flavoring of food. Alternative language, toll-free telephone number or web address for the information specified in subdivision (g) may be used, subject to Executive Officer approval. The Executive Officer shall specify guidelines for the aforementioned labeling requirements.
Prohibited Fuels	No person shall cause or allow any of the following materials to be burned in a wood burning fireplace, wood burning heater, or outdoor wood burning device: garbage, treated wood, plastic products, rubber products, waste petroleum products, paints and paint solvents, coal, or any other material not intended by a manufacturer for use as a fuel in a wood burning fireplace, wood burning heater, or outdoor wood burning device.	No person shall burn any product not intended for use as fuel in a wood-burning device including, but not limited to, garbage, treated wood, particle board, plastic products, rubber products, waste petroleum products, paints, coatings or solvents, or coal. Manufactured logs are exempt from this requirement.

SMAQMD

- SMAQMD Rule 417 (Wood Burning Appliances)

The District evaluated the requirements contained within SMAQMD Rule 417 and and found the District rule 4901 when evaluated holistically is more stringent.

	SJVAPCD Rule 4901 Wood Burning Fireplaces and Wood Burning Heaters	**SMAQMD Rule 417 (Wood Burning Appliances)**
Last Amended	9/18/2014	10/26/2006
General Exemption	Cook stoves	Cook stoves, or Commercial products manufactured expressly for starting a fire in a wood fired appliance.

	SJVAPCD Rule 4901 Wood Burning Fireplaces and Wood Burning Heaters	SMAQMD Rule 417 (Wood Burning Appliances)
Wood Heater Manufacturers & Retailers	Sale or transfer of wood burning heaters • New. No person shall advertise, sell, offer for sale, supply, install, or transfer a new wood burning heater unless it is EPA Phase II or more stringent certification as currently enforced by NSPS at time of sale or transfer or a pellet-fueled heater exempt from certification until such time NSPS removes exemption, then it must comply with NSPS. • Used. No person shall advertise, sell, offer for sale, supply, install, or transfer a used wood burning heater unless it has been rendered permanently inoperable, satisfies NSPS, or is a low mass fireplace, masonry heater, or other wood burning device of a make and model that meets all federal requirements and has been approved in writing by the APCO.	Effective October 26, 2007, no person shall sell, offer for sale, supply, install, or transfer a new wood burning appliance unless it is one of the following: A U.S. EPA Phase II Certified wood burning heater, A pellet-fueled wood burning heater, A masonry heater, or an appliance or fireplace determined to meet the U.S. EPA particulate matter. emission standard set forth in Title 40 CFR, Part 60, Subpart AAA, and approved in writing by the Air Pollution Control Officer. No person shall advertise, sell, offer for sale, supply, install, or transfer a used wood burning appliance unless it meets the requirements of section 301.1, or has been rendered permanently inoperable. All wood burning appliances shall be installed and operated according to the manufacturer's specifications. Any U.S. EPA Phase II certified wood burning appliance which has been altered, installed, or disassembled in any way not specified by the manufacturer, or is operated in any manner that would result in emissions exceeding the standards set forth in Title 40 CFR, Part 60, Subpart AAA, shall not be considered a U.S. EPA Phase II certified appliance.

	SJVAPCD Rule 4901 Wood Burning Fireplaces and Wood Burning Heaters	SMAQMD Rule 417 (Wood Burning Appliances)
Public Awareness Information	Retailers selling or offering for sale new wood burning heaters shall supply public awareness information with each sale in the form of pamphlets, brochures, or fact sheets on the following: proper installation, operation, and maintenance, fuel, health effects, weatherization methods for the home, proper sizing of wood burning heaters, and Burn Curtailments.	Appliances shall distribute public awareness information with each wood burning appliance, in the form of pamphlets, brochures, or fact sheets on the following topics: 1. Proper installation, operation, and maintenance of the wood burning appliance, 2. Proper fuel selection and use, 3. Health effects from wood smoke, and 4. Weatherization methods for the home
Solid Wood Fuel or Wood Sale	Advertising Requirements for Sale of Wood - No person shall sell, offer for sale, or supply any wood which is orally or in writing, advertised, described, or in any way represented to be “seasoned wood” unless the wood has a moisture content of ≤ 20% by weight. - The APCO may delegate another person or agency the authority to test wood for moisture content and determine compliance.	No person shall sell, offer for sale, or supply any wood which orally, or in writing, is advertised, described, or in any way represented to be “seasoned” or “dry” wood unless the wood has a moisture content of 20 percent or less by weight.
Prohibited Fuels	No person shall cause or allow any of the following materials to be burned in a wood burning fireplace, wood burning heater, or outdoor wood burning device: garbage, treated wood, plastic products, rubber products, waste petroleum products, paints and paint solvents, coal, or any other material not intended by a manufacturer for use as a fuel in a wood burning fireplace, wood burning heater, or outdoor wood burning device.	No person shall cause or allow any of the following materials to be burned in a wood burning appliance: garbage, treated wood, plastic products, rubber products, waste petroleum products, paints and other coatings, solvents, coal, glossy or colored paper, particle board, any other material not intended by a manufacturer for use as fuel in a solid fuel burning device.

- SMAQMD Rule 421 (Mandatory Episodic Curtailment of Wood and other Solid Fuel Burning)

The District evaluated the requirements contained within SMAQMD Rule 421 and found the District rule 4901 when evaluated holistically is more stringent.

	SJVAPCD Rule 4901 Wood Burning Fireplaces and Wood Burning Heaters	**SMAQMD Rule 421 (Mandatory Episodic Curtailment of Wood and other Solid Fuel Burning)**
Last aAmended	9/18/2014	09/24/2009
General Exemption	Cook stoves	Cook stoves The provisions of this rule shall not apply to fires conducted as part of a religious ceremony. The provisions of Section 301 shall not apply to any person who has an approved Hardship Waiver for economic reasons
Sole Source Exemption	Those for whom a wood burning fireplace or wood burning heater is the sole available source of heat in a residence. This includes times of temporary service outages, as determined by the gas or electrical utility service are exempt from wood burning curtailments.	The provisions of this rule shall not apply to wood burning devices that are the sole source of heat in a residence.

	SJVAPCD Rule 4901 Wood Burning Fireplaces and Wood Burning Heaters	SMAQMD Rule 421 (Mandatory Episodic Curtailment of Wood and other Solid Fuel Burning)
No Burn Day **(Nov-Feb)**	Level 1 Curtailment called when PM2.5 is 20-65 µg/m3 • Wood burning fireplace, low mass fireplace, masonry heater, outdoor wood burning device, or nonregistered wood burning heater shall not be operated. • Registered wood burning heater may be operated provided it's fired on approved fuel, maintained, operated according to manufacturer instructions, and has no visible smoke.	The requirements of this section shall be in effect during the burning season. 1) No person may have a fire or operate a wood burning device when a Mandatory Curtailment is in effect. 2) The Air Pollution Control Officer will declare a Stage 1 Mandatory Curtailment whenever he or she determines that the 24-hour average PM2.5 concentration may exceed 31 µg/m3 but is not likely to exceed 35 µg/m3. 3) The Air Pollution Control Officer will declare a Stage 2 Mandatory Curtailment whenever he or she determines that the 24-hour average PM2.5 concentration may exceed 35 µg/m3. The Air Pollution Control Officer will declare a Voluntary Curtailment whenever he or she determines that the 24-hour average PM2.5 concentration may exceed 25 µg/m3 but is not likely to exceed 31 µg/m3. Burn curtailments do not apply to U.S. EPA Phase II Certified wood burning heaters and pellet fueled wood burning heaters provided the devices do not emit visible smoke and a Stage 1 Mandatory Curtailment is in effect.
	Level 2 Curtailment called when PM is >65 µg/m3 for all units	

BAAQMD

- BAAQMD Regulation 6 Rule 3 (Wood-Burning Devices)

The District evaluated the requirements contained within BAAQMD Regulation 6 Rule 3 and found the District rule 4901 when evaluated holistically is more stringent.

	SJVAPCD Rule 4901 Wood Burning Fireplaces and Wood Burning Heaters	BAAQMD Rule 6-3 Particulate Matter and Visible Emissions Wood Burning Devices
Last Amended	9/18/2014	10/21/2015
Natural Gas Exemption	Locations where natural gas is not available are not subject to episodic curtailments (propane & butane are not considered natural gas).	No exemption (exemption (§ 6-3-10) deleted during the 2015 amendments)
Sole Source Exemption	Those for whom a wood burning fireplace or wood burning heater is the sole available source of heat in a residence. This includes times of temporary service outages, as determined by the gas or electrical utility service are exempt from wood burning curtailments.	Burn Bans are not applicable to any person whose **sole source of heat is an EPA certified wood-burning device that is registered** with the District per the requirements of Sections 6-3-404 and 405 and who does not have available to them a permanently-installed NG, propane, or electric heating device.
		Rental properties subject to Section 6-3-305 located in areas with NG service no longer qualify for exemption.
		Any person seeking exemption under Section 6-3-110 must have previously registered their EPA certified wood heater in the District's registration program and must maintain documentation that the device is operated according to manufacturer's specifications. The following wood heaters are eligible to registered: **404.1** Wood heaters that are EPA certified to meet performance and emission standards of 7.5 g/hr or less **404.2** A pellet-fueled wood heater exempt from EPA certification requirements pursuant to 40 CFR 60 AAA at the time of purchase or installation
		Registration is a 5-year term

	SJVAPCD Rule 4901 Wood Burning Fireplaces and Wood Burning Heaters	BAAQMD Rule 6-3 Particulate Matter and Visible Emissions Wood Burning Devices
Limited Exemption: Loss of NG and/or Electrical Power	Those for whom a wood burning fireplace or wood burning heater is the sole available source of heat in a residence. This includes times of temporary service outages, as determined by the gas or electrical utility service are exempt from wood burning curtailments.	Mandatory burn bans shall not apply to a person whose dwelling is in an area that has a temporary loss of gas and/or electric utility service and there is no alternate form of heat available. Qualification for exemption is subject to verification.
Limited Exemption: non-Functional Permanently Installed Heater	Those for whom a wood burning fireplace or wood burning heater is the sole available source of heat in a residence. This includes times of temporary service outages, as determined by the gas or electrical utility service are exempt from wood burning curtailments.	Mandatory burn bans do not apply to any person whose only non-wood burning, permanently installed source of heat is non-functional and requires repair to resume operations. A dwelling may qualify for a 30-day exemption if there is no alternate form of heat and the non-functional heater is repaired to resume function within 30 days. Qualification for this exemption is subject to verification and must be supported by documentation of repair, which must be submitted to the District within 10 days of a receipt of a request for such records.
No Burn Day (Nov-Feb)	Level 1 Curtailment called when PM2.5 is 20-65 µg/m^3 • Wood burning fireplace, low mass fireplace, masonry heater, outdoor wood burning device, or nonregistered wood burning heater shall not be operated. • Registered wood burning heater may be operated provided it's fired on approved fuel, maintained, operated according to manufacturer instructions, and has no visible smoke. Level 2 Curtailment called when PM is >65 µg/m^3 for all units	35 µg/m^3 results in a Mandatory Burn Ban (all devices) • 6-3-301: No person shall operate or combust wood or solid-fuel products in any wood-burning device during a Mandatory Burn Ban
Wood Heater Manufacturers & Retailers	Sale or transfer of wood burning heaters • New. No person shall advertise, sell, offer for sale, supply, install, or transfer a new wood burning heater unless it is EPA Phase II or more stringent certification as currently	No manufacturer or retailer shall advertise, sell, offer for sale or resale, supply, install or transfer a new or used wood-burning device … unless the device meets or exceeds 40 CFR 60 AAA - Effective 12/31/15: certified to meet 4.5 g/hr - Effective 5/15/2020: certified to meet 2.5 g/hr if crib tested or 2.0 g/hr if cordwood tested

	SJVAPCD Rule 4901 Wood Burning Fireplaces and Wood Burning Heaters	BAAQMD Rule 6-3 Particulate Matter and Visible Emissions Wood Burning Devices
Sale, Resale, or Installation of Wood-Burning Devices	enforced by NSPS at time of sale or transfer or a pellet-fueled heater exempt from certification until such time NSPS removes exemption, then it must comply with NSPS. • Used. No person shall advertise, sell, offer for sale, supply, install, or transfer a used wood burning heater unless it has been rendered permanently inoperable, satisfies NSPS, or is a low mass fireplace, masonry heater, or other wood burning device of a make and model that meets all federal requirements and has been approved in writing by the APCO.	No person shall advertise, sell, offer for sale or resale, supply, install or transfer a new or used wood-burning device unless it meets 60 CFR 60 AAA. This requirement does not apply if a wood-burning device is an installed fixture in the sale or transfer of any real property.
Requirements for Real Property	No person shall sell or transfer any real property which contains a wood burning heater without first assuring it complies with NSPS, is pellet-fueled, or is permanently inoperable. Upon the sale or transfer, the seller shall provide to the recipient, and the APCO, documentation with compliance to 5.2.1.	Any person selling, renting or leasing a real property shall provide sale or rental disclosure documents that describe the health hazards of PM2.5 (in accordance with BAAQMD guidance) from burning wood or any solid fuel as a source.
Requirements for Rental Properties	None	Effective 11/1/2018, all real property offered for lease or rent in areas with natural gas service shall have a permanently-installed form of heat that does not burn solid fuel.

	SJVAPCD Rule 4901 Wood Burning Fireplaces and Wood Burning Heaters	BAAQMD Rule 6-3 Particulate Matter and Visible Emissions Wood Burning Devices
Requirements for New Building Construction	Limitations on wood burning fireplaces or wood burning heaters in new residential developments - No wood burning fireplace in a new residential development with density >2 dwelling units per acre - No more than 2 EPA units per acre in a new residential development with density >2 dwelling units per acre - No more than 1 fireplace or EPA unit in a new residential development with density ≤2 dwelling units per acre New Residential Development: any single or multi-family housing unit, for which construction began on or after 1/1/2004. Construction began when the foundation for the structure was constructed.	No person or builder shall install a wood-burning device in a new building construction.
Requirements for Remodeling a Fireplace or Chimney	None	No person shall remodel a fireplace or chimney unless a gas-fueled, electric, or EPA certified device is installed that meets requirements of 40 CFR 60 AAA. This requirement is triggered by a fireplace or chimney remodel where a total cost exceeds $15,000 and requires a local building permit.
Visible Emissions	A registered EPA unit may be operated if it has no visible smoke when operated under normal operating conditions may be used during a Level 1 curtailment.	No person shall cause or allow a visible emission that exceeds Ringlemann 1 (20% opacity) for a period or periods aggregating more than 3 minutes in any hour. Visible emissions from startup shall not exceed 20 consecutive minutes in any consecutive four-hour period.
Public Awareness Information	Retailers selling or offering for sale new wood burning heaters shall supply public awareness information with each sale in the form of pamphlets, brochures, or fact sheets on the following: proper installation, operation, and maintenance, fuel, health effects, weatherization methods for the home, proper sizing of wood burning heaters, and Burn Curtailments.	Any person offering for sale, selling or installing a new or used wood-burning device shall provide public awareness information to each purchaser of a wood-burning device in the form of pamphlets, brochures, or fact sheets. The information shall include the following statement: “Wood smoke contains harmful PM which is associated with numerous negative health impacts.”

	SJVAPCD Rule 4901 Wood Burning Fireplaces and Wood Burning Heaters	BAAQMD Rule 6-3 Particulate Matter and Visible Emissions Wood Burning Devices
Solid Wood Fuel or Wood Sale	Advertising Requirements for Sale of Wood - No person shall sell, offer for sale, or supply any wood which is orally or in writing, advertised, described, or in any way represented to be "seasoned wood" unless the wood has a moisture content of ≤ 20% by weight. - The APCO may delegate another person or agency the authority to test wood for moisture content and determine compliance.	Any person offering for sale, selling or providing solid fuel or wood intended for use in a wood-burning device shall: - Attach a label to each package of solid fuel or wood sold that states the following: "Use of this and other solid fuels may be restricted at times by law. Please check 1877-4-NO-BURN or www.8774noburn.org before burning." - If wood is seasoned (not to include manufactured logs), then the label must also state: "This wood meets air quality regulations for moisture content to be less then 20% (percent) by weight for cleaner burning." - If wood is NOT seasoned "This wood does **NOT** meet air quality regulations for moisture content and must be properly dried before burning."
Prohibited Fuels	No person shall cause or allow any of the following materials to be burned in a wood burning fireplace, wood burning heater, or outdoor wood burning device: garbage, treated wood, plastic products, rubber products, waste petroleum products, paints and paint solvents, coal, or any other material not intended by a manufacturer for use as a fuel in a wood burning fireplace, wood burning heater, or outdoor wood burning device.	No person shall cause or allow any of the following materials to be burned in a wood-burning device: garbage, treated wood, non-seasoned wood, used or contaminated wood pallets, plastic products, rubber products, waste petroleum products, paints and paint solvents, coal, animal carcasses, glossy or colored paper, salt water driftwood, particle board, and any material not intended by the manufacturer for use as a fuel in a wood-burning device.

ADDITIONAL EMISSION REDUCTION OPPORTUNITIES

While the District's existing residential wood burning strategy is already the most stringent, the District's evaluation has found opportunities for achieving additional emissions reductions Valley-wide through a number of enhancements to the strategy. These ehnahcements include several additional requirements under Rule 4901 that address visible emissions, new development, enforcement of existing requirements, and enhanced efforts with respect to public education and outreach, enforcement, and air quality forecasting. Consistent with the District's ongoing efforts to improve our residential wood burning strategy, these enhancements will build on the District's successful strategy to achieve even further reductions in emissions from residential wood burning.

Additionally, the District evaluated achieving further reductions through more stringent wood burning curtailment program in hot-spot areas by lowering burn prohibitions for non-registered units from 20 µg/m³ to 12 µg/m³. Hot-spot areas include Fresno, Madera, and Kern counties. While the existing rule is already very stringent and requires wood burning curtailment well below the 35 µg/m³ and 65 µg/m³ standards, the plan proposes to further reduce the curtailment level to achieve the additional emissions reductions needed for attainment.

Coupled with the proposed curtailment enhancements, the plan proposes enhanced levels of incentives to replace wood burning devices with only natural gas or propane units in the hot-spot areas. The Burn Cleaner program would continue to offer the current level of incentives (see below) Valleywide. The District estimates incentive monies will be $75 million total cost with $57 million dedicated to hot-spot areas.

EVALUATION FINDINGS

The District has evaluated all potential control technologies and all control technologies achieved in practice in other areas or included in other state implementation plans for this source category. As demonstrated above, Rule 4901 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds RACM, BACM, and MSM requirements for this source category.

While the District meets or exceeds RACM, BACM, and MSM requirements for this source category, given the enormity of reductions needed to demonstrate attainment with the latest PM2.5 standards this measure would go beyond MSM to reduce additional emissions by implementing an even more stringent wood burning curtailment program with the following potential enhancements:

- Curtailment Levels
  - Lower curtailment levels in the targeted hot-spot areas of Fresno County, Madera County, and Kern County
    - No burn for non-registered units at or above 12 µg/m^3
    - No burn for all devices above 35 µg/m^3
  - Maintain current curtailment levels in rest of Valley
    - No burn for non-registered units at or above 20 µg/m^3

        - No burn for all devices above 65 µg/m^3
- Incentive Levels
    - Offer enhanced levels of incentives in hot-spot areas to fund the full replacement of wood burning devices
        - Incentive will only be provided for transition to natural gas devices in areas where natural gas services are available
    - Incentives will be provided for EPA-certified wood burning or pellet fueled devices in areas with no access to natural gas services
    - Continue to offer current level of incentives in rest of Valley
- New Construction
    - Prohibit wood-burning devices in new construction (at higher elevations, only allow EPA-certified devices, subject to density requirements)
- Enhanced outreach and education efforts to increase awareness of residential wood burning health impacts and District's residential wood burning reduction strategy Valleywide
- New visible emissions limitations for residential wood burning
- New requirement for significant remodels of a fireplace or chimney that requires the removal of open-hearth fireplaces
- Only allow seasoned wood to be burned Valleywide
- Enhanced enforcement to assure continued high compliance rate Valleywide under new strategy
- Enhanced enforcement during transfer of real property by requiring verification forms for all house transfers in the Valley
- Enhanced curtailment forecasting through use of new meteorological and air quality models and tools as feasible

C.20 Rule 4902 (Residential Water Heaters)

Discussion

Rule 4902 is a point-of-sale rule that limits NOx emissions from natural gas-fired residential water heaters. Rule 4902 was adopted on July 17, 1993 and subsequently amended in March 2009. The original rule enforced a NOx emissions limit of 40 nanograms of NOx per Joule of heat output (ng/J). 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.[81]

Manufacturers have focused on combustion modifications to meet the lower NOx limit as required in other California air districts. Combustion modification systems are designed to reduce thermal NOx formation by changing the flame characteristics to reduce peak flame temperature. Combustion modification for residential water heaters is achieved by different burner designs such as low NOx and ultra-low NOx burners. Some of the design principles used in low NOx and ultra-low NOx burners include staged air burners, staged fuel burners, pre-mix burners, internal recirculation, and radiant burners.

Emission Inventory

POLLUTANT	2013	2017	2019	2020	2022	2023	2024	2025	2026	2028
	Annual Average - Tons per day									
PM2.5	0.21	0.22	0.22	0.22	0.23	0.23	0.23	0.23	0.23	0.24
NOX	2.15	2.07	2.05	2.02	1.97	1.94	1.90	1.91	1.92	1.94
	Winter Average - Tons per day									
PM2.5	0.27	0.29	0.30	0.30	0.30	0.31	0.31	0.31	0.31	0.31
NOX	2.85	2.75	2.72	2.68	2.62	2.58	2.53	2.54	2.55	2.58

Source Category

Rule 4902 is a point of sale rule that affects water heater manufacturers, plumbing wholesalers, retail home supply stores, plumbers and contractors, and homeowners. This source category encompasses several types of water heaters, including conventional storage water heaters, demand water heaters, heat pump water heaters, solar water heaters, and tankless coil and indirect water heaters. Water heater options also vary by fuel type which includes electricity, fuel oil, geothermal energy, natural gas, propane, and solar energy.

Conventional storage water heaters are the most common. They have an insulated tank sized from 20 to 80 gallons and natural gas fired units have a gas burner under the tank regulated by a thermostat. Demand water heaters, also known as instantaneous water heaters, heat water as it is required and do not use a storage tank. As soon as

[81] EPA. Revisions to the California State Implementation Plan, San Joaquin Valley Unified Air Pollution Control District. Final Rule. 75 Fed. Reg. 24408. (2010, May 5). (to be codified at 40 CFR 52). https://www.gpo.gov/fdsys/pkg/FR-2010-05-05/pdf/2010-10404.pdf

there is a demand for hot water, a gas burner heats cold water as it travels through a pipe in the unit.

Natural gas fired units provide hot water at a rate upwards of 5 gallons per minute. A tankless coil water heater heats water flowing through a heat exchanger installed in a furnace or boiler. Similar to the tankless coil water heater, an indirect water heater uses a furnace or boiler. Fluid heated by the furnace or boiler is circulated through a heat exchanger in a storage tank.

HOW DOES DISTRICT RULE 4902 COMPARE WITH FEDERAL AND STATE RULES AND REGULATIONS?

Federal 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.

State Regulations

There are no state regulations applicable to air quality from commercial charbroiling activities.

HOW DOES DISTRICT RULE 4902 COMPARE TO RULES IN OTHER AIR DISTRICTS?

SCAQMD

- SCAQMD Rule 1121 (Control of Nitrogen Oxides from Residential Type, Natural Gas-Fired Water Heaters) *(September 3, 2004)*

The District evaluated the requirements contained within the SCAQMD Rule and found no requirements that were more stringent than those already in District Rule 4902.

	SJVAPCD	SCAQMD
Applicability	Manufacturers, distributors, retailers, and installers of PUC quality natural gas-fired residential water heaters with heat input rates ≤ 75,000 Btu/hr	Manufacturers, distributors, retailers, and installers of natural gas-fired water heaters, with heat input rates < 75,000 Btu/hr
Exemption	• PUC quality natural gas fired water heaters with rated heat input of > 75,000 Btu/hr • Water heaters using fuels other than PUC quality natural gas • Water heaters used exclusively in recreational vehicles	• Water heaters with a rated heat input capacity of ≥75,000 Btu/hr • Water heaters used in recreational vehicles
Requirements	• No person shall manufacture for sale, distribute, sell, offer for sale, or install within the District any PUC quality natural gas-fired: • Mobile home water heater unless it is certified to a NOx emission level of ≤ 40 ng/J.	• No person shall manufacture for sale, distribute, sell, offer for sale, or install within SCAQMD any gas-fired water heaters unless it is certified to a NOx emission level of ≤ 10 ng/J; or 15 ppmv at 3% O2, dry

	SJVAPCD	SCAQMD
	• Pool heater unless it is certified to a NOx emission level of ≤ 40 ng/J • Water heater, excluding mobile home water heaters, instantaneous water heaters, and pool heaters, unless it is certified to a NOx emission level of ≤ 10 ng/J. • Instantaneous water heater unless it is certified to a NOx emission level of ≤ 14 ng/J.	• No person shall manufacture for sale, distribute, sell, offer for sale, or install within SCAQMD any gas-fired mobile home water heater unless it is certified to a NOx emission level of ≤ 40 ng/J; or 55 ppmv at 3% O2, dry

SMAQMD

- SMAQMD Rule 414 (Water Heaters, Boilers and Process Heaters Rated Less than 1,000,000 BTU Per Hour) *(March 25, 2010)*

The District evaluated the requirements contained within SMAQMD Rule and found no requirements that were more stringent than those already in District Rule 4902. Requirements for units with a rating greater than 75,000 Btu/hr but less than 2,000,000 Btu/hr are included under District Rule 4308 and have at least as stringent or more stringent limits than those in SMAQMD Rule.

	SJVAPCD	SMAQMD
Applicability	Manufacturers, distributors, retailers, and installers of PUC quality natural gas-fired residential water heaters with heat input rates ≤ 75,000 Btu/hr	Any person who manufactures, distributes, offers for sale, sells, or installs any type of water heater (such as tank or tankless/instantaneous), boiler or process heater, with a rated heat input capacity < 1,000,000 Btu/hr, fired with gaseous or nongaseous fuels, for use in this District.
Exemption	• PUC quality natural gas fired water heaters with rated heat input of > 75,000 Btu/hr • Water heaters using fuels other than PUC quality natural gas • Water heaters used exclusively in recreational vehicles	• Water heaters used in recreational vehicles • Pool/spa heaters with a heat input rating of less than 75,000 Btu/hr • Water heaters, boilers and process heaters fired with liquefied petroleum gas
Requirements	• No person shall manufacture for sale, distribute, sell, offer for sale, or install within the District any PUC quality natural gas-fired: • Mobile home water heater unless it is certified to a NOx emission level of ≤ 40 ng/J • Pool heater unless it is certified to a NOx emission level of ≤ 40 ng/J • Water heater, excluding mobile home water heaters, instantaneous water heaters, and pool heaters, unless it is	A person shall only distribute, offer for sale, sell, or install within the SMAQMD a water heater, boiler or process heater with certified NOx and CO emissions ≤ the following limits: • < 75,000 Btu/hr: ○ Mobile home: 40 ng/J ○ All others: 10 ng/J • 75,000 - <400,000 Btu/hr: ○ Pool/Spa: 40 ng/J ○ All others: 14 ng/J • 400,000 to <1 million Btu/hr:

	SJVAPCD	SMAQMD
	certified to a NOx emission level of ≤ 10 ng/J • Instantaneous water heater unless it is certified to a NOx emission level of ≤ 14 ng/J	○ All types: 14 ng/J NOx and 400 ppmv CO @ 3% O2

BAAQMD

- BAAQMD Regulation 9 Rule 6 (Nitrogen Oxides Emissions from Natural Gas-Fired Boilers and Water Heaters) *(November 7, 2007)*

The District evaluated the requirements contained within BAAQMD and found no requirements that were more stringent than those already in District. Requirements for units with a rating greater than 75,000 Btu/hr but less than 2,000,000 Btu/hr are included under District Rule 4308 and have at least as stringent or more stringent limits than those in BAQMD Rule.

	SJVAPCD	BAAQMD
Applicability	Manufacturers, distributors, retailers, and installers of PUC quality natural gas-fired residential water heaters with heat input rates ≤ 75,000 Btu/hr	This rule limits the emissions of nitrogen oxides from natural gas-fired water heaters and boilers
Exemption	• PUC quality natural gas fired water heaters with rated heat input of > 75,000 Btu/hr • Water heaters using fuels other than PUC quality natural gas • Water heaters used exclusively in recreational vehicles	The requirement *[No person shall sell, install, or offer for sale within the District any natural gas-fired storage tank water heater, manufactured after July 1, 1992, with a rated heat input capacity of 75,000 BTU/Hour or less, that emits more than 40 ng/J.]* shall not apply to the following: • Natural gas-fired boilers and water heaters with a rated heat input capacity > 2,000,000 BTU/hr. • Natural gas-fired water heaters used in recreational vehicles • Water heaters using a fuel other than natural gas • Natural gas-fired pool/spa heaters with < 400,000 BTU/hr rated heat input capacity used exclusively to heat swimming pools, hot tubs or spas
Requirements	No person shall manufacture for sale, distribute, sell, offer for sale, or install within the District any PUC quality natural gas-fired: • Mobile home water heater unless it is certified to a NOx emission level of ≤ 40 ng/J • Pool heater unless it is certified to a NOx emission level of ≤ 40 ng/J. • Water heater, excluding mobile home water heaters,	Natural gas-fired storage tank water heaters with a rated heat input capacity ≤ 75,000 Btu/hr: • No person shall sell, install, or offer for sale within the District any natural gas-fired storage tank water heater that emits > 10 ng/J. This subsection shall not apply to water heaters used for mobile homes. Natural gas-fired boilers and water heaters with a rated heat input capacity of 75,001 to 2,000,000 Btu/hr:

	SJVAPCD	BAAQMD
	instantaneous water heaters, and pool heaters, unless it is certified to a NOx emission level of ≤ 10 ng/J. • Instantaneous water heater unless it is certified to a NOx emission level of ≤ 14 ng/J.	• No person shall sell, install, or offer for sale within the District any large natural gas-fired boiler, storage tank water heater, or instantaneous water heater with a rated heat input capacity from 75,001 to 400,000 Btu/hr, inclusive, manufactured after January 1, 2013, that emits more than 14 ng/J. • No person shall sell, install, or offer for sale within the District any large natural gas-fired boiler, storage tank water heater, or instantaneous water heater with a rated heat input capacity from 400,001 to 2,000,000 Btu/hr, inclusive, manufactured after January 1, 2013, that emits more than 14 ng/J, or more than 20 ppm NOx at 3% O2, dry. No person shall sell, install, or offer for sale within the District any natural gas-fired mobile home water heater that emits > 40 ng/J. No person shall sell, install, or offer for sale within the District any natural gas-fired pool/spa heater with an input rating from 400,001 to 2,000,000 Btu/hr that emits > 14 ng/J, or > 20 ppm NOx at 3% O2, dry.

VCAPCD

- VCAPCD Rule 74.11 (Natural Gas-Fired Water Heaters) (*January 12, 2010*)

The District evaluated the requirements contained within VCAPCD and found no requirements that were more stringent than those already in District Rule 4902. Requirements for units with a rating greater than 75,000 Btu/hr but less than 2,000,000 Btu/hr are included under District Rule 4308 and have at least as stringent or more stringent limits than those in VCAPCD Rule.

	SJVAPCD	VCACPD
Applicability	Manufacturers, distributors, retailers, and installers of PUC quality natural gas-fired residential water heaters with heat input rates ≤ 75,000 Btu/hr	Any person selling, offering for sale, or installing natural gas-fired water heaters, including mobile home water heaters, rated at < 75,000 Btu/hr in Ventura County
Exemption	• PUC quality natural gas fired water heaters with rated heat input of > 75,000 Btu/hr • Water heaters using fuels other than PUC quality natural gas	The provisions of this rule shall not apply to: 1. Water heaters with a rated heat input ≥ 75,000 Btu/hr 2. Water heaters used in recreational vehicles

	SJVAPCD	VCACPD
	• Water heaters used exclusively in recreational vehicles	
Requirements	• No person shall manufacture for sale, distribute, sell, offer for sale, or install within the District any PUC quality natural gas-fired: • Mobile home water heater unless it is certified to a NOx emission level of ≤ 40 ng/J. • Pool heater unless it is certified to a NOx emission level of ≤ 40 ng/J. • Water heater, excluding mobile home water heaters, instantaneous water heaters, and pool heaters, unless it is certified to a NOx emission level of ≤ 10 ng/J. • Instantaneous water heater unless it is certified to a NOx emission level of ≤ 14 ng/J.	• No person shall sell, offer for sale, or install within Ventura County any natural gas-fired water heater unless the water heater is certified to a NOx emission level ≤: ○ 10 ng/J; or ○ 15 ppmv at 3% O2, dry • No person shall sell, offer for sale, or install within Ventura County any natural gas-fired mobile home water heater unless the water heater is certified to a NOx emission level ≤: • 40 ng/J; or • 55 ppmv at 3% O2, dry

ADDITIONAL EMISSION REDUCTION OPPORTUNITIES

Beyond the review of current regulation and rule requirements, the District performed an extensive review of the feasibility of expanding applicability or removal of exemptions for this source category, technologies and measures that have been implemented in practice in other regions, and potential new technologies and measures that may be feasible for implementation in the near future. Based on this exhaustive review, District staff did not find any additional measures currently available or will be available prior to the 2025 attainment deadline date that could improve the effectivity of this rule.

As stated above, the most recent amendment of Rule 4902 strengthened the emission limit and as a result, NOx 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 SOx and PM2.5 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.

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]	146 lbs	146 lbs	117 lbs
Energy Factor[1]	0.62	0.62	0.93
Purchase Price[1]	$895.00	$1,132.00	$650.00
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]	$3,919	$6,852	$9,922
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]	$105.76	$105.76	
Annual Operating Cost Savings Compared to Electric	$461.71	$236.11	N/A
Cost per pound NOx	$241.50	$92.40	
Cost per ton NOx	**$482,945**	**$184,792**	

[1] Unit specifications and prices acquired from Grainger Industrial Supply as of June 14, 2018
[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 2017 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.

EVALUATION FINDINGS

The District has evaluated all potential control technologies and all control technologies achieved in practice in other areas or included in other state implementation plans for this source category. As demonstrated above, Rule 4902 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds RACM, BACM, and MSM requirements for this source category.

C.21 Rule 4905 (Natural Gas-Fired, Fan-Type Central Furnaces)

Discussion

District 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 central furnaces for use in 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. Adopted on October 20, 2005, Rule 4905 established NOx limits for residential central furnaces supplied, sold, or installed in the Valley. The rule NOx emission limit was set at 0.093 pounds per million Btu of heat output (lb/MMBtu). January 2015 amendments lowered the NOx emission limit for residential units from 40 ng/J (0.093 lb/MMBtu) to 14 ng/J, expanded rule applicability to include commercial units with a NOx emission limit of 14 ng/J and units installed in manufactured homes with a NOx emission limit of 40 ng/J to be lowered to 14 ng/J in 2018. EPA approved these amendments into the SIP effective April 28, 2016.[82] Due to the limited number of certified compliant units that will be available by the compliance deadline dates, the rule was amended again on June 21, 2018, to extend the implementation period for another 12 months to allow an additional period of time necessary to continue technology development and the certification process while providing strong incentive for accelerated deployment of compliant units.

Emissions Inventory

POLLUTANT	2013	2017	2019	2020	2022	2023	2024	2025	2026	2028
	Annual Average - Tons per day									
PM2.5	0.20	0.21	0.21	0.21	0.22	0.22	0.22	0.22	0.22	0.22
NOX	2.44	2.48	2.43	2.38	2.29	2.24	2.18	2.13	2.07	1.95
	Winter Average - Tons per day									
PM2.5	0.26	0.27	0.28	0.28	0.29	0.29	0.29	0.29	0.30	0.30
NOX	3.25	3.30	3.23	3.16	3.05	2.98	2.90	2.83	2.75	2.60

Source Category

This source category includes natural gas-fired central furnaces in the Valley that have a rated heat input capacity of less than 175,000 British thermal units per hour (Btu/hr), and combination heating and cooling units with a rated cooling capacity of less than 65 Btu/hr. All heating systems have three basic components: a heat source, a heat distribution system, and a control system. The control system is usually a programmable thermostat. The heat source, which generally determines the type of distribution system used, is selected based on many factors. The most important factor is geographical location, which determines the climate and types of available fuel. Most commercial and residential buildings in the Valley have access to natural gas, which is typically the cheapest and most convenient fuel source in areas where it is available. The most common type of heating system for residential and commercial buildings are furnaces fueled by natural gas that use forced air distribution. Central furnaces are

[82] Approval of California Air Plan Revisions, San Joaquin Valley Unified Air Pollution Control District and South Coast Air Quality Management District. Final Rule. 81 Fed. Reg. 17390. (2016, March 29). (to be codified at 40 CFR Part 52). https://www.gpo.gov/fdsys/pkg/FR-2016-03-29/pdf/2016-06962.pdf

controlled by a thermostat, which sends signals to turn the device on or off when the building temperature does not match a chosen set point. A valve then opens to send natural gas to the burners, which combusts the gas directly into the heat exchangers. A blower pulls air from outside the building through a filter, across the heat exchanger, and through a series of ducts and vents to different areas of the building. Exhaust from the combustion exits the building through a separate duct.

Condensing units use an additional heat exchanger to extract the latent heat in the flue (exhaust) gas by cooling the combustion gasses to near ambient temperature and thereby increase the heating efficiency by up to 10%. The water vapor in the flue gas is condensed, collected, and drained.

Units installed in manufactured homes utilize the same types of materials and operating principles as commercial and residential units; however, significant differences exist. Furnaces installed in manufactured homes use sealed combustion, pre-heat the air typically to 50-60°F, use a concentric vent, and exhaust gases are vented through the inside core of the vent pipe. Furnaces installed in manufactured homes also have to comply with strict space restrictions.[83]

HOW DOES DISTRICT RULE 4905 COMPARE WITH FEDERAL AND STATE RULES AND REGULATIONS?

The District identified federal, state, and local air quality regulations and compared them to analogous District rules to identify potential emission reductions opportunities. Any potential opportunities identified were then analyzed to determine if they are technologically and economically feasible to require in Valley.

Federal Regulations

There are no EPA CTG, ACT, NSPS, NESHAP, or MACT requirements for this source category.

State Regulations

There are no state regulations applicable to this source category.

HOW DOES DISTRICT RULE 4905 COMPARE TO RULES IN OTHER AIR DISTRICTS?

There are no analogous rules for this source category in SMAQMD.

SCAQMD

- SCAQMD Rule 1111 (Reduction of NOx Emissions from Natural) *(Amended July 6, 2018)*

As summarized above, the District evaluated the requirements contained within SCAQMD Rule 1111 and found no requirements that were more stringent than those already in Rule 4905.

[83] U.S. Department of Energy. (2014, July 7). *Energy Conservation Program for Consumer Products: Energy Conservation Standards for Residential Furnace Fans.* Retrieved 9/23/14 from https://www.federalregister.gov/articles/2014/07/03/2014-15387/energy-conservation-program-for-consumer-products-energy-conservation-standards-for-residential.

	SJVAPCD	SCAQMD
Applicability	Residential and commercial furnaces with rated heat input capacity of < 175,000 btu/hr or < 65,000 btu/hr for combination heating and cooling units	Residential and commercial furnaces with rated heat input capacity of < 175,000 btu/hr or < 65,000 btu/hr for combination heating and cooling units
Exemption	• Natural gas furnace not exceeding NOx emissions of 40 ng/J and installed with propane conversion kit for propane firing only	• Furnaces installed in mobile homes before October 1, 2012 • Natural gas furnace installed with propane conversion kit for propane firing only
Requirements	Furnaces must not exceed NOx limit of 14 ng/J	Furnaces must not exceed NOx limit of 14 ng/J

BAAQMD

- BAAQMD Regulation 9 Rule 4 (Nitrogen Oxides from Fan Type Residential Central Furnaces) *(Amended December 7, 1983)*

The District evaluated the requirements contained within BAAQMD Regulation 9 Rule 4 and found no requirements that were more stringent than those already in Rule 4905.

	SJVAPCD	BAAQMD
Applicability	Residential and commercial furnaces with rated heat input capacity of < 175,000 btu/hr or < 65,000 btu/hr for combination heating and cooling units	Residential central furnaces with rated heat input capacity of < 175,000 btu/hr, excluding heating/cooling units utilizing three phase electric current
Exemption	Natural gas furnace not exceeding NOx emissions of 40 ng/J and installed with propane conversion kit for propane firing only	Although BAAQMD does not explicitly provide any exemptions, the rule only applies to residential furnaces and excludes heating/cooling units
Requirements	Furnaces must not exceed NOx limit of 14 ng/J	Furnaces must not exceed NOx limit of 40 ng/J

VCAPCD

- VCAPCD Rule 74.22 (Natural Gas-Fired, Fan-Type Central Furnaces) *(Adopted November 9, 1993)*

The District evaluated the requirements contained within VCAPCD Rule 74.22 and found no requirements that were more stringent than those already in Rule 4905.

	SJVAPCD	VCAPCD
Applicability	Residential and commercial furnaces with rated heat input capacity of < 175,000 btu/hr or < 65,000 btu/hr for combination heating and cooling units	Residential and commercial furnaces with rated heat input capacity of < 175,000 btu/hr or < 65,000 btu/hr for combination heating and cooling units
Exemption	Natural gas furnace not exceeding NOx emissions of 40 ng/J and installed with propane conversion kit for propane firing only	Units installed in manufactured housing

	SJVAPCD	VCAPCD
Requirements	Furnaces must not exceed NOx limit of 14 ng/J	Furnaces must not exceed NOx limit of 40 ng/J

SDCAPCD

- SDCAPCD Rule 69.6 (Natural Gas-Fired Fan Type Central Furnaces) *(Adopted June 17, 1998)*

The District evaluated the requirements contained within San Diego County APCD Rule 69.6 and found no requirements that were more stringent than those already in Rule 4905.

	SJVAPCD	San Diego County APCD
Applicability	Residential and commercial furnaces with rated heat input capacity of < 175,000 btu/hr or < 65,000 btu/hr for combination heating and cooling units	Furnaces with rated heat input capacity of < 175,000 btu/hr or < 65,000 btu/hr for combination heating and cooling units
Exemption	• Natural gas furnace not exceeding NOx emissions of 40 ng/J and installed with propane conversion kit for propane firing only	Units installed in mobile homes
Requirements	Furnaces must not exceed NOx limit of 14 ng/J	Furnaces must not exceed NOx limit of 40 ng/J

Additional Emission Reduction Opportunities

This rule implements requirements that go beyond most stringent measures feasible to implement in the Valley, as evidenced by the need for the District to amend this rule this year to extend the deadlines to provide manufacturers additional time to research, develop, certify, and commercialize compliant units. As such, there are no additional emission reductions opportunities identified at this time.

Evaluation Findings

The District has evaluated all potential control technologies and all control technologies achieved in practice in other areas or included in other state implementation plans for this source category. As demonstrated above, Rule 4905 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds RACM, BACM, and MSM requirements for this source category.

C.22 REGULATION VIII (FUGITIVE PM10 PROHIBITIONS)

DISCUSSION

The District's Regulation VIII series (Fugitive PM10 Prohibitions) was adopted in November 2001, and subsequently amended in 2004. This rule series contains a comprehensive suite of rules designed to reduce fugitive PM10 emissions from a range of sources, as further described below:

Rule 8011: General Requirements

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. 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 RACM level rules to meet the more stringent BACM level required in serious PM10 nonattainment areas.

Rule 8021: Construction, Demolition, Excavation, Extraction, and Other Earthmoving Activities

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, 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.

Rule 8031: Bulk Materials

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 to 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, and other measures. In 2004, Rule 8031 was amended to require the construction and maintenance of wind barriers when handling bulk materials.

Rule 8041: Carryout and Trackout

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; carryout and trackout thresholds for any site with 150 or more 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, Rule 8041 was amended to require a threshold for vehicles with three or more axles to takes 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.

Rule 8051: Open Areas

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, Rule 8051 was amended to add applicability thresholds for rural and urban areas.

Rule 8061: Paved and Unpaved Roads

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, 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 to require that all new roads within urban areas be paved.

Rule 8071: Unpaved Vehicle/Equipment Traffic Areas

Rule 8071 is applicable to unpaved vehicle/equipment areas, including parking, fueling, service, 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, 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 specific to whenever 25 or more three-axle vehicle trips occur on an unpaved vehicle/equipment traffic area.

Rule 8081: Agricultural Sources

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, Rule 8081 was amended to add 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; expand rule applicability by updating the vehicle threshold from 75 vehicle daily trips to 50 annual average vehicle trips; and add a requirement specific to whenever 26 or more three-axle vehicle trips will occur on an unpaved vehicle/equipment traffic area.

EMISSIONS INVENTORY

Rule 8021: Construction, Demolition, Excavation, Extraction, and Other Earthmoving Activities

POLLUTANT	2013	2017	2019	2020	2022	2023	2024	2025	2026	2028
	Annual Average - Tons per day									
NOX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PM2.5	1.52	1.76	1.85	1.89	1.56	1.58	1.61	1.64	1.67	1.74
	Winter Average - Tons per day									
NOX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PM2.5	1.39	1.61	1.70	1.73	1.43	1.45	1.48	1.50	1.53	1.60

Rule 8031: Bulk Materials

POLLUTANT	2013	2017	2019	2020	2022	2023	2024	2025	2026	2028
	Annual Average - Tons per day									
NOX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PM2.5	0.04	0.05	0.05	0.05	0.06	0.06	0.06	0.06	0.06	0.06
	Winter Average - Tons per day									
NOX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PM2.5	0.04	0.05	0.05	0.05	0.06	0.06	0.06	0.06	0.06	0.06

Rule 8041: Carryout and Trackout

The emissions from this source category are included in the inventory for Rule 8061 (Paved and Unpaved Roads).

Rule 8051: Open Areas

POLLUTANT	2013	2017	2019	2020	2022	2023	2024	2025	2026	2028
	Annual Average - Tons per day									
NOX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PM2.5	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34
	Winter Average - Tons per day									
NOX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PM2.5	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21

Rule 8061: Paved and Unpaved Roads

POLLUTANT	2013	2017	2019	2020	2022	2023	2024	2025	2026	2028
	Annual Average - Tons per day									
NOX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PM2.5	6.66	6.98	7.14	7.22	7.40	7.49	7.58	7.67	7.75	7.90
	Winter Average - Tons per day									
NOX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PM2.5	5.70	6.00	6.16	6.23	6.40	6.49	6.57	6.65	6.72	6.87

Rule 8071: Unpaved Vehicle/Equipment Traffic Areas

POLLUTANT	2013	2017	2019	2020	2022	2023	2024	2025	2026	2028
	Annual Average - Tons per day									
NOX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PM2.5	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
	Winter Average - Tons per day									
NOX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PM2.5	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52

Rule 8081: Agricultural Sources

POLLUTANT	2013	2017	2019	2020	2022	2023	2024	2025	2026	2028
	Annual Average - Tons per day									
NOX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PM2.5	1.20	1.18	1.17	1.17	1.16	1.15	1.15	1.14	1.14	1.13
	Winter Average - Tons per day									
NOX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PM2.5	1.47	1.44	1.43	1.43	1.42	1.41	1.41	1.40	1.39	1.38

HOW DOES DISTRICT REGULATION VIII COMPARE WITH FEDERAL AND STATE RULES AND REGULATIONS?

Federal Regulations

There are no EPA CTG, ACT, NSPS, NESHAP, or MACT guidelines for this source category. The following federal regulations apply to sources covered under Regulation VIII:

- Rule 57 FR 13498 (General Preamble for Title I of CAA)

The District evaluated the requirements contained within the General Preamble and found no requirements that were more stringent than those already in Regulation VIII.

- EPA-450/2-92-004 (Fugitive Dust Background Document and Technical Information Document for Best Available Control Measures (BACM))

The District evaluated the requirements contained within the Fugitive Dust Background Document and Technical Information Document for BACM and found no requirements that were more stringent than those already in Regulation VIII.

State Regulations
There are no state regulations applicable to this source category.

HOW DOES DISTRICT REGULATION VIII COMPARE TO RULES IN OTHER AIR DISTRICTS?

There are no analogous rules for this source category in BAAQMD.

SCAQMD
- Rule 1156 (Further Reductions of Particulate Emissions from Cement Manufacturing Facilities) *(Last amended November 6, 2015)*

The District evaluated the requirements contained within SCAQMD Rule 1156 and found no requirements that were more stringent than those already in Regulation VIII.

- Rule 1157 (PM10 Emission Reductions form Aggregate and Related Operations) *(Last amended September 8, 2008)*

The District evaluated the requirements contained within SCAQMD 1157 and found no requirements that were more stringent than those already in Regulation VIII.

SMAQMD
- Rule 403 (Fugitive Dust) *(Last amended August 3, 1977)*

The District evaluated the requirements contained within SMAQMD Rule 403 and found no requirements that were more stringent than those already in Regulation VIII.

VCAPCD
- Rule 55 (Fugitive Dust) *(Adopted June 10, 2008)*

The District evaluated the requirements contained within VCAPCD Rule 55 and found no requirements that were more stringent than those already in Regulation VIII.

Clark County Department of Air Quality (CCDAQ)
- Section 41 (Fugitive Dust) *(Adopted April 15, 2014)*

The District evaluated the requirements contained within CCDAQ Section 41 and found no requirements that were more stringent than those already in Regulation VIII.

- Section 91 (Fugitive Dust from Unpaved Roads, Unpaved Alleys, and Unpaved Easement Roads) *(Last amended April 15, 2014)*

The District evaluated the requirements contained within CCDAQ Section 91 and found no requirements that were more stringent than those already in Regulation VIII.

- Section 92 (Fugitive Dust from Unpaved Parking Lots and Storage Areas) *(Last amended April 15, 2014)*

The District evaluated the requirements contained within CCDAQ Section 92 and found no requirements that were more stringent than those already in Regulation VIII.

- Section 93 (Fugitive Dust from Paved Roads and Street Sweeping Equipment) *(Last amended April 15, 2014)*

The District evaluated the requirements contained within CCDAQ Section 93 and found no requirements that were more stringent than those already in Regulation VIII.

- Section 94 (Permitting and Dust Control for Construction Activities) *(Last amended July 1, 2004)*

The District evaluated the requirements contained within CCDAQ Section 94 and found no requirements that were more stringent than those already in Regulation VIII.

Great Basin APCD Rule 433 (Control of Particulate Emissions at Owens Lake)

- Section 41 (Fugitive Dust) *(Adopted April 13, 2016)*

The District evaluated the requirements contained within Great Basin APCD Rule 433 and found no requirements that were more stringent than those already in Regulation VIII.

ADDITIONAL EMISSION REDUCTION OPPORTUNITIES

Regulation VIII currently employs the best dust mitigation techniques. There are no additional potential opportunities for further emissions reductions from this source category.

Furthermore, while District Regulation VIII was critical in the District's attainment of the PM10 standards, a variety of studies have been conducted which 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 under Rule 8021 and to indicate the level of significance of those PM2.5 emissions. Modeling results show that the geologic fraction of PM2.5 found in the Valley makes a relatively small contribution to overall PM2.5 mass. In addition, studies have shown that geologic dust alone has relatively low toxicity.

EVALUATION FINDINGS

The District has evaluated all potential requirements achieved in practice in other areas or included in other state implementation plans. As demonstrated above, Regulation VIII currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds RACM, BACM, and MSM requirements for this source category.

C.23 RULE 9510 (INDIRECT SOURCE REVIEW)

DISCUSSION

Rule 9510 Indirect Source Review (ISR) was adopted in December 15, 2005 and amended in December 2017 and is the only rule of its kind in the State of California and throughout the nation. The District's rule is recognized as the benchmark, or best available control, for regulating these indirect sources of emissions. State and federal laws are prescriptive in establishing the District's authority regulating indirect sources. These complex legal requirements were well documented and litigated as the District spent over five years successfully defending its existing rule through the highest courts at the state and federal levels. The emission control requirements under the District's current rule are as stringent as possible in adherence with all applicable state and federal regulations and case law.

The California Air Resources Board, South Coast Air Quality Management District, Bay Area Air Quality Management District and other air districts are currently attempting to replicate the success of the rule in the development of their own Indirect Source Review rules by utilizing San Joaquin Valley Air District's experience and regulatory language to help guide their efforts.

The rule is to reduce the growth in NOx and PM emissions from mobile and area sources associated with construction and operation of new development projects in the Valley. The ISR rule applies to developers of new residential, commercial and industrial projects and to transportation and transit projects whose emissions will exceed certain thresholds contained in the rule. The ISR rule encourages clean air designs to be incorporated into the development project, or, if insufficient emissions reductions can be designed into the project, by paying a mitigation fee that will be used to fund off-site emissions reduction projects. A significant improvement has occurred in the design of development projects in the Valley through the incorporation of features that result in reduced emissions. Since adoption of the rule, developers have voluntarily begun to incorporate many air-friendly design changes into their projects. For instance, significant reductions in emissions have occurred through the use of a "construction clean fleet", which is defined as a construction fleet mix cleaner than the State fleet average. Another noteworthy change is that developers of large distribution centers are continuing to reduce operational emissions and associated impacts through voluntarily committing to use newer heavy-duty on-road fleet vehicles and maintaining a fleet replacement schedule that ensures older vehicles are replaced in a timely manner. In 2006, the first year of implementation, only 14.3% of approved projects reduced construction exhaust impacts through use of a clean construction equipment fleet. The percentage has risen to approximately 33% for the entire history of the ISR program, and 46% for the reporting period of 2017.

The population in the San Joaquin Valley is expected to be one of the fastest growing regions in the state through at least 2033. The Demographic Research Unit of the Department of Finance released interim revised population growth projections in January 2018 and expects approximately 21.8% growth in the Valley's population during the 2018 to 2033 period. In contrast, the total population for the state of

California is projected to increase by only 12.7% over the same period.[84] As land development and population in the San Joaquin Valley continue to increase, area source emissions from activities such as consumer product use, fuel combustion for heating and cooking, and landscape maintenance will increase. The total number of vehicle miles traveled (VMT) also increases with population growth, resulting in more emissions due to the combustion of vehicle fuels.

The projected growth in these so called "indirect source" emissions erodes some of the progress generated by emission reductions achieved through the District's stationary source program and state and federal mobile source controls. The emissions are called indirect because they do not come directly from a smokestack, like traditional industry emissions, but rather the emissions are indirectly caused by this growth in population.

Mobile source emissions make up over 85% of the Valley's primary driver in the formation of PM and ozone pollution, and therefore reductions in mobile source emissions have become an ever-increasingly important part of the District's clean air strategies. Although the District has no regulatory authority to control tailpipe emissions from motor vehicles, the District undertook groundbreaking action to reduce vehicle miles traveled by adopting Rule 9510 Indirect Source Review.

EMISSIONS INVENTORY

There is no emission inventory specific to Rule 9510.

SOURCE CATEGORY

The ISR rule applies to developers of new residential, commercial and industrial projects and to transportation and transit projects whose emissions will exceed certain applicability thresholds contained in the rule. The rule requires a development project construction to reduce NOx emissions by 20% and reduce a development project's operational NOx emissions by 33.3% and 50%, when compared to unmitigated project baseline emissions. NOx emissions can come from the combustion of fuels in motor vehicles, and other off-road vehicles such as construction equipment. PM emissions can be from fugitive dust particles or fine particles directly emitted from combustion processes.

A development project is subject to the ISR rule if it received its final discretionary approval from a public agency on or after March 1, 2006, and meets or exceeds any one of the following District applicability thresholds:

2,000 sq. ft commercial	25,000 sq. ft. light industrial	100,000 sq. ft. heavy industrial
20,000 sq. ft. medical office	39,000 sq. ft general office	9,000 sq. ft. educational
10,000 sq. ft. government	20,000 sq. ft. recreational	50 residential units
9,000 sq. ft. of space not included in the list		

A development project meeting or exceeding any one of the following District "Large

[84] State Population Projections (2010-2060). Total Population by County (1-year increments). (2018, January) *Retrieved from*: http://www.dof.ca.gov/Forecasting/Demographics/Projections/

Development Project" applicability thresholds is subject to ISR if it received its project-level approval from a public agency on or after March 21, 2018:

10,000 sq. ft commercial	125,000 sq. ft. light industrial	500,000 sq. ft. heavy industrial
100,000 sq. ft. medical office	195,000 sq. ft general office	45,000 sq. ft. educational
50,000 sq. ft. government	100,000 sq. ft. recreational	250 residential units
45,000 sq. ft. of space not included in the list		

Developers of projects subject to Rule 9510 must reduce emissions occurring during construction and operational phases through on-site emission reduction measures, or by paying off-site mitigation fees. One hundred percent of all off-site mitigation fees are used by the District to fund emission reduction projects through its Emission Reduction Incentive Programs, achieving emission reductions on behalf of the project. The use of clean air project design elements that reduce the vehicle miles travelled associated with a project, including operational measures (such as the use of clean trucking fleets) and construction measures (such as the use of clean construction fleets), have resulted in 12,500 tons of NOx and PM10 reductions over the life of the program. In addition, project proponents that have found the payment of offsite mitigation fees to be a more feasible and cost-effective manner to meet the requirements of Rule 9510 have generated another 6,900 tons of NOx and PM10 reductions through the investment of those mitigation fees in local emissions reduction projects utilizing the District's incentive grant programs.

HOW DOES DISTRICT RULE 9510 COMPARE WITH FEDERAL AND STATE RULES AND REGULATIONS?

Federal Regulations

Federal requirements such as NSPS, NESHAP, MACT, CTGs, and ACTs and state regulations are not applicable to this source category.

State Regulations

There are no state regulations applicable to this source category.

HOW DOES DISTRICT RULE 9510 COMPARE TO RULES IN OTHER AIR DISTRICTS?

The requirements and applicability of Rule 9510 were compared to analogous rules in other air districts and states to determine the stringency of Rule 9510 compared to those other rules. The District has not identified any agencies with indirect source regulations analogous to Rule 9510.

ADDITIONAL EMISSION REDUCTION OPPORTUNITIES

The District is the only air quality agency in the nation that has established a regulatory framework for reducing indirect mobile source-related emissions from development.

EVALUATION FINDINGS

The District is the only air quality agency in the nation that has established a regulatory framework for reducing indirect mobile source-related emissions from development. Therefore exceeds RACM, BACM, and MSM requirements for this source category.

C.24 Lawn and Garden Equipment Strategy

Discussion

The District's innovative strategies to reduce emissions from the lawn care source category 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, the District conducted a successful pilot program for equipment used in commercial lawn and garden operations and hosted a conference on lawn care, landscaping, and air quality to discuss emerging low-emission technologies. Furthermore, the District is considering enhancements to the District's *Clean Green Yard Machines* program to include the replacement of equipment utilized by commercial lawn care professionals.

Since 2001, the District has operated the highly successful *Clean Green Yard Machines* program, which provides Valley residents incentives to replace their old, high-polluting gas powered lawn mowers with electric, zero-emission options. The District launched this program to not only help reduce emissions generated from gasoline-powered mowers, but to also help residents experience the benefits of cleaner technology that may ultimately lead to changes in behavior on a community level. When residents have positive experiences with zero-emission technology, they may make conscious decisions to use other cleaner technologies such as electric vehicles. Utilizing electric lawn mowers can provide residents with immediate economic, environmental, and health benefits. Not only do residents eliminate the use of gasoline, the maintenance of an electric lawn mower is far less as owners do not have to change fuel filters, sparkplugs, or oil. While an electric lawn mower does have a higher initial upfront cost, the cost for long-term operation and maintenance of the equipment is lower in comparison to a gas mower. In addition, electric lawn mowers generate significantly less noise and the operator's exposure to emissions generated directly from a gas mower's engine is eliminated when using an electric mower. To date, the District has helped San Joaquin Valley residents purchase over 5,000 new electric lawn mowers with approximately $1,100,000 in District incentive funding.

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.

EMISSIONS INVENTORY

POLLUTANT	2013	2017	2019	2020	2022	2023	2024	2025	2026	2028
	Annual Average - Tons per day									
PM2.5	0.08	0.08	0.08	0.08	0.09	0.09	0.09	0.09	0.09	0.09
NOX	0.89	0.88	0.88	0.88	0.92	0.92	0.93	0.93	0.94	0.96
	Winter Average - Tons per day									
PM2.5	0.07	0.07	0.07	0.07	0.08	0.08	0.08	0.08	0.08	0.08
NOX	0.84	0.83	0.83	0.83	0.86	0.86	0.87	0.87	0.88	0.89

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 CARB 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 larger machines (such as lawn and garden tractors) typically use four-stroke engines. Lawn mowers are available with either type of engine. Two-stroke engines rely on oil mixed with gasoline to lubricate the engine components. Much of this oil is not completely combusted by the engine, thus creating high levels of exhaust emissions. The major pollutants from a two-stroke engine are oil-based particulates, PM2.5, NOx, 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 dusty paved surfaces. These types of activities 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.

How does the District Lawn and Garden Strategy compare with federal and state 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.

CARB 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 CARB 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. CARB recently amended the SORE rule in December 2016 to revise certification procedures, update compliance testing procedure, require certification test fuel consistent with commercially available gasoline, and 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 does the District Lawn and Garden Strategy compare to rules in other air districts?

There are no other rules currently in place at other air districts that regulate emissions from this source category.

Additional Emission Reduction Opportunities

CARB and EPA have regulatory authority over engine standards. As described above, the CARB 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 and equipment used by commercial lawn; potential control strategies including in-use rule or best management practices, episodic controls, and zoning.

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, there was concern regarding the viability of cordless electric technology in the commercial sector 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.

In 2012, the District actively pursued demonstrations of new opportunities through its Technology Advancement Program, including the launch of the Cordless Zero-Emission Commercial Lawn and Garden Equipment Demonstration Program. The program was funded with State Air Quality Improvement Program and District program funds and provided 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 were demonstrated to be successful, providing an opportunity for the District to develop incentive programs to promote these technologies.

Equipment Utilized by Commercial Lawn and Garden Care Professionals

In August 2011, the District Governing Board approved the implementation of the District's Cordless Zero-Emission Commercial Lawn and Garden Equipment Advance Technology Demonstration Project with funds provided by the CARB. The purpose of this project was to demonstrate the viability and durability of new electric lawn care equipment such as mowers, chainsaws, blowers, and other commonly used equipment

in commercial applications, and to receive candid feedback from end-users that could help manufacturers further develop and improve upon their products. Implementing this project provided valuable insight in regards to the readiness level of electric equipment for commercial use and, albeit limited, a preview of the inventory of old gas-powered lawn care equipment owned and operated by commercial professionals who provide their services throughout the Valley.

Through the implementation of the pilot project, the District gained a better understanding of the types and number of equipment that were operated in the commercial lawn and garden sector with information provided by the participants. The 60 businesses and public agencies that participated owned a total of 2,203 pieces of equipment and the majority of them were gas and diesel powered. This data provides insight into the sheer volume of commercial lawn and garden equipment currently operating in the Valley. Between these 60 participants, 445 pieces of new zero-emission electric lawn care equipment were purchased and demonstrated in a variety of commercial applications, and under different weather and terrain conditions.

These participants provided valuable feedback on the ease of use, durability, weight, and overall experience of the new electric equipment purchased through the program. The feedback provided by participants varied between the different types of electric lawn care equipment. For example, the ride-on lawn mowers received very positive comments overall in the evaluation categories, but the standard push and walk-behind mowers were generally only suitable for small areas and were not sufficient for large commercial jobs. The most significant concern from the commercial end-users was the life of the battery and the time required to recharge. However, recent advances in battery technology have made commercial equipment a realistic alternative to traditional gas powered equipment in a number of applications.

Building on the success of the residential program and with the experience gained from the demonstration project, the District will consider expanding the *Clean Green Yard Machines* program to include the replacement of lawn and garden equipment from commercial end-users.

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 C-25 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	Bans all blowers

Santa Monica	

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 reduce noise nuisances in neighborhoods and near schools.

EVALUATION FINDINGS

The District has evaluated all potential control technologies and all control technologies achieved in practice in other areas or included in other state implementation plans for the lawn and garden equipment. In addition to replacing old residential lawn mowers with cleaner options, the District intends to focus on equipment used in commercial applications. Many Valley residents and businesses utilize professional lawn care services and these services are often performed with older gas-powered lawn and garden equipment.

To encourage the use of cleaner, electric options, the District will consider expanding the *Clean Green Yard Machines* program to include the replacement of lawn and garden equipment from commercial end-users. This new program would be designed to assist public agencies and private businesses purchase zero emission equipment to perform their services. Zero emission lawn and garden equipment have advanced in the past few years, not only in the area of durability, but also dependability with longer battery lives that can be used in commercial settings where the equipment is typically used for long durations. In addition to lawn mowers, the expanded category can include additional equipment that are often used in commercial applications such as edgers, blowers, chainsaws, polesaws, vacuums trimmers, and additional battery and charging equipment.

C.25 AMMONIA IN THE SAN JOAQUIN VALLEY

Extensive scientific research and technical analyses demonstrate that ammonia reductions do not contribute to the Valley's PM2.5 attainment (see Appendix G) and, therefore, does not need to be addressed as a part of the District's review of BACM and MSM. Even though ammonia is an insignificant PM2.5 precursor in the Valley, the following analysis shows that the Valley's ammonia emissions have been significantly reduced through stringent regulations, that additional ammonia control measures are infeasible, and that Valley sources are already implementing BACM and MSM.

As demonstrated in Appendix B of this Plan, the three main sources of ammonia emissions in the Valley from stationary and area sources that account for 95% of the Valley's ammonia emissions are as follows (based on CEPAM v1.05 Annual Average Emissions Inventory for 2018):

- Farming Operations with 186.5 tons per day (tpd), and
- Solvent evaporation from Agricultural Fertilizers at 114.4 tpd, and
- Composting Solid Waste Operations at 6.2 tpd.

It is important to note that the District does not have statutory authority to regulate the application of agricultural fertilizers. That said, the District did evaluate fertilizers as a part of this control measure analysis.

The following discussion evaluates:

- Confined Animal Facilities (District Rule 4570)
- Agricultural Fertilizers
- Biosolids, Animal Manure, and Poultry Litter Operations (District Rule 4565)
- Organic Material Composting (District Rule 4566)
- Major Sources of Ammonia

RULE 4570 (CONFINED ANIMAL FACILITIES)

Discussion

District Rule 4570, was originally adopted on June 15, 2006 and was most recently amended on October 21, 2010. The purpose of this rule is to limit emissions of VOC from Confined Animal Facilities (CAF). District Rule 4570 applies to facilities where animals are corralled, penned, or otherwise caused to remain in restricted areas and primarily fed by a means other than grazing for at least 45 days in any twelve-month period. In addition to limiting VOC emissions, District Rule 4570 also includes measures that control ammonia (NH3) emissions from these operations; the required measures have reduced ammonia emissions by over 100 tpd[85].

[85] Appendix F of the Staff Report for the June 2009 re-adoption of Rule 4570, starting on the 329th page of the pdf available here http://www.valleyair.org/Board_meetings/GB/agenda_minutes/Agenda/2009/June/Agenda%20Item_10_June_18_200.pdf

Source Category

Confined Animal Facilities are used for the raising of animals including, but not limited to, cattle, calves, chickens, ducks, goats, horses, sheep, swine, rabbits, and turkeys, which are corralled, penned, or otherwise caused to remain in restricted areas for commercial agricultural purposes and fed by a means other than grazing. (CH&SC §39011.5 (a)(1)). The major categories of Confined Animal Facilities are listed below.

- Dairy Operations - Dairy operations are those operations producing milk or animals for facilities that produce milk.
- Poultry Operations - Poultry facilities operate either as layer ranches for egg production or as broiler ranches where birds are grown for the fresh meat market.
- Beef Cattle Feeding Operations – Beef cattle facilities are facilities that raise beef cattle (heifers and steers) for their meat.
- Swine Operations – These operations raise pigs for their meat. The production cycle for hogs has three (3) phases: farrowing (giving birth), nursing, and finishing.

Rule 4570 Applicability Thresholds

The thresholds for a facility to be classified as a large CAF in the Valley and the thresholds for a facility to be subject to District Rule 4570 are shown in the following table. The large CAF thresholds are based on the definition of a large CAF adopted by CARB as required by California Senate Bill (SB) 700. District Rule 4570 applies to confined animal facilities that have the capacity to house a number of animals equal to or exceeding the Rule 4570 regulatory thresholds, which are lower than the large CAF thresholds for certain facilities.

Rule 4570 Applicability for Regulation		
Livestock Category	**SJVAPCD Large CAF Thresholds**	**Rule 4570 Regulatory Thresholds**
Dairy	1,000 milking cows	500 milking cows
Beef Feedlots	3,500 beef cattle	3,500 beef cattle
Other Cattle Facility	7,500 calves, heifers, or other cattle	7,500 calves, heifers, or other cattle
Poultry Facilities		
Chicken	650,000 head	400,000 head
Duck	650,000 head	400,000 head
Turkey	100,000 head	100,000 head
Swine Facility	3,000 head	3,000 head
Horses Facility	3,000 head	3,000 head
Sheep and Goat Facilities	15,000 head of sheep, goats, or any combination of the two	15,000 head of sheep, goats, or any combination of the two
Any livestock facility not listed above	30,000 head	30,000 head

Emission Control Requirements of District Rule 4570

District Rule 4570 requires multiple mitigation measures from the following CAF categories: Dairy, Beef Feedlots, Other Cattle Facilities, Swine Facilities, Poultry facilities, and various other smaller operations. Each of these facilities consists of multiple sources of emissions within the facility. Since these facilities generally cover a

large area and have different processes, a single mitigation measure or technology is generally not sufficient to control overall emissions from the facility. Mitigation measures required by Rule 4570 have been tailored for each source of emissions, thereby ensuring that the overall emissions from a facility are reduced. The current methodology in Rule 4570 allows for the greatest overall control from the entire facility.

District Rule 4570 recognized the following five emission sources for all of the CAFs: Feed, Housing, Solid Waste, Liquid Waste, and Land Application of Manure. Rule 4570 requires each CAF to implement a certain number of mitigation measures for each of these sources. District Rule 4570 also distinguishes between the different types of housing configurations (freestall vs open corrals) for cattle and, as such, requires specific mitigation measures for each type of housing. By requiring mitigation measures for each source of emissions at a facility, District Rule 4570 ensures that reductions are achieved throughout the facility.

Ammonia is produced on livestock operations when urea (present in urine) is broken down by the enzyme urease (present in feces and soil) to form ammonia gas and carbamine acid, which further decomposes to release another molecule of ammonia gas and carbon dioxide. When urine mixes with feces or soil, ammonia is volatilized (lost to the air) within minutes, but the reaction may continue for several hours depending on a variety of factors, taking anywhere from a few hours to days to reach peak levels. The rate is dependent on the amount of urea and urease available for reaction, as well as meteorological conditions such as temperature and wind speed. Production of ammonia is an inevitable part of livestock production, but ammonia emissions can be reduced through management practices, such as those required by District Rule 4550, that help to prevent ammonia formation and volatilization.

The following describes some of the mitigation measures required by District Rule 4570, and the ways in which these measures reduce ammonia emissions:

- Nutritional management: Ammonia emissions result from the decomposition of undigested nitrogen compounds in animal waste. Proper nutritional management, with diets formulated to feed proper amounts of protein, improves nitrogen utilization by the animal, reducing production of ammonia from animal waste.[86]

- Increased cleaning and removal of manure and litter from animal housing areas: Because animal waste is the primary source of ammonia emissions at confined animal facilities, increased removal of waste from animal housing areas will reduce ammonia emissions. Proper management of the waste will stabilize the nitrogen compounds, which will reduce the rate that these compounds are converted to ammonia that can be lost to the atmosphere. In addition, ammonia is highly soluble in water; therefore, when a flush system is used, ammonia

[86] Hristov, A. N., Heyler, K., Schurman, E., Griswold, K., Topper, P., Hile, M., ... & Dinh, S. (2015). CASE STUDY: Reducing dietary protein decreased the ammonia emitting potential of manure from commercial dairy farms. The Professional Animal Scientist, 31(1), 68-79.

emissions will be reduced because much of the ammonia will dissolve in the water rather than volatilize to the air.

Research by Schmidt, Card, Gaffney, and Hoyt (2005) indicated significantly lower NH3 emissions after cleaning of the lanes at a dairy. Research by Beene, Krauter, and Goorahoo (2005) also indicated lower NH3 emissions after cleaning of the lanes at the dairies monitored[87]. Other research by Card and Schmidt supports that management of manure in corrals reduces NH3 emissions from the corrals and points out that of the two dairies tested, the NH3 emissions from the dairy with constantly managed corrals (Dairy 2) had "exceptionally low ammonia emissions".[88]

- Incorporation of manure into fields: Incorporation of manure in fields reduces volatilization of gaseous pollutants by minimizing the amount of time that the manure is exposed to the atmosphere. Once the waste has been incorporated into the soil, VOCs and ammonia are absorbed onto soil particles, providing the opportunity for these soil microbes to oxidize these compounds into carbon dioxide, water, and nitrates.

NH3 emissions from confined animal facilities result from the microbial decomposition of nitrogenous compounds in manure and the subsequent volatilization of the ammonia that is produced. The study "Emissions of Volatile Organic Compounds Originating from UK Livestock Agriculture" (2004) by Hobbs, Webb, Mottram, Grant, and Misselbrook determined that, "there is a close association between ammonia and NMVOC (non-methane volatile organic compound) productions from manure" and "NMVOC emissions remain in a relatively constant ratio to those of ammonia".[89] Other researchers have also found similar relationships between NMVOC and NH3. For example, a correlation between NH3 and several individual NMVOCs was found in a study by Feilberg, Liu, Adamsen, Hansen, and Jonassen (2010).[90] This is expected because many of the VOCs emitted from confined animal facilities, including dairies, also originate from the decomposition of undigested protein in manure. Therefore, the measures included in District Rule 4570 to reduce VOC emissions from manure are also expected to reduce NH3 emissions.

[87] Schmidt, C.E., Card, T., Gaffney, P., and Hoyt., S. (2005) California Air Resource Board (ARB) and Central California Ozone Study (CCOS) Project: Assessment of Reactive Organic Gases and Amines from a Northern California Dairy Using the USEPA Surface Emissions Isolation Flux Chamber. 14th USEPA Annual Emissions Inventory Conference Las Vegas, Nevada, April, 2005. Technical Paper. Available at: http://www.epa.gov/ttn/chief/conference/ei14/session1/schmidt.pdf

[88] Card, T. and Schmidt, C. (2006) Dairy Air Emissions Report: Summary of Dairy Emission Estimation Procedures (May 2006). Final Report to California Air Resource Board (ARB). http://www.arb.ca.gov/ag/caf/SchmidtDairyEmissions2005.pdf http://www.arb.ca.gov/ag/caf/SchmidtDairyTestData2005.pdf

[89] Hobbs, P.J. Webb, J. Mottram, T.T. Grant, B. Misselbrook, T.M. (2004) Emissions of Volatile Organic Compounds Originating from UK Livestock Agriculture. 2004©. Society of Chemical Industry. J Sci Food Agric 84:1414-1420 http://www.valleyair.org/busind/pto/dpag/VOC_from_UK_livestock.pdf

[90] Feilberg, A, Liu, D., Adamsen, A.P.S., Hansen M.J., Jonassen K.E.N. (2010). Odorant Emissions from Intensive Pig Production Measured by Online Proton-Transfer-Reaction Mass Spectrometry. Environmental Science & Technology Vol.44:5894–900.

Research has demonstrated that silage and silage-based total mixed ration (TMR) are one of the largest sources of VOC emissions at cattle facilities, but are not significant sources of NH3 emissions. Therefore, the measures that specifically apply to management of silage and TMR will not be discussed in detail in this analysis.

It should be noted that, although Rule 4570 includes some options to provide flexibility to the operators of CAFs and that the majority of these measures are expected to reduce NH3 emissions, it also specifically requires certain measures that reduce NH3 emissions. Examples of mitigation measures specifically required in Rule 4570 that reduce NH3 emissions include the mitigation measures required at dairies and other cattle facilities for the areas in which the cattle are housed (e.g. barns, exercise pens, and corrals), such as increased cleaning and manure removal from lanes in freestall barns, corrals, and pens, and increased cleaning and manure removal from corrals and pen housing areas. These required measures have been shown to reduce NH3 emissions from these areas. Research has shown that for dairies and other cattle facilities the vast amount of NH3 emissions are from the areas in which the cattle are housed.[91, 92] Based on the current District NH3 emission factors,[93] the areas that house cattle are responsible for more than 72% of the NH3 emissions from dairies and other cattle facilities. Rule 4570 mitigation measures that are specifically required for the areas in which the cattle are housed include the following:

Rule 4570 Dairy CAF Phase II Mitigation Measures (Required)

Freestall Barns

1. Pave feedlanes, where present, for a width of at least eight (8) feet along the corral side of the feedlane fence for milk and dry cows and at least six (6) feet along the corral side of the feedlane for heifers.
2. a) Flush, scrape, or vacuum freestall flush lanes immediately prior to, immediately after, or during each milking; or b) Flush or scrape freestall flush lanes at least three (3) times per day.

Corrals/Pens

1. Pave feedlanes, where present, for a width of at least 8 feet along the corral side of the feedlane fence for milk and dry cows and at least 6 feet along the corral side of the feedlane for heifers.
2. a) Clean manure from corrals at least four (4) times per year with at least sixty (60) days between cleaning; or b) Clean corrals at least once between April and July and at least once between September and December.
3. a) Scrape, vacuum, or flush concrete lanes in corrals at least once every day for mature cows and every seven (7) days for support stock; or b). Clean concrete

[91] Schmidt, C. Card, T., and Gaffney, P. (2005). Assessment of Reactive Organic Gases and Amines from a Northern California Dairy Using the USEPA Surface Emission Isolation Flux Chamber. Presented at the Livestock Emissions Research Symposium held on January 26, 2005 at the San Joaquin Valley Air Pollution Control District, Fresno. https://www.arb.ca.gov/ag/agadvisory/schmidt05jan26.pdf

[92] Card, T. and Schmidt, C. (2006) Dairy Air Emissions Report: Summary of Dairy Emission Estimation Procedures (May 2006). Final Report to California Air Resource Board (ARB).

[93] SJVAPCD. (2018). Dairy Emission Factors. Retrieved from: https://www.valleyair.org/busind/pto/dpag/Dairy%20emission%20Factors.pdf

lanes such that the depth of manure does not exceed twelve (12) inches at any point or time.
4. Inspect water pipes and troughs and repair leaks at least once every seven (7) days.
5. a) Slope the surface of the corrals at least 3% where the available space for each animal is 400 square feet or less. Slope the surface of the corrals at least 1.5% where the available space for each animal is more than 400 square feet per animal; or b) Maintain corrals to ensure proper drainage preventing water from standing more than forty-eight (48) hours; or c) Harrow, rake, or scrape corrals sufficiently to maintain a dry surface.
6. If the Confined Animal Facility (CAF) has shade structures, they must choose one of the following: a) Install shade structures such that they are constructed with a light permeable roofing material; or b) Install all shade structures uphill of any slope in the corral; or c) Clean manure from under corral shades at least once every fourteen (14) days, when weather permits access into the corral; or d) Install shade structure so that the structure has a North/South orientation.

Rule 4570 Beef Feedlot Phase II Mitigation Measures (Required)

Housing

1. Scrape corrals twice a year with at least ninety (90) days between cleanings, excluding the removal of in-corral mounds.
2. Inspect water pipes and troughs and repair leaks at least once every seven (7) days.
3. a) Slope the surface of the corrals at least 3% where the available space for each animal is 400 square feet or less. Slope the surface of the corrals at least 1.5% where the available space for each animal is more than 400 square feet per animal; or b) Maintain corrals to ensure proper drainage preventing water from standing more than forty-eight (48) hours; or c) Harrow, rake, or scrape corrals sufficiently to maintain a dry surface.
4. If the Confined Animal Facility (CAF) has shade structures, they must choose one of the following: a) Install shade structures such that they are constructed with a light permeable roofing material; or b) Install all shade structures uphill of any slope in the corral; or c) Clean manure from under corral shades at least once every fourteen (14) days, when weather permits access into the corral; or d) Install shade structure so that the structure has a North/South orientation.

Rule 4570 Other Cattle Phase II Mitigation Measures (Required)

Freestall Barns

1. Vacuum, scrape, or flush freestalls at least once every seven (7) days.
2. Pave feedlanes, where present, for a width of at least six (6) feet along the corral side of the feedlane.

Corrals/Pens

1. Scrape corrals twice a year with at least 90 days between cleanings, excluding in-corral mounds.

2. a) Scrape, vacuum, or flush concrete lanes in corrals at least once every seven (7) days; or b) Clean concrete lanes such that the depth of manure does not exceed twelve (12) inches at any point or time.
3. Inspect water pipes and troughs and repair leaks at least once every seven (7) days.
4. a) Slope the surface of the corrals at least 3% where the available space for each animal is 400 square feet or less. Slope the surface of the corrals at least 1.5% where the available space for each animal is more than 400 square feet per animal; or b) Maintain corrals to ensure proper drainage preventing water from standing more than forty-eight (48) hours; or c) Harrow, rake, or scrape corrals sufficiently to maintain a dry surface.
5. If the Confined Animal Facility (CAF) has shade structures, they must choose one of the following: a) Install shade structures such that they are constructed with a light permeable roofing material; or b) Install all shade structures uphill of any slope in the corral; or c) Clean manure from under corral shades at least once every fourteen (14) days, when weather permits access into the corral; or d) Install shade structure so that the structure has a North/South orientation.

In addition to these measures, which are specifically required for cattle CAFs by Rule 4570, CAFs must also choose to implement additional measures of Rule 4570 that are also expected to reduce NH3 emissions.

Estimated NH3 Reductions from Rule 4570 for Cattle Facilities

The NH3 reductions from cattle facilities as a result of the measures required below are conservatively estimated below based on the information that is currently available.

Increased cleaning of freestall lanes:

Research by Schmidt, Card, Gaffney, and Hoyt (2005) indicated significantly lower NH3 emissions after cleaning of the lanes at a dairy.[94] Research by Beene, Krauter, and Goorahoo (2005)[95] also indicated lower NH3 emissions after cleaning of the lanes at the dairies they monitored. Emission models have also indicated that increased cleaning of barns will reduce NH3 emissions. Research by Mendes, Pieters, Snoek and others (2017) using a process-based model indicated that scraping manure or scraping

[94] Schmidt, C.E., Card, T., Gaffney, P., and Hoyt., S. (2005) California Air Resource Board (ARB) and Central California Ozone Study (CCOS) Project: Assessment of Reactive Organic Gases and Amines from a Northern California Dairy Using the USEPA Surface Emissions Isolation Flux Chamber. 14th USEPA Annual Emissions Inventory Conference Las Vegas, Nevada, April, 2005. Technical Paper. Available at: http://www.epa.gov/ttn/chief/conference/ei14/session1/schmidt.pdf

[95] Beene, M., Krauter, C., and Goorahoo D., (2005) Ammonia Fluxes from Animal Housing at a California Free Stall Dairy. Presented at the EPA 15th Emissions Inventory Conference, May 15-18, 2006, New Orleans, LA. Technical Paper: https://www3.epa.gov/ttnchie1/conference/ei15/session6/beene.pdf

manure combined with flushing reduced total NH3 emissions from a barn housing cattle by 17-27%.[96]

a) Non-Manure Bedding in Freestall Barns, b) Remove Manure from Freestall Bedding or Management of Freestall Bedding, or c) Have no animals in exercise pens or corrals at any time

Rule 4570 requires dairies and other cattle facilities to implement one of the following mitigation measures to reduce emissions from freestall barns:

a) Use non-manure-based bedding and non-separated solids based bedding for at least 90% of the bedding material, by weight, for freestalls (e.g. rubber mats, almond shells, sand, or waterbeds)

b) Remove manure that is not dry from individual cow freestall beds or rake, harrow, scrape, or grade freestall bedding at least once every seven (7) days for a large Dairy CAF (1,000 milk cows or more) or at least once every fourteen (14) days for a medium Dairy CAF (500 milk cows or more)

c) Have no animals in exercise pens or corrals at any time

Dairies and other cattle facilities that are subject to Rule 4570 must implement one of the practices above or request approval for an alternative mitigation that has been determined by the District, CARB, and EPA to achieve reductions that are equal to or exceed the reductions that would be achieved by complying with the requirements of Rule 4570. Each of the mitigation measures listed above is expected to reduce NH3 emissions. The greatest NH3 reductions would result from option 3, have no corrals animals in corrals or exercise pens at any time. Based on the District NH3 emission factors for dairies approximately 57% of NH3 emissions from dairies are from the corrals and pens. This is because of the very large surface area of corrals/pens where manure is excreted by cattle, which results in greater emissions.

Restricting animals from corrals and pens would reduce the overall area from which NH3 could be emitted and result in increased cleaning of manure excreted in barns. This would significantly reduce NH3 emissions but would not be practical for all dairies because not all cattle facilities have barns, others use different management strategies, and total confinement of cattle without access to exercise areas may also raise concerns about animal health and welfare.

Option 2 above - Use non-manure-based/non-separated solids based bedding would result in the next greatest NH3 reductions. The typical bedding used for cattle in freestall barns is composted/dried separated solids or manure. This manure contains nitrogen that can be emitted as NH3 as the manure decomposes and nitrogenous

[96] Mendes, L.B., Pieters, J.G., Snoek, D., Ogink N.W.M., Brusselman, E., Demeyer, P. (2017) Reduction of Ammonia Emissions from Dairy Cattle Cubicle Houses via Improved Management or Design-Based Strategies: A Modeling Approach, In Science of The Total Environment, Volume 574, 2017, Pages 520-531, ISSN 0048-9697, https://doi.org/10.1016/j.scitotenv.2016.09.079.

organic matter in the manure mineralizes to non-organic nitrogen. Replacing manure or separated solids based bedding with non-manure, non-separated solids based bedding would eliminate nearly all of the NH3 emissions that result from decomposition of the bedding and the only NH3 emissions from the bedding would be from the fresh manure excreted by the cattle. However, this option is not practical for all dairy facilities because of different management practices and the cost of purchasing and replacing bedding materials in the freestalls barns (e.g. mattresses, sand, etc.)

Option 3 above – Remove manure that is not dry from individual freestall beds or rake, harrow, scrape, or grade freestall beds will also reduce NH3 from freestall bedding by removing manure that emits NH3 when it decomposes and managing the bedding to allow urine to drain away from the bedding. Nitrogen in urine is primarily in the form of urea. Nitrogen from the urea in urine is emitted as NH3 after it has been hydrolyzed to NH3. The conversion of urea to NH3 is catalyzed by the enzyme urease, which is predominantly found in feces. Reducing contact between urine and feces has been shown to be an effective approach to reduce NH3 emissions. In a study by Braam (1997), a floor sloped by 3%, allowing urine to drain away from manure, was found to reduce NH3 emissions by 21%.

a) Clean manure from corrals at least four times per year with at least 60 days between cleaning; or b) Clean corrals at least once between April and July and at least once between September and December

Rule 4570 requires dairies and other cattle facilities to implement one of the following mitigation measures to reduce emissions from corrals/pens:

a) Clean manure from corrals at least four (4) times per year with at least sixty (60) days between cleaning;

b) Clean corrals at least once between April and July and at least once between September and December

Each of the mitigation measures listed above is expected to reduce NH3 emissions. Based on the District NH3 emission factors for dairies, approximately 57% of NH3 emissions from dairies are from corrals and pens. This is because of the very large surface area of corrals/pens where manure is excreted by cattle, which results in greater emissions. Research by Card and Schmidt (2005) supports that management of manure in corrals reduces NH3 emissions from the corrals and points out that of the two dairies tested, the NH3 emissions from the dairy with constantly managed corrals (Dairy 2) had “exceptionally low ammonia emissions”. Follow-up research by Card and Schmidt (2009) at one of the dairies studied (Dairy 1) indicated that NH3 emissions were significantly reduced (> 80% reduction comparing 2008 to 2005 reported NH3 emissions) when the frequency of management of the manure in the corrals was increased.[97]

[97] Schmidt, C. Card, T. (2009) 2008 Dairy Emissions Study: Summary of Dairy Emission Factors and Emission Estimation Procedures. August 2009. Final Report to San Joaquin Valley Air Pollution Control District

a) Slope the surface of the corrals/pens; b) Maintain corrals to ensure proper drainage preventing water from standing; or c) Harrow, rake, or scrape corrals sufficiently to maintain a dry surface

Rule 4570 requires dairies and other cattle facilities to implement one of the following mitigation measures to reduce emissions from corrals/pens:

a) Slope the surface of the corrals at least 3% where the available space for each animal is 400 square feet or less; Slope the surface of the corrals at least 1.5% where the available space for each animal is more than 400 square feet per animal;

b) Maintain corrals to ensure proper drainage preventing water from standing more than forty-eight (48) hours; or

c) Harrow, rake, or scrape corrals and corrals sufficiently to maintain a dry surface, unless the corrals have not held animals in the last thirty (30) days

Proper sloping or management of corrals/pens will reduce NH3 from corral/pens by allowing urine drain away from the corrals/pens. Nitrogen in urine is primarily in the form of urea. As explained above, nitrogen from the urea in urine is emitted as NH3 after it has been hydrolyzed to NH3. The conversion of urea to NH3 is catalyzed by the enzyme urease, which is predominantly found in feces. Reducing contact between urine and feces has been shown to be an effective approach to reduce NH3 emissions. As discussed above, a floor sloped by 3%, allowing urine to drain away from manure, was found to reduce NH3 emissions by 21%.

a) Within 72 hours of removal from housing, either Remove dry manure from the facility or Cover dry manure outside the housing with a weatherproof covering from October through May; or b) Within 72 hours of removal from the drying process, either remove separated solids from the facility; or cover separated solids outside the housing with a weatherproof covering from October through May

Rule 4570 requires large dairy CAFs (at least 1,000 milk cows) and other cattle facilities that handle or store solid manure or separated manure solids outside of the animal housing to implement one of the following mitigation measures (or an approved alternative mitigation measure) to reduce emissions from the solid manure or separated manure solids:

a) Within seventy-two (72) hours of removal from housing, either:
    a. Remove dry manure from the facility; or
    b. Cover dry manure outside the housing with a weatherproof covering from October through May, except for times when wind events remove the covering, not to exceed twenty-four (24) hours per event.

b) Within seventy-two (72) hours of removal from the drying process, either:
    a. Remove separated solids from the facility; or

b. Cover separated solids outside the housing with a weatherproof covering from October through May, except for times when wind events remove the covering, not to exceed twenty-four (24) hours per event.

Large dairy CAFs and other cattle facilities that are subject to the Rule 4570 must implement one of the practices above or request approval for an alternative mitigation that has been determined by the District, CARB, and EPA to achieve reductions that are equal to or exceed the reductions that would be achieved by complying with the requirements of Rule 4570. Dairies and other cattle facilities may have both scraped solid manure and separated solids and will only be required to implement a mitigation measure for one of these types of solid manure, while beef cattle generally will not have separated solids and must implement a mitigation measure for the solid manure handled outside of corrals. Research by Chadwick (2005) indicated that covering manure piles reduced NH3 emissions by an average of 90%.[98]

a) Incorporate all solid manure within 72 hours of land application; or b) Only apply solid manure that has been treated with an anaerobic treatment lagoon, aerobic lagoon, or digester system; or c) Apply no solid manure with a moisture content of more than 50%

Rule 4570 requires dairies and other cattle facilities that apply solid manure to cropland to implement one of the following mitigation measures (or an approved alternative mitigation measure) to reduce emissions from the land application of solid manure:

a) Incorporate all solid manure within seventy-two (72) hours of land application; or

b) Only apply solid manure that has been treated with an anaerobic treatment lagoon, aerobic lagoon, or digester system; or

c) Apply no solid manure with a moisture content of more than 50%

Dairies and other cattle facilities that are subject to Rule 4570 must implement one of the practices above or request approval for an alternative mitigation that has been determined by the District, CARB, and EPA to achieve reductions that are equal to or exceed the reductions that would be achieved by complying with the requirements of Rule 4570. Based on a review of Valley facilities that Rule 4570 apply to, the mitigation measure that nearly all dairy and other cattle facilities have selected to implement is Mitigation Measure a) *Incorporate all solid manure within 72 hours of land application*. The Alberta, Canada Agriculture and Forestry publication, *Ammonia Volatilization from Manure Application,*[99] indicates average ammonium-nitrogen losses of 35% for manure incorporated in three days compared to 66% for manure that is not incorporated.

a) Only apply liquid manure that has been treated with an anaerobic treatment lagoon, aerobic lagoon, or digester system; or b) Allow liquid manure to stand in the fields for no

[98] Chadwick, D.R. (2005) Emissions of Ammonia, Nitrous Oxide and Methane from Cattle Manure Heaps: Effect of Compaction and Covering. Atmosphere Environment, 39: 787-799. Available at: http://www.sciencedirect.com/science/article/pii/S135223100400994X

[99] Atia, A. (2008). Ammonia volatilization from manure application. Alberta Agriculture, Food and Rural Development.

more than twenty-four (24) hours after irrigation; or c. Apply liquid/slurry manure via injection with drag hose or similar apparatus

Rule 4570 requires dairies and other cattle facilities that apply liquid manure to cropland to implement one of the following mitigation measures (or an approved alternative mitigation measure) to reduce emissions from the land application of liquid manure:

a) Only apply liquid manure that has been treated with an anaerobic treatment lagoon, aerobic lagoon, or digester system; or

b) Allow liquid manure to stand in the fields for no more than twenty-four (24) hours after irrigation; or

c) Apply liquid/slurry manure via injection with drag hose or similar apparatus

Dairies and other cattle facilities that are subject to Rule 4570 must implement one of the mitigation measures above or request approval for an alternative mitigation that has been determined by the District, CARB, and EPA to achieve reductions that are equal to or exceed the reductions that would be achieved by complying with the requirements of Rule 4570.

The actual NH3 emissions from the application of liquid manure in the San Joaquin Valley are expected to be minimal because of the typical practices that are utilized when applying liquid manure in the San Joaquin Valley. The report, *Managing Dairy Manure in the Central Valley of California,* prepared by the University of California Division of Agricultural and Natural Resources Committee of Experts on Dairy Manure Management (2005) indicates that in California "nearly all" manure from lagoons used for land application is diluted with irrigation water and applied via surface gravity irrigation systems and that "during irrigations, farmers commonly dilute lagoon water with 5 to 10 parts of fresh source water." The report goes on to state that, "in systems with frequent, but well diluted manure water applications, ammonia losses from the ground surface will commonly be minimal during the irrigation (10% or less)."

For application of liquid manure, the mitigation measure that nearly all dairy and other cattle facilities have selected to implement is Mitigation Measure b) *Allow liquid manure to stand in the fields for no more than 24 hours after irrigation*. This is because, in comparison, the other options are more costly and difficult to implement. In addition, for many facilities implementation of the other options is impractical. There are few cattle facilities with properly designed anaerobic treatment lagoons, and no lagoons for dairy manure operating in the San Joaquin Valley have been identified that satisfy the requirements for aerobic treatment lagoons as specified in District Rule 4570. As mentioned above, there are approximately a dozen anaerobic digesters currently operating in the San Joaquin Valley, so this option is not feasible due to the large number of dairies in the San Joaquin Valley.

Application of liquid or slurry manure with a drag hose or similar apparatus could result in significant NH3 reductions, but has higher costs compared to flood or furrow irrigation

of liquid manure. This practice is not currently common and is not feasible during times when a crop is growing. Therefore, it will be conservatively assumed that all dairies and other cattle facilities implement Mitigation Measure b) Allow liquid manure to stand in the fields for no more than 24 hours after irrigation. In order for liquid manure to remain standing in the field for no more than 24 hours, it must infiltrate the crop soil within this time and this can be assumed to be approximately equivalent to incorporation of the liquid manure. The Alberta, Canada Agriculture and Forestry publication, *Ammonia Volatilization from Manure Application*,[100] indicates average ammonium-nitrogen losses of 25% for manure incorporated in one day, compared to 66% for manure that is not incorporated. At a San Joaquin Valley dairy measured during a 2008 dairy emissions study by Schmidt, the net NH3 emissions from liquid manure application up to 24 hours were approximately 46% of total net NH3 emissions from liquid manure application (up to 100 hours).[101] This indicates an overall reduction of approximately 54% if liquid manure applied to land completely infiltrates the soil within 24 hours.

The analysis below focuses on how District Rule 4570 limits NH3 emissions in comparison to other rules and regulations.

How does District Rule 4570 compare with federal and state rules and regulations?

Federal requirements such as NSPS, NESHAP, MACT, CTGs, and ACTs and state regulations are not applicable to this source category.

How does District Rule 4570 compare to rules in other air districts?

As the largest agricultural area in California, the District took the lead in devising a list of mitigation measures for the various emission sources during the initial development of District Rule 4570. This list of mitigation measures was essentially utilized, almost identically, by all air districts in their rules. However, during the last amendments to District Rule 4570, all of the mitigation measures were reevaluated in light of the latest available science. In comparison to the previous version of the rule, the current rule lowered threshold limits to bring in additional CAFs, requires additional mitigation measures, clarified previous mitigation measures, and added additional monitoring, testing, and recordkeeping to improve enforceability.

The following California air district rules were compared to District Rule 4570:

- SCAQMD Rule 223, adopted June 2, 2006
- SCAQMD Rule 1127, adopted August 6, 2004
- BAAQMD Regulation 2 Rule 10, adopted July 19, 2006
- VCAPCD Rule 23 (Exemptions), amended November 12, 2013
- SMAQMD Rule 496, adopted August, 24, 2006
- Imperial County APCD (ICAPCD) Rule 217 and Policy Number 38, adopted February 9, 2016

[100] Atia, A. (2008). Ammonia volatilization from manure application. Alberta Agriculture, Food and Rural Development.
[101] Chadwick, D.R. (2005) Emissions of Ammonia, Nitrous Oxide and Methane from Cattle Manure Heaps: Effect of Compaction and Covering. Atmosphere Environment, 39: 787-799. Available at: http://www.sciencedirect.com/science/article/pii/S135223100400994X

Idaho Administrative Procedure Act (IDAPA) 58.01.01 Sections 760-764 was also compared with District Rule 4570 and the analysis is shown below.

It is important to note that only District Rule 4570, SMAQMD Rule 496, and SCAQMD Rule 1127 are prohibitory rules. For this reason, these rules include detailed recordkeeping as well as monitoring and testing requirements. Generally, the level of detail in a prohibitory rule is absent from permits rules because the purpose of a permit rule is different from the purpose of a prohibitory rule.

South Coast AQMD

- SCAQMD Rule 223 (Emission Reduction Permits for Large Confined Animal Facilities) *(Adopted June 2, 2006)*

Based on the analysis of the CAF categories in District Rule 4570 and SCAQMD Rule 223, it is clear that District Rule 4570 is more stringent than SCAQMD Rule 223. District Rule 4570 requires facilities to choose more mitigation measures and makes several mitigation measures mandatory.

District Rule 4570 also provides mitigation for more CAF categories (beef feedlots, other cattle, and swine) that are not addressed by SCAQMD Rule 223, and also has much more detailed recordkeeping requirements to demonstrate implementation of selected mitigation measures.

	SJVAPCD Rule 4570	SCAQMD Rule 223	Conclusion
Applicability	Applies to large CAFs as defined by CARB. Requirements apply to horse facilities with at least 3,000 head In addition to Large CAFs, also applies to Dairies with at least 500 milk cows (Large CAF threshold 1,000 milk cows) and Broiler, Duck, and Layer facilities with at least 400,000 birds (Large CAF threshold 650,000 birds)	Applies to large CAFs as defined by CARB Defines a large CAF for horses as having at least 2,500 head (Note: There are currently no CAFs in the Valley with at least 2,500 horses and no horse CAFs in the Valley are expected to exceed this threshold in the foreseeable future)	Rule 4570 is more stringent regarding applicability

Requirements for Dairy CAFs		
	SJVAPCD Rule 4570	**SCAQMD Rule 223**
Requirements: Feed Mitigation Measures	Operators must implement four mandatory feed mitigation measures and chose one other option from a list of three, for a total of five feed mitigation measures	Nine optional feed mitigation measures, from which an operator must choose five to implement

Requirements for Dairy CAFs		
	SJVAPCD Rule 4570	**SCAQMD Rule 223**
Requirements: Milk Parlor Mitigation Measures	Flush or hose milking parlor immediately prior to, immediately after, or during each milking. Class Two mitigation measures removed due to infeasibility (see the Staff Report for the October 21, 2010 amendments to Rule 4570 for more detail)	Includes option of choosing one class 1 measure (Flush or hose milking parlor immediately prior to, immediately after, or during each milking) or one Class 2 measure
Requirements: Freestall Mitigation Measures	Operators must implement a total of three mitigation measures - two mandatory mitigation measures and choose one additional measure from three possible options	Operators must choose to implement two mitigation measures from eight possible options
Requirements: Corral Mitigation Measures	Operators must implement a total of seven mitigation measures – six mandatory mitigation measures and choose one additional measure from three possible options	Operators must choose to implement six mitigation measures from 14 possible Class One mitigation measures and two possible Class Two mitigation measures
Requirements: Solid Manure and Separated Solids Mitigation Measures	Operators must choose to implement at least one mitigation measure from two possible options	Operators must implement two mitigation measures chosen from three possible Class One mitigation measures and three possible Class Two mitigation measures. However, for practical purposes only one mitigation measure must be implemented. The Class one mitigation measures include: 1) Covering dry manure piles outside the pens with a waterproof covering from October through May, 2) Covering dry separated solids outside the pens with a waterproof covering from October through May, and 3) Removal of manure from the facility within seventy-two (72) hours of removal from the pens or corrals. Dairies in the SCAQMD are generally dry scrape dairies and will not have separated solids and many dairies store manure in the pens until it can be removed for use as fertilizer or compost.
Requirements: Liquid Manure Mitigation Measures	Operators must choose to implement at least one mitigation measure from four possible options	Operators must choose to implement one mitigation measures from five possible Class One mitigation measures and five possible Class Two mitigation measures
Requirements: Manure Land Application Mitigation Measures	Operators must choose to implement one mitigation measure for solid manure land application and one mitigation measure for liquid manure land application measures from six possible options	Operators must choose to implement two mitigation measures from four possible options

Requirements for Poultry CAFs		
	SJVAPCD Rule 4570	**SCAQMD Rule 223**
Requirements: Feed Operations	Operators must choose to implement one feed mitigation measure from four possible options	Operators must choose to implement five mitigation measures from six possible options
Requirements: Poultry Housing	Operators required to implement two mitigation measures for layers, four mitigation measures for broilers or ducks, and five mitigation measures for turkeys	Operators must choose to implement four mitigation measures from 11 possible Class One mitigation measures and two possible Class Two mitigation measures
Requirements: Solid Manure or Separated Solids	Operators must choose to implement one mitigation measure	Operators must choose to implement one mitigation measures from three possible Class One mitigation measures and three possible Class Two mitigation measures
Requirements: Liquid Manure	Operators that handle manure in liquid form must choose to implement one mitigation measure	Operators that handle manure in liquid form must choose to implement one mitigation measures from four possible Class One mitigation measures and three possible Class Two mitigation measures

Requirements for Other CAF Categories		
	SJVAPCD Rule 4570	**SCAQMD Rule 223**
Requirements:	District Rule 4570 provides specific mitigation measures for beef cattle feedlots, other cattle, and swine CAFs	SCAQMD Rule 223 does not address mitigation measures for beef cattle feedlots, other cattle, and swine CAFs

Suspension and Substitution of Mitigation Measures		
	SJVAPCD Rule 4570	**SCAQMD Rule 223**
Requirements:	Allows temporary suspension of a mitigation measure upon the determination by a certified veterinarian or nutritionist that such a suspension is necessary for animal health purposes. The District must be notified within 48 hours, and a new measure must be implemented if the suspension is expected to last longer than 30 days. Allows for substitution of one mitigation measure with an equivalent or more stringent measure	Allows temporary suspension of a mitigation measure upon the determination by a certified veterinarian or nutritionist that such a suspension is necessary for animal health purposes. The District must be notified within 48 hours, and a new measure must be implemented if the suspension is expected to last longer than 30 days. Allows for substitution of one mitigation measure with an equivalent or more stringent measure

South Coast AQMD

- SCAQMD Rule 1127 (Emission Reductions from Livestock Waste) *(Adopted August 6, 2004)*

For dairy CAFs, District Rule 4570 is more stringent than SCAQMD Rule 1127. District Rule 4570 requires emission reductions from additional emission categories that are not addressed by SCAQMD Rule 1127 (e.g. milk parlors, freestall barns, and liquid manure), as well as requiring emission reductions from CAFs from other animal species. District Rule 4570 exemption is more stringent because it is only a temporary suspension that cannot exceed 30 days, whereas SCAQMD Rule 1127's exemption may be permanent, without requiring substitution of another measure. District Rule 4570 requires facilities to choose more mitigation measures and makes several mitigation measures mandatory. District Rule 4570 also provides specific mitigation measures for beef cattle feedlots, other cattle, poultry, and swine CAFs, while SCAQMD Rule 1127 does not. District Rule 4570 is therefore more stringent than SCAQMD Rule 1127.

	SJVAPCD Rule 4570	SCAQMD Rule 1127
Applicability	Applies to dairy CAFs with at least 500 milking cows; Also applies to other CAFs, Applies to more than just manure-handling	Applies to dairies with 50 or more cows, heifers, and/or calves. Applies to dairy farms and related operations such as heifer and calf farms and the manure produced on them

Requirements for Dairy CAFs		
	SJVAPCD Rule 4570	**SCAQMD Rule 1127**
Requirements: Milking Parlor and Freestall Mitigation Measures	For milking parlors, operators must implement one mandatory mitigation measure For Freestalls, operators must implement a total of three mitigation measures - two mandatory mitigation measures and choose one additional measure from three possible options	No requirements for milking parlors and freestalls
Requirements: Corral Mitigation Measures	Operators must implement a total of seven mitigation measures – six mandatory mitigation measures and choose one additional measure from three possible options	Mitigation measures required by SCAQMD Rule 1127 specify the removal of manure from the corrals, the minimization of water in the corrals, and the cleaning schedule and cleaning strategy for the corrals

Requirements for Dairy CAFs		
	SJVAPCD Rule 4570	**SCAQMD Rule 1127**
Requirements: Mitigation Measures For Solid Manure, Separated Solids, Liquid Manure, and Manure Land Application	Operators must choose one mitigation measure for solid manure/separated solids, one mitigation measure for liquid manure, and one mitigation measure for solid manure land application and one mitigation measure for liquid manure land application	SCAQMD Rule 1127 requires that manure removed must be either treated at an approved manure processing operation, or applied on agricultural land with local approval. SCAQMD Rule 1127 does not specify mitigation measures for solid manure, separated solids, or liquid manure
Requirements: Corral Mitigation Measures	Operators must implement a total of seven mitigation measures – six mandatory mitigation measures and choose one additional measure from three possible options	Operators must choose to implement six mitigation measures from 14 possible Class One mitigation measures and two possible Class Two mitigation measures
Requirements: Solid Manure and Separated Solids Mitigation Measures	Operators must choose to implement at least one mitigation measure from two possible options	Operators must implement two mitigation measures chosen from three possible Class One mitigation measures and three possible Class Two mitigation measures. However, for practical purposes only one mitigation measure must be implemented. The Class one mitigation measures include: 1) Covering dry manure piles outside the pens with a waterproof covering from October through May, 2) Covering dry separated solids outside the pens with a waterproof covering from October through May, and 3) Removal of manure from the facility within seventy-two (72) hours of removal from the pens or corrals. Dairies in the SCAQMD are generally dry scrape dairies and will not have separated solids and many dairies store manure in the pens until it can be removed for use as fertilizer or compost.

Requirements for Other CAF Categories		
	SJVAPCD Rule 4570	**SCAQMD Rule 1127**
Requirements:	District Rule 4570 provides specific mitigation measures for beef cattle feedlots, other cattle, poultry, and swine CAFs	SCAQMD Rule 223 does not address mitigation measures for beef cattle feedlots, poultry, and swine CAFs
Suspension and Substitution of Mitigation Measures		
	SJVAPCD Rule 4570	**SCAQMD Rule 1127**

Requirements:	Allows temporary suspension of a mitigation measure upon the determination by a certified veterinarian or nutritionist that such a suspension is necessary for animal health purposes. The District must be notified within 48 hours, and a new measure must be implemented if the suspension is expected to last longer than 30 days. Allows for substitution of one mitigation measure with an equivalent or more stringent measure	Allows one exemption per year from one of the corral clearings required every 90 days if the moisture content in the corrals is greater than 50%. The operator is required to notify SCAQMD 30 days before the required cleaning, and test moisture content weekly.

Bay Area AQMD

- BAAQMD Regulation 2 Rule 10 (Rule 2-10) (Large Confined Animal Facilities) *(Adopted July 19, 2006)*

District Rule 4570 requires facilities to choose specific mitigation measures and makes several mitigation measures mandatory. In addition, District Rule 4570 has lower applicability thresholds for dairies, chickens, and ducks. Based on this information and the discussion above, District Rule 4570 is far more stringent than BAAQMD Rule 2-10.

	SJVAPCD Rule 4570	BAAQMD Rule 2-0
Applicability	Applies to large CAFs as defined by CARB. Requirements apply to horse facilities with at least 3,000 head In addition to Large CAFs, also applies to Dairies with at least 500 milk cows (Large CAF threshold 1,000 milk cows) and Broiler, Duck, and Layer facilities with at least 400,000 birds (Large CAF threshold 650,000 birds)	Applies to large CAFs as defined by CARB Defines a large CAF for horses as having at least 2,500 head (Note: There are currently no CAFs in the Valley with at least 2,500 horses and no horse CAFs in the Valley are expected to exceed this threshold in the foreseeable future)

Requirements for CAFs		
	SJVAPCD Rule 4570	**BAAQMD Rule 2-0**
Requirements:	Requires specific mitigation measures for various emission sources (e.g. feed, housing, manure handling, etc.) for the different types of CAFs	Requires permit conditions that implement control measures that represent Reasonably Available Control Technology (RACT) to reduce emissions of VOC, NOx and PM from the facility Currently no CAFs subject to rule and no approved list of RACT measures that must be implemented

Ventura County APCD

- VCAPCD Rule 23 (Exemptions from Permit) *(Amended November 11, 2013)*

In response to California Senate Bill (SB) 700, VCAPCD revised its "Exemptions from Permit" rule to remove an exemption for agricultural operations, including CAFs. VCAPCD does not have a specific rule for CAFs. In its staff report for the rule revision, VCAPCD staff noted that no facilities in their jurisdiction would meet the "large CAF" definition and there was no expectation that a large CAF would move into the area in the foreseeable future; therefore, no separate CAF rule was necessary. VCAPCD does not have a specific rule for CAFs; therefore, District Rule 4570 is more stringent.

	SJVAPCD Rule 4570	VCAPCD Rule 23
Applicability	Applies to large CAFs as defined by CARB. Requirements apply to horse facilities with at least 3,000 head In addition to Large CAFs, also applies to Dairies with at least 500 milk cows (Large CAF threshold 1,000 milk cows) and Broiler, Duck, and Layer facilities with at least 400,000 birds (Large CAF threshold 650,000 birds)	Adopted CARBs definition of large CAFs Defines a large CAF for horses as having at least 2,500 head (Note: There are currently no CAFs in the Valley with at least 2,500 horses and no horse CAFs in the Valley are expected to exceed this threshold in the foreseeable future)

Requirements for CAFs		
	SJVAPCD Rule 4570	**VCAPCD Rule 23**
Requirements:	Requires specific mitigation measures for various emission sources (e.g. feed, housing, manure handling, etc.) for the different types of CAFs	No specific requirements or rules for CAFs There are currently no facilities in VCAPCD that are large CAFs and no large CAF is expected to move into the area in the foreseeable future; therefore, VCAPCD determined no separate CAF rule was necessary

Sacramento Metro AQMD

- SMAQMD Rule 496 (Large Confined Animal Facilities) *(Adopted August 24, 2006)*

District Rule 4570 is more stringent than SMAQMD Rule 496 because District Rule 4570 requires emission reductions from four additional emission categoriesat dairy CAFs - milk parlors, feed, freestall barns, and liquid manure - that are not addressed by SMAQMD Rule 496 as well as having specific requirements for other types of CAFs. District Rule 4570 also requires facilities to choose more mitigation measures and mandates several mitigation measures. In addition, Rule 4570 applies to dairies with greater than 500 milk cows and 400,000 layers and broilers while SMAQMD Rule 496 applies to dairies with 1,000 milk cows or more and broiler and layer operations with more than 650,000 birds.

	SJVAPCD Rule 4570	SMAQMD Rule 496
Applicability	Applies to large CAFs as defined by CARB. Requirements apply to horse facilities with at least 3,000 head In addition to Large CAFs, also applies to Dairies with at least 500 milk cows (Large CAF threshold 1,000 milk cows) and Broiler, Duck, and Layer facilities with at least 400,000 birds (Large CAF threshold 650,000 birds)	Applies to large CAFs as defined by CARB Defines a large CAF for horses as having at least 2,500 head (Note: There are currently no CAFs in the Valley with at least 2,500 horses and no horse CAFs in the Valley are expected to exceed this threshold in the foreseeable future)

Requirements for Dairy CAFs		
	SJVAPCD Rule 4570	**SMAQMD Rule 496**
Requirements: Feed Mitigation Measures	Operators must implement four mandatory feed mitigation measures (excluding silage) and chose one other option from a list of three, for a total of five feed mitigation measures	Nine optional feed mitigation measures (excluding silage), from which an operator must choose to implement four feed mitigation measures. Operators must also choose one silage mitigation measure
Requirements: Milk Parlor Mitigation Measures	Flush or hose milking parlor immediately prior to, immediately after, or during each milking. Class Two mitigation measures removed due to infeasibility (see the Staff Report for the October 21, 2010 amendments to Rule 4570 for more detail)	Includes option of choosing one class 1 measure (Flush or hose milking parlor immediately prior to, immediately after, or during each milking) or one Class 2 measure
Requirements: Freestall Mitigation Measures	Operators must implement a total of three mitigation measures - two mandatory mitigation measures and choose one additional measure from three possible options	Operators must choose to implement two mitigation measures from eight possible Class One mitigation measure options and two possible Class Two mitigation measure options
Requirements: Corral Mitigation Measures	Operators must implement a total of seven mitigation measures – six mandatory mitigation measures and choose one additional measure from three possible options	Operators must choose to implement six mitigation measures from 15 possible Class One mitigation measure options and three possible Class Two mitigation measure options
Requirements: Solid Manure and Separated Solids Mitigation Measures	Operators must choose to implement at least one mitigation measure from two possible options	Operators must implement two mitigation measures chosen from three possible Class One mitigation measures and three possible Class Two mitigation measures.
Requirements: Liquid Manure Mitigation Measures	Operators must choose to implement at least one mitigation measure from four possible options	Operators must choose to implement one mitigation measures from four possible Class One mitigation measures and four possible Class Two mitigation measures

Requirements for Dairy CAFs		
	SJVAPCD Rule 4570	**SMAQMD Rule 496**
Requirements: Manure Land Application Mitigation Measures	Operators must choose to implement one mitigation measure for solid manure land application and one mitigation measure for liquid manure land application measures from six possible options	Operators must choose to implement two mitigation measures from four possible options

Requirements for Poultry CAFs		
	SJVAPCD Rule 4570	**SMAQMD Rule 496**
Requirements: Feed Operations	Operators must choose to implement one feed mitigation measure from four possible options	Operators must choose to implement five mitigation measures from nine possible options
Requirements: Poultry Housing	Operators are required to implement two mitigation measures for layers, four mitigation measures for broilers or ducks, and five mitigation measures for turkeys	Operators must choose to implement four mitigation measures from 16 possible options
Requirements: Solid Manure or Separated Solids	Operators must choose to implement one mitigation measure	Operators must choose to implement one mitigation measures from three possible Class One mitigation measures and two possible Class Two mitigation measures
Requirements: Liquid Manure	Operators that handle manure in liquid form must choose to implement one mitigation measure	Operators that handle manure in liquid form must choose to implement one mitigation measures from four possible Class One mitigation measures and three possible Class Two mitigation measures

Requirements for Other CAF Categories		
	SJVAPCD Rule 4570	**SMAQMD Rule 496**
Requirements:	District Rule 4570 provides specific mitigation measures for beef cattle feedlots, other cattle, and swine CAFs	SMAQMD Rule 496 does not address mitigation measures for beef cattle feedlots, other cattle, and swine CAFs

Suspension and Substitution of Mitigation Measures		
	SJVAPCD Rule 4570	**SMAQMD Rule 496**
Requirements:	Allows temporary suspension of a mitigation measure upon the determination by a certified veterinarian or nutritionist that such a suspension is necessary for animal health purposes. The District must be notified within 48 hours, and a new measure must be implemented if the suspension is expected to last longer than 30 days. Allows for substitution of one mitigation measure with an equivalent or more stringent measure	Allows temporary suspension of a mitigation measure upon the determination by a certified veterinarian or nutritionist that such a suspension is necessary for animal health purposes. The District must be notified within 48 hours, and a new measure must be implemented if the suspension is expected to last longer than 30 days. Allows for substitution of one mitigation measure with an equivalent or more stringent measure

Imperial County APCD

- ***ICAPCD Rule 217 (Large Confined Animal Facilities Permits Required)*** *(Amended February 9, 2016)*

ICAPCD Rule 217 indicates that the purpose of the rule is to limit emissions of VOCs and NH3 from Large Confined Animal Facilities. ICAPCD Rule 217 was originally adopted on October 10, 2006, but was recently amended on February 9, 2016. The amendments were intended to address deficiencies that US EPA and CARB identified in the rule as originally adopted and resulted in requirements that were essentially identical to District Rule 4570, which had already been approved for inclusion in the State Implementation Plan (SIP). District Rule 4570 and ICAPCD Rule 217 contain fundamentally identical requirements and therefore are of equal stringency.

	SJVAPCD Rule 4570	ICAPCD Rule 217
Applicability	Applies to the Large CAFs and other Confined Animal Facilities with the following numbers of animals: • Dairy: 500 Milk Cows • Beef Feedlots: 3,500 Beef Cattle • Other Cattle: 7,500 cattle • Chickens: 400,000 birds • Ducks: 400,000 birds • Turkeys: 100,000 birds • Swine: 3,000 head • Horses: 3,000 head • Sheep and Goats: 15,000 head • Other: 30,000 head	Applies to the Large CAFs and other Confined Animal Facilities with the following numbers of animals: • Dairy: 500 Milk Cows • Beef Feedlots: 3,500 Beef Cattle • Other Cattle: 3,500 cattle • Chickens: 400,000 birds • Ducks: 400,000 birds • Turkeys: 100,000 birds • Swine: 3,000 head • Horses: 2,500 head • Sheep and Goats: 15,000 head • Other: 30,000 head (Note: There are currently no CAFs in the Valley with at least 2,500 horses and no horse CAFs in the Valley are expected to exceed this threshold in the foreseeable future)

Requirements for Dairy CAFs		
	SJVAPCD Rule 4570	**ICAPCD Rule 217**
Requirements: Feed Mitigation Measures	Operators must implement four mandatory feed mitigation measures (excluding silage) and chose one other option from a list of three, for a total of five feed mitigation measures	Operators must implement four mandatory feed mitigation measures (excluding silage) and chose one other option from a list of three, for a total of five feed mitigation measures
Requirements: Milk Parlor Mitigation Measures	Flush or hose milking parlor immediately prior to, immediately after, or during each milking.	Flush or hose milking parlor immediately prior to, immediately after, or during each milking.
Requirements: Freestall Mitigation Measures	Operators must implement a total of three mitigation measures - two mandatory mitigation measures and choose one additional measure from three possible options	Operators must implement a total of three mitigation measures - two mandatory mitigation measures and choose one additional measure from three possible options

Requirements for Dairy CAFs		
	SJVAPCD Rule 4570	**ICAPCD Rule 217**
Requirements: Corral Mitigation Measures	Operators must implement a total of seven mitigation measures – six mandatory mitigation measures and choose one additional measure from three possible options	Operators must implement a total of seven mitigation measures – six mandatory mitigation measures and choose one additional measure from three possible options
Requirements: Solid Manure and Separated Solids Mitigation Measures	Operators must choose to implement at least one mitigation measure from two possible options	Operators must choose to implement at least one mitigation measure from two possible options
Requirements: Liquid Manure Mitigation Measures	Operators must choose to implement at least one mitigation measure from four possible options	Operators must choose to implement at least one mitigation measure from four possible options
Requirements: Manure Land Application Mitigation Measures	Operators must choose to implement one mitigation measure for solid manure land application and one mitigation measure for liquid manure land application measures from six possible options	Operators must choose to implement one mitigation measure for solid manure land application and one mitigation measure for liquid manure land application measures from six possible options

Requirements for Beef CAFs		
	SJVAPCD Rule 4570	**ICAPCD Rule 217**
Requirements: Feed Mitigation Measures	Operators must implement two feed mitigation measures from four possible options	Operators must implement two feed mitigation measures from four possible options
Requirements: Housing Mitigation Measures	Operators must implement a total of five mitigation measures - four mandatory mitigation measures and choose one additional measure from two possible options	Operators must implement a total of five mitigation measures - four mandatory mitigation measures and choose one additional measure from two possible options
Requirements: Solid Manure and Separated Solids Mitigation Measures	Operators must choose to implement at least one mitigation measure from two possible options	Operators must choose to implement at least one mitigation measure from two possible options
Requirements: Liquid Manure Mitigation Measures	Operators must choose to implement at least one mitigation measure from four possible options	Operators must choose to implement at least one mitigation measure from four possible options
Requirements: Manure Land Application Mitigation Measures	Operators must choose to implement one mitigation measure for solid manure land application and one mitigation measure for liquid manure land application measures from six possible options	Operators must choose to implement one mitigation measure for solid manure land application and one mitigation measure for liquid manure land application measures from six possible options

Requirements for Other Cattle CAFs		
	SJVAPCD Rule 4570	**ICAPCD Rule 217**
Requirements: Feed Mitigation Measures	Operators must implement two feed mitigation measures from four possible options	Operators must implement two feed mitigation measures from four possible options
Requirements: Freestall Mitigation Measures	Operators must implement a total of three mitigation measures - two mandatory mitigation measures and choose one additional measure from two possible options	Operators must implement a total of three mitigation measures - two mandatory mitigation measures and choose one additional measure from two possible options
Requirements: Corral Mitigation Measures	Operators must implement a total of six mitigation measures – five mandatory mitigation measures and choose one additional measure from three possible options	Operators must implement a total of six mitigation measures – five mandatory mitigation measures and choose one additional measure from three possible options
Requirements: Solid Manure and Separated Solids Mitigation Measures	Operators must choose to implement at least one mitigation measure from two possible options	Operators must choose to implement at least one mitigation measure from two possible options
Requirements: Liquid Manure Mitigation Measures	Operators must choose to implement at least one mitigation measure from four possible options	Operators must choose to implement at least one mitigation measure from four possible options
Requirements: Manure Land Application Mitigation Measures	Operators must choose to implement one mitigation measure for solid manure land application and one mitigation measure for liquid manure land application measures from six possible options	Operators must choose to implement one mitigation measure for solid manure land application and one mitigation measure for liquid manure land application measures from six possible options

Requirements for Swine CAFs		
	SJVAPCD Rule 4570	**ICAPCD Rule 217**
Requirements: Feed Mitigation Measures	Operators must implement two feed mitigation measures	Operators must implement two feed mitigation measures
Requirements: Housing Mitigation Measures	Operators must implement three housing mitigation measures	Operators must implement three housing mitigation measures
Requirements: Liquid Manure Mitigation Measures	Operators must implement one liquid manure mitigation measures	Operators must implement one liquid manure mitigation measures
Requirements: Manure Land Application Mitigation Measures	Operators must choose to implement one mitigation measure for manure land application	Operators must choose to implement one mitigation measure for manure land application

Requirements for Poultry CAFs		
	SJVAPCD Rule 4570	**ICAPCD Rule 217**
Requirements: Feed Operations	Operators must choose to implement one feed mitigation measure from four possible options	Operators must choose to implement one feed mitigation measure from four possible options
Requirements: Poultry Housing	Operators are required to implement two mitigation measures for layers, four mitigation measures for broilers or ducks, and five mitigation measures for turkeys	Operators are required to implement two mitigation measures for layers, four mitigation measures for broilers or ducks, and five mitigation measures for turkeys
Requirements: Solid Manure or Separated Solids	Operators must choose to implement one mitigation measure	Operators must choose to implement one mitigation measure
Requirements: Liquid Manure	Operators that handle manure in liquid form must choose to implement one mitigation measure	Operators that handle manure in liquid form must choose to implement one mitigation measure

Suspension and Substitution of Mitigation Measures		
	SJVAPCD Rule 4570	**ICAPCD Rule 217**
Requirements:	Allows temporary suspension of a mitigation measure upon the determination by a certified veterinarian or nutritionist that such a suspension is necessary for animal health purposes. The District must be notified within 48 hours, and a new measure must be implemented if the suspension is expected to last longer than 30 days. Allows for substitution of one mitigation measure with an equivalent or more stringent measure	Allows temporary suspension of a mitigation measure upon the determination by a certified veterinarian or nutritionist that such a suspension is necessary for animal health purposes. The District must be notified within 48 hours, and a new measure must be implemented if the suspension is expected to last longer than 30 days. Allows for substitution of one mitigation measure with an equivalent or more stringent measure

Idaho Administrative Procedure Act (IDAPA)

- ***IDAPA 58.01.01 Sections 760-764 (Rules for the Control of Ammonia from Dairy Farms)***

IDAPA 58.01.01 Sections 760-763 was adopted on March 30, 2007 and IDAPA 58.01.01 Subsection 764.02: Table – Ammonia Control Practices for Idaho Dairies was last amended on May 8, 2009.

Pursuant to IDAPA 58.01.01 Section 761, Sections 760-764 apply to dairies of the following sizes. The thresholds are based on estimating the number of cattle required to produce 100 tons of ammonia emissions annually. Different thresholds are given for drylot dairies, dairies with scraped freestalls, and dairies with flushed freestalls.

District Rule 4570 is far more stringent than IDAPA 58.01.01 Sections 760-764. Unlike IDAPA 58.01.01 Sections 760-764, District Rule 4570 requires specific practices for the various operations at dairies. District Rule 4570 exemption is more stringent because it is a temporary suspension that cannot exceed 30 days, whereas the IDAPA 58.01.01 Sections 760-764 exemption may last one year, without any requirement to substitute

another measure. District Rule 4570 also provides specific mitigation measures for beef cattle feedlots, other cattle facilities, poultry facilities, and swine facilities, while IDAPA 58.01.01 Sections 760-764 does not.

	SJVAPCD Rule 4570	IDAPA 58.01.01 Sections 760-764
Applicability	Applies to the Large CAFs and other Confined Animal Facilities with the following numbers of animals: • Dairy: 500 Milk Cows • Beef Feedlots: 3,500 Beef Cattle • Other Cattle: 7,500 cattle • Chickens: 400,000 birds • Ducks: 400,000 birds • Turkeys: 100,000 birds • Swine: 3,000 head • Horses: 3,000 head • Sheep and Goats: 15,000 head • Other: 30,000 head	Applies to dairies with the following number of cattle: • Drylot Dairy: minimum of 4,589 milk cow equivalents • Freestall Scrape Dairy: minimum of 2,643 milk cow equivalents • Freestall Flush Dairy: minimum of 1,638 milk cow equivalents

Requirements for Dairy CAFs		
	SJVAPCD Rule 4570	**IDAPA 58.01.01 Sections 760-764**
Requirements:	District Rule 4570 requires specific mitigation measures to address emissions from various sources at dairies (e.g. milking parlor, corrals, freestalls, manure management, and manure land application)	Must employ Best Management Practices (BMPs) (e.g. solid separation, corral cleaning, composting, etc.)

Requirements for Other CAF Categories		
	SJVAPCD Rule 4570	**IDAPA 58.01.01 Sections 760-764**
Requirements:	District Rule 4570 provides specific mitigation measures for beef cattle feedlots, other cattle, swine, and poultry CAFs	IDAPA 58.01.01 Sections 760- 764 only applies to dairies and does not apply to beef cattle feedlots, other cattle, swine, or poultry CAFs

Suspension and Substitution of Mitigation Measures		
	SJVAPCD Rule 4570	**IDAPA 58.01.01 Sections 760-764**
Requirements:	Allows temporary suspension of a mitigation measure upon the determination by a certified veterinarian or nutritionist that such a suspension is necessary for animal health purposes. The District must be notified within 48 hours, and a new measure must be implemented if the suspension is expected to last longer than 30 days. Allows for substitution of one mitigation measure with an equivalent or more stringent measure	Allows exemption for up to one year for a dairy that become subject to the rule as a result of an emergency for example if a dairy farmer takes additional cows due to unforeseen circumstances)

Additional Emission Reduction Opportunities

Recent studies have cited the episodic application of sodium bisulfate (SBS) onto manure at dairies as a potential control strategy to reduce ammonia emissions. SCAQMD included a potential control measure within their 2012 Air Quality Management Plan (AQMP) to evaluate the use of SBS at dairies to determine the technical and economic feasibility of its application in reducing ammonia emissions as well as potential impacts to groundwater. The District did not find any agency requiring the use of SBS. The District has evaluated SBS as a potential control measure and determined that for a variety of reasons that this control strategy is infeasible and ineffective for reducing PM2.5 concentrations in the Valley.

SBS is an acid salt that has been used to reduce pH and bacterial levels in the bedding for dairy cattle. Application of SBS on fresh manure or corral surfaces has the potential to reduce ammonia emissions by reducing the pH of the manure or corral surface. With a lower pH, a greater fraction of the ammonia is converted to non-volatile ammonium (NH_4^+). The ammonium combines with sulfate to form ammonium sulfate, which is retained in the manure or on the surface of the corral.

There are a number of potential issues that need to be considered related to the application of SBS at dairies including, but not limited to, the health and safety of dairy workers and dairy cattle, impacts on water quality, and overall cost and effectiveness. The SCAQMD 2012 AQMP states: that potential use of SBS would be specific to dairies in the SCAQMD and may be unique to localized operations, that "the requirements may not be applicable to dairies elsewhere where a site-specific assessment would need to be made relative to those particular conditions", and that it is likely that each air district would need to conduct an assessment as to the feasibility of SBS application in their jurisdiction.

The SCAQMD AQMP focuses on episodic controls to reduce ammonia emissions during periods of high PM2.5 concentrations. PM concentrations in the Valley are highest during the winter season (November – February). Unlike the SCAQMD where the majority of dairies are open corral facilities, most dairies in the Valley utilize a freestall design and generally restrict the cows' access to corrals during the winter months since the corrals are wet and muddy. As a result, there would be very little to no fresh manure excreted in corrals during the winter period. In addition, once wet conditions set in, it is not feasible to utilize tractors in the corrals to apply SBS since the tractors tend to get stuck in mud. Application by hand at large dairies would be very labor intensive, time consuming, extremely costly, and would potentially pose health and safety risks to the workers.

Although SBS is generally considered to be safe in small quantities, excessive loading of salts is a major water quality concern in the central and southern regions of the Valley where many dairies are located. A dairy would also need to work with the Regional Water Quality Control Board to determine if the application of SBS is allowed. In addition, applying SBS to corrals, which for many dairies can be greater than several acres in size, is not practical or feasible. Also, because flush dairies are common in the Valley (both freestall and open corral), the heavy use areas will generally be paved, and

frequent flushing of the freestall or corral lanes (as required by Rule 4570) already significantly reduces ammonia emissions; therefore, application of SBS to only these areas would not provide significant additional reductions in ammonia emissions. By design, SBS will be flushed to a lagoon or pond where the high buffering capacity would render it ineffective and possibly increase H2S emissions.

There are significant costs associated with the application of SBS. Iowa State University Extension estimates the costs of SBS to be $660/ton. District estimates show that 1,304 lb-1,955 lb/cow-yr of SBS would be needed for application to one entire corral area, costing $430-$645/cow-yr. Using the District's corral ammonia emission factor for milk cows and assuming a conservatively high estimate of 50% reduction in overall ammonia emissions, the cost of the ammonia reductions would be at least $41,067/ton to $61,601/ton or higher depending on corral size. Applying SBS to large areas also requires significant amounts of SBS to be applied. The application of SBS will also be short lived and conflict with requirements from Rule 4550 which requires dairies to scrape their corrals on a frequent basis at least once every two weeks, making the application of SBS ineffective and costly due to the constant need to reapply. Information from Iowa State shows reduced costs of $129-$193/cow-yr for only treating heavy use areas, such as feed bunks and water troughs. It is not clear how much manure is excreted in heavy use areas, but even if the resulting cost per ton of reduction was cut in half, the costs would still be significant.

Due to the barriers to widespread implementation of SBS application to Valley cattle facilities, as well as the high costs of effective application to control ammonia emissions, the application of SBS is not a feasible regulatory requirement.

Evaluation Findings

While BACM and MSM requirements do not apply to ammonia since it is not a significant precursor to PM2.5 formation in the Valley, District staff concludes that District Rule 4570 meets BACM and MSM requirements for ammonia emissions from CAFs. The District evaluated the feasibility of additional ammonia emissions reductions and did not identify any additional feasible measures.

AMMONIA EMISSIONS FROM AGRICULTURAL FERTILIZER

The District does not have statutory authority to regulate the application of agricultural fertilizers. However, in recent years, California has begun increasing efforts to improve the efficiency of nitrogen usage to minimize environmental impacts from the use of fertilizers and manure in California agriculture. One of the primary drivers for these efforts is to reduce nitrate contamination in groundwater. An additional goal of these efforts is to minimize losses of reactive nitrogen to the atmosphere through volatilization. As part of the efforts to improve the efficiency of nitrogen use in California, the University of California, Davis, Agricultural Sustainability Institute produced the report The California Nitrogen Assessment: Challenges and Solutions for People, Agriculture, and the Environment.[102] The California Nitrogen Assessment

[102] Tomich, T. P., Brodt, S. B., Dahlgren, R. A., & Scow, K. M. (Eds.). (2016). The California Nitrogen Assessment: Challenges and solutions for people, agriculture, and the environment. Univ of California Press. Executive summary

began in 2009 with goals of providing insights into balancing the benefits of nitrogen in California's modern economy, including agriculture, and the effects of surplus nitrogen in the environment and comparing options to improve the management of nitrogen and mitigate the negative impacts of surplus nitrogen in the environment. The final report for the California Nitrogen Assessment was completed in 2015. The California Nitrogen Assessment executive summary states, "*Nitrogen, in various reactive forms, is indispensable to the productivity of California agriculture. And yet, only about half the nitrogen applied ends up where we intend; the balance leaks, polluting our air and water, with detrimental effects on our environment and human health.*" … "*California can lead the way for the world in seeking a better balance between managing nitrogen as an essential agricultural input and minimizing its negative impacts on communities and the environment."* The information from the California Nitrogen Assessment will be used to help agricultural producers continue to improve methods of fertilizer and manure application to maximize nitrogen use efficiency and minimize environmental impacts, such as contamination of groundwater and emissions of NH3 to the atmosphere.

As part of the efforts to reduce the environmental impacts of nitrogen usage on California farms, California regulations have been adopted that apply to the use of manure and fertilizers in agricultural operations. These regulations have been adopted by the State Water Resources Control Board, which enforces state and federal water quality protection laws and regulates agricultural sources to ensure compliance with these laws. The State Water Resources Control Board consists of Regional Water Quality Control Boards (Regional Boards) that develop objectives and plans to protect the beneficial uses of water, recognizing local differences in climate, topography, geology and hydrology. The Central Valley Regional Water Quality Control Board adopts water quality regulations in California's Central Valley and monitors compliance with these regulations. The Central Valley Regional Water Quality Control Board has recently adopted regulations that will reduce the amount of nitrogen that agricultural facilities can apply to cropland and will result in decreased emissions of NH3.

These regulations include the Waste Discharge Requirements General Order for Existing Milk Cow Dairies (Dairy General Order, adopted in 2007 and revised and re-issued in 2013), the Waste Discharge Requirements General Order for Confined Bovine Feeding Operations (Bovine Feedlot General Order, adopted in 2017), and the Waste Discharge Requirements General Order for Confined Poultry Operations (Poultry General Order, adopted in 2016). The Dairy General Order applies to dairy operations, the Bovine Feedlot General Order applies to facilities other than dairies in which cattle are confined, and the Poultry General Order applies to poultry operations of a certain size. In addition to the water quality regulations that apply to confined animal feeding operations, the Central Valley Regional Water Quality Control Board ensures compliance with water quality objectives on commercial agricultural land that is not covered under another order, including managing nitrogen applied to cropland, through the Irrigated Lands Regulatory Program. The Irrigated Lands Regulatory Program initially began as a means to prevent agricultural runoff from polluting surface waters, subsequently groundwater regulations were added to the program in 2012. Agricultural

available at: http://asi.ucdavis.edu/programs/sarep/research-initiatives/are/nutrient-mgmt/california-nitrogen-assessment/ExecutiveSummaryLayout_FINAL_reduced.pdf

operations throughout the Central Valley are subject to waste discharge requirements that protect both surface water and groundwater.

Agricultural operations that are not subject to a general order or the Irrigated Lands Regulatory Program are generally regulated via individual orders that ensure compliance with the same requirements. The requirements of these orders for Confined Animal Feeding Operations include:

- A Nutrient Management Plan (NMP), prepared by a certified professional crop advisor or equivalent, designed to control nutrient losses for protection of surface water and groundwater and ensure compliance with the requirements for the whole farm nitrogen balance;
- A Waste Management Plan (WMP), prepared by a licensed engineer, designed to ensure that waste generated at the facility is properly managed and stored until such time that it can be applied to cropland;
- Environmental sampling and monitoring of soil, manure, water and plant tissue for compliance;
- Periodic site inspections, record-keeping, and reporting; and
- Additional groundwater monitoring to assess ongoing water quality protection

The requirements for agricultural operations that are subject to the Irrigated Lands Regulatory Program include preparation of a Nitrogen Management Plan that accounts for all of the nitrogen applied to fields through irrigation water and fertilizers and the nitrogen removed by crops.

The purpose of these regulations is to minimize the impacts that these operations have on the quality of surface and groundwater, including prevention of runoff and leaching of nitrogen compounds to the environment. This has generally required reductions in the amount of nitrogen that has traditionally been applied to agricultural lands, which also results in reductions in emissions of NH3 to the atmosphere.

The Nutrient Management Plan and Nitrogen Management Plan are designed to assure that the amount of nitrogen applied to agricultural lands is in reasonable balance with the needs of crops grown at the farm. Nitrogen from manure at confined animal feeding operations in excess of crop needs must be exported off the farm to where it can be used by other crops. Manure used on the farm is required to be stored safely until it is used and then only applied to agricultural fields in the amounts needed and during periods when it is required by crops growth. Over-application or mistimed application of nitrogen fertilizers can result in unnecessary losses of nitrogen to the environment, both as seepage below the root zone (in the form of nitrate or other nitrogen compounds)[103] or as air emissions of NH3 gas and oxides of nitrogen.

[103]See Chang, A., Harter, T., Letey, J., Meyer, D., Meyer, R.D., Campbell-Mathews, M., Mitloehner, F., Pettygrove, S., Robinson, P., Zhang, R., (2005) Managing Dairy Manure in the Central Valley of California. Publication 9004, Division of Agriculture and Natural Resources. University of California. Available at: http://groundwater.ucdavis.edu/files/136450.pdf

In accordance with the recommendations contained in the University of California document Managing Dairy Manure in the Central Valley of California (2005), the Central Valley Regional Water Quality Control Board Dairy General Order, Bovine Feedlot General Order, and Poultry General Order generally prohibit the amount of total nitrogen applied to agricultural fields from exceeding 1.4 times the amount that will be removed from the field in the harvested portion of the crop. To comply with these more stringent targets for nitrogen application, many confined animal feeding operations have had to greatly increase the precision of their manure and fertilizer applications, while also reducing the overall amount of nitrogen applied to their crops.[104] For instance, on a group of San Joaquin Valley dairy farms, it was estimated that prior to adoption of the General Order in 2007, the total inputs of nitrogen were 1,070 lb-N/acre-year, the amount of nitrogen removed by crops was 500 lb-N/acre-year, and potential losses of nitrogen to groundwater alone ranged from 370 to 570 lb-N/acre-year.[105] Based on this study, it can be estimated that, as a result of full implementation of the Dairy General Order, the total amount of nitrogen applied to cropland at dairies will be reduced by approximately 35% compared to conditions prior to the Dairy General Order, with resulting reductions in NH3 emissions. Similar reductions in the amount of nitrogen applied to agricultural fields associated with other cattle facilities and poultry facilities and resulting NH3 emissions can reasonably be expected as a result of implementation of the Bovine Feedlot General Order and Poultry General Order.

Adjusting the timing of nitrogen application to increase nitrogen uptake by crops is also expected to reduce emissions of NH3 by reducing the amount of nitrogen that is available for volatilization. Some research already suggests that lower emissions of reactive nitrogen will occur by timing applications of nitrogen to better coincide with the needs for crop growth. The California Nitrogen Assessment suggests that synchronizing fertilizer application with crop demand will reduce emissions of NH3 and N2O to the atmosphere, while also reducing the flow of nitrates to groundwater. The California Air Resource Board report Assessment of Nitrous Oxide Emissions in California's Dairy Systems[106] states regarding synchronizing nitrogen application with crop demand, "Once the N requirement for each crop stage is known, the N applications can be adjusted accordingly. This strategy should lead to improved N use efficiency and likely lower N2O emissions."

Agricultural operations in California are continuing to improve management practices to improve nitrogen utilization and minimize nitrate leaching in crop production. These practices will also result in reduced emissions of reactive nitrogen. Researchers at UC Cooperative Extension have been studying the nitrogen use efficiency for various crop types and have begun identifying the point at which the application of additional nitrogen no longer significantly increases crop quality and yields. This will allow growers to apply

[104] Harter, T., Menke, J., (2005) Cow Numbers and Water Quality – Is There a Magic Limit? – A Groundwater Perspective. Revised Manuscript from Proceedings, National Alfalfa Symposium, December 13-15, 2004, San Diego, CA. UC Cooperative Extension, University of California, Davis 95616. Available at: http://groundwater.ucdavis.edu/files/136450.pdf

[105] Harter, T., Menke, J., (2005)

[106] Horwath, W. R., Burger, M., Pettygrove, S. (November 2013) Assessment of Nitrous Oxide Emissions in California's Dairy Systems. Final Report to the California Air Resources Board, Contract No. 09-325. Available at: https://www.arb.ca.gov/research/apr/past/09-325.pdf

fertilizer with more precision to reduce the amount of nitrogen left in the soil. Because of the recent efforts in California to address the environmental impacts of reactive nitrogen, the overall efficiency of nitrogen usage at California farms is expected to increase and emissions of reactive nitrogen, including NH3, are expected to decrease significantly.

RULE 4565 (BIOSOLIDS, ANIMAL MANURE, AND POULTRY LITTER OPERATIONS)

Discussion

District Rule 4565 was adopted on March 15, 2007. The primary purpose of this rule is to limit emissions of VOC from operations involving the management of biosolids, animal manure, or poultry litter. District Rule 4565 applies to operations that landfill, land apply, compost, or co-compost these materials. Composting facilities subject to Rule 4565 fall into one of three categories based on the wet tons of compostable materials received at the facility for processing annually (annual throughput): facilities with throughputs less than 20,000 tons per year; those with at least 20,000 tons, but less than 100,000 tons per year; and those with throughputs of at least 100,000 tons per year. In addition to limiting VOC emissions, the measures required by District Rule 4565 have also been demonstrated to limit ammonia (NH3) emissions from these operations.

NH3 emissions from biosolids, animal manure, and poultry litter result from the microbial decomposition of nitrogenous compounds in these materials and the subsequent volatilization of the ammonia that is produced. In general, the class one mitigation measures required by District Rule 4565 consist of management practices that facilitate stabilization of the nitrogen during co-composting operations and reduce volatilization of gaseous pollutants. The class two mitigation measures required by District Rule 4565 apply to the largest composting operations and involve use of a control device, typically a biofilter.

Descriptions of some of the mitigation measures required by District Rule 4565 and the ways in which these measures reduce NH3 emissions are provided below:

- Injection, land incorporation, or covering biosolids, animal manure, and poultry litter that is land applied into fields: Injection, incorporation, or covering biosolids, animal manure, or poultry litter applied to cropland reduces volatilization of gaseous pollutants by minimizing the amount of time that these materials are exposed to the atmosphere. Once the waste has been injected into the soil, incorporated into the soil, or covered with soil, NH3 and VOCs are absorbed onto soil particles, providing the opportunity for soil microbes to oxidize these compounds into nitrates, carbon dioxide, and water.[107]

- Covering Active and Curing Compost Piles with a waterproof covering, six inches of finished compost, or six inches of soil: Covering composting piles with a

[107] US EPA Emissions Standards Division, Office of Air Quality Planning and Standards (August 2001). Emissions from Animal Feeding Operations (Draft). EPA Contract 68-D6-0011. Available at: https://www3.epa.gov/ttn/chief/ap42/ch09/draft/draftanimalfeed.pdf

waterproof covering reduces exposure of the VOCs and NH3 to the atmosphere thereby reducing volatilization of these compounds. Covering the compost piles with finished compost or soil reduces emissions in the same manner as a biofilter; microorganisms in the finished compost or soil facilitate conversion of VOCs and NH3 to carbon dioxide, nitrogen, water, and biomass before the compounds are emitted to the atmosphere. Source testing of engineered covers for compost piles (e.g. Gore covers) have demonstrated control efficiencies of greater than 90% for VOC and 60% for NH3 (without venting to a biofilter). Additionally, the report prepared by CalRecycle for the San Joaquin Valley Air Pollution Control District Technology Advancement Program (TAP) project: Greenwaste Compost Site Emissions Reductions from Solar-Powered Aeration and Biofilter Layer (5/14/2013)[108] demonstrated control efficiencies greater than 90% for VOC and between 53% to greater than 83% for NH3 for compost piles covered with one foot of finished compost.

- Aerated Static Piles (ASPs) or In-Vessel Composting Vented to a Biofilter: For large composting facilities with annual throughputs of at least 100,000 tons per year, District Rule 4565 requires implementation of at least one Class Two Mitigation Measure. The Class two mitigation measures require active composting or curing of compost to be conducted using aerated static piles or in-vessel composting vented to a control device with a minimum control efficiency of 80% for VOC, or implementation of an equivalent mitigation measure. As previously mentioned, because of practical and economic considerations, large composting operations that must control emissions and/or odors almost universally use biofilters as control devices. Although District Rule 4565 only specifies a VOC control efficiency of 80%, when biofilters are designed and operated to achieve the required VOC control efficiency, they also result in a similar control efficiency for NH3 emissions.

  The SCAQMD Final Staff Report for Proposed Amended Rule 1133.1 – Chipping and Grinding Activities and Proposed Rule 1133.3 – Emission Reductions from Greenwaste Composting Operations (July 2011)[109] states "*Based on the information collected on existing biofilter composting applications, overall control efficiencies of about 80 to 90 percent for VOC and 70 to over 90 percent for ammonia have been achieved*." and also states "*Based on source tests data from existing cocomposting operations (Inland Empire Regional Composting Facilities and City of Los Angeles Sanitation Bureau), properly designed and maintained biofilters have demonstrated over 90 percent destruction efficiencies for both VOC and ammonia emissions.*"

[108] CalRecycle – Principal Study Author Robert Horowitz (5/14/2013) Greenwaste Compost Site Emissions Reductions from Solar-Powered Aeration and Biofilter Layer. Funded by and prepared for the San Joaquin Valley Air Pollution Control District Technology Advancement Program (TAP). Available at: http://www.valleyair.org/Grant_Programs/TAP/documents/C-15636-ACP/C-15636_ACP_FinalReport.pdf

[109] South Coast AQMD (July 2011) Final Staff Report for Proposed Amended Rule 1133.1 – Chipping and Grinding Activities and Proposed Rule 1133.3 – Emission Reductions from Greenwaste Composting Operations. Available at: http://www.aqmd.gov/docs/default-source/Agendas/Governing-Board/2011/2011-jul8-037.pdf?sfvrsn=2

Source Category

Composting facilities subject to Rule 4565 fall into one of three categories based on the wet tons of compostable materials received at the facility for processing annually (annual throughput): facilities with throughputs less than 20,000 tons per year; those with at least 20,000 tons, but less than 100,000 tons per year; and those with throughputs of at least 100,000 tons per year or greater.

Emissions from Composting Facilities Subject to District Rule 4565:

The composting mitigation measures included in District Rule 4565 focus on the following three primary emission sources at composting facilities: (a) receiving/mixing areas, (b) active-phase compost piles, and (c) curing-phase compost piles.

The following discussion describes the assumptions used to estimate the District Rule 4565 NH3 control efficiencies for the different emissions sources identified for composting operations.

NH3 Emissions from the Receiving and Mixing (Scraping) Areas

At a composting facility, compostable material is delivered, unloaded, mixed, and then transferred to the active composting area, which may consist of piles, windrows, or engineered systems. During these initial steps, the NH3 is emitted from the compostable material. NH3 from these operations can be reduced by properly maintaining the receiving and mixing areas by scraping or sweeping on a regular basis (Class One Mitigation Measure #1). This will also reduce the total surface area of these materials that is exposed to the atmosphere from which emissions occur. It is assumed that the magnitude of the emissions flux during this process equals the emissions flux during the active phase of composting, but the total time of emissions from these processes is limited.

The following assumptions will be used to estimate the District Rule 4565 NH3 control efficiency receiving and mixing compostable materials:

- The NH3 emissions factor for compostable materials in the receiving and mixing area is 0.00046 lb-NH3/ton-hr. This is a conservative value based on flux chamber source testing results from uncontrolled active-phase co-composting as determined by Schmidt and Card (2002, 2004).[110]

- Total NH3 emissions are based on the annual throughput of the facility, assuming that all compostable material (throughput) sits in the scraping area for two hours per day, six days per week, and 50 weeks per year, for a total of 600 hours per year.

NH3 Emissions from Active-Phase and Curing Phase Composting

[110] Card, T. and Schmidt, C. (2002). *Emissions Evaluation of Aerated Static Pile Composting of Anaerobically Digested Biosolids at the Davenport Composting Facility* (Draft Report). Prepared for Southern California Alliance of Publicly Owned Treatment Works and updated in 2004.

The NH3 emission factor for co-composting operations is based on South Coast Air Quality Management District (SCAQMD) Rule 1133.2 (Emission Reductions from Co-composting Operations), which is 2.93 lb-NH3/ton. This emission factor accounts for the NH3 emissions during both the active phase and curing phase of composting. For purposes of estimating the NH3 control efficiency for District Rule 4565, it is assumed that the percentage of the co-composting NH3 emission factor attributed to the active and curing phases of composting is the same as the percentage of the VOC emission factor attributed to each of these phases. The District document "Compost VOC Emission Factors" (September 15, 2010)[111] indicates that 90% of composting VOC emissions are attributed to the active phase and 10% to the curing phase. The same ratio of 90% of emissions from the active phase of composting and 10% for the curing phase of composting will be assumed for NH3 emissions.

District Rule 4565 Control Measure Efficiencies:

The estimated NH3 control efficiencies for the District Rule 4565 mitigation measures are summarized in the table below.

Overall NH3 Control Efficiencies for Rule 4565 Mitigation Measures	
Class 1 Measures	**Overall Control Efficiency**
Scrape to ≤ 1"	10%
Cover Active Piles ≥ 6"	60%
Cover Curing Piles ≥ 6"	60%
Class 2 Measures	**Overall Control Efficiency**
Active-Phase ASPs to ≥ 80% control device	26%
Active-Phase in-vessel to ≥ 80% control device	80%
Curing-Phase ASPs to ≥ 80% control device	26%
Curing-Phase in-vessel to ≥ 80% control device	80%
ASPs + Compost Cover	**Control Efficiency**
Active-Phase ASPs to ≥ 80% control device + Compost Cover	70%
Curing-Phase ASPs to ≥ 80% control device + Compost Cover	70%

As mentioned above, the CalRecycle report prepared for San Joaquin Valley Air Pollution Control District TAP Project: Greenwaste Compost Site Emissions Reductions from Solar-Powered Aeration and Biofilter Layer (5/14/2013) demonstrated control

[111] San Joaquin Valley Air Pollution Control District [SJVAPCD]. (September 15, 2010). Compost VOC Emission Factors. Fresno, CA: San Joaquin Valley Air Pollution Control District. Available at: http://www.valleyair.org/busind/pto/emission_factors/Criteria/Criteria/Composting/Compost%20EF.pdf

efficiencies of between 53% to greater than 83% for NH3 for compost piles covered with one foot of finished compost. Based on data from a study prepared for the San Joaquin Valleywide Air Pollution Study Agency (2009),[112] the District previously estimated that a finished compost cover would achieve a VOC reduction of 56% compared to an uncontrolled pile; therefore, the compost cover is conservatively estimated to have a control efficiency of 60% for NH3. The NH3 control efficiency for aerated static piles with a compost cover is estimated to be 70% also based the CalRecycle project report. The remaining NH3 control efficiencies for scraping and the Class 2 measures are assumed to be the same as the VOC control efficiencies that were used in the original 2006 rulemaking process for Rule 4565 and as used by SCAQMD for SCAQMD Rule 1133.2 (Emission Reductions from Co-composting Operations).

NH3 Control Efficiencies for Class One Mitigation Measures

- Scraping: A conservative NH3 control efficiency of 10% is assumed for scraping and maintaining the areas for receiving and mixing compostable materials

- Compost Cover: The District estimated 60% control efficiency for NH3 during the active phase of composting based on an emissions profile derived from SJVAPSA (2011). Given the use of the same type of compost cover and the nature of the emissions, the District also estimates 60% control efficiency for compost cover during the curing phase.

NH3 Control Efficiencies for Class two Mitigation Measures

- Active phase and curing-phase aerated static pile systems (ASPs) venting to a control device with 80% control efficiency: The District conservatively assumes a 33% capture efficiency for an uncovered aerated static pile system. Applying an 80% control to the captured emissions results in an overall NH3 control efficiency of 26%, as shown below:

  Overall Control: 0.33 x 0.8 x 100 = 26%

- In-vessel active and curing-phase composting venting to a control device with 80% control efficiency: Engineered in-vessel composting systems are expected to capture 100% of the emissions from the composting operation. Applying 80% control efficiency to 100% capture results in an overall NH3 control efficiency of 80%.

- ASPs plus compost cover: Alternatively, a facility may choose to use ASPs with a compost cover that is vented to a control device with 80% control efficiency. As mentioned above, based on the study report prepared for the San Joaquin valley

[112] San Joaquin Valleywide Air Pollution Study Agency [SJVAPSA]. (2011). *Comparison of Mitigation Measures for Reduction of Emissions Resulting from Greenwaste Composting*. Fresno, CA: San Joaquin Valleywide Air Pollution Study Agency. Retrieved from website: http://www.valleyair.org/busind/pto/emission_factors/Criteria/Criteria/Composting/FINAL-COMPOST-STUDY-REPORT.pdf (Final Report)

Technology Advancement Program (2013), the control efficiency of an ASP with a compost cover is 70%.

The minimum expected overall District Rule 4565 NH3 control efficiencies for land application of biosolids, animal manure, or poultry litter and co-composting facilities with throughputs of less than 20,000 tons per year, 20,000 tons but less than 100,000 tons per year, and 100,000 tons per year or more are summarized in the tables below.

Estimated Overall NH3 Control Efficiencies for Rule 4565 Mitigation Measures for Land Application of Biosolids, Animal Manure, and Poultry Litter	
Rule 4565 Requirements for Land Application	**Estimated Overall NH3 Control Efficiency**
Direct injection within three hours of receipt at the facility **Or** Land incorporation within three hours of receipt at the facility; Materials received after 6 pm must be land incorporated by noon of the following calendar day **Or** Cover the biosolids, animal manure, or poultry litter with waterproof cover, six inches of finished compost, or six inches of soil within three hours of receipt at the facility	50%*

* *Injection, incorporation, and covering biosolids, animal manure, or poultry litter are expected to have a similar control efficiency as covering compost piles; however, an NH3 control efficiency of 50% rather than 60% has been used for a more conservative estimate*

Estimated Minimum Overall NH3 Control Efficiencies for Rule 4565 Mitigation Measures for Co-Composting Facilities of Different Sizes		
Facility Throughput (wet tons/yr)	**Rule 4565 Requirements**	**Estimated Overall NH3 Control Efficiency**
< 20,000 wet tons per year	At least three Class One mitigation measures or At least two Class One mitigation measures in addition to one Class Two mitigation measure for active composting	10%
20,000 but < 100,000 wet tons per year	At least four Class One mitigation measures or At least three Class One mitigation measures in addition to one Class Two mitigation measure for active composting	10%
≥ 100,000 wet tons per year	At least four Class One mitigation measures in addition to one Class Two mitigation measure for active composting or At least two Class One mitigation measures, in addition to one Class Two mitigation measure for active composting and one Class Two mitigation measure for curing composting	31%

How does District Rule 4565 compare with federal and state rules and regulations?

For the 2018 PM2.5 Plan, the District identified federal, state, and local air quality regulations and compared them to analogous District rules to identify potential emission reductions opportunities. Any potential opportunities identified were then analyzed to determine if they are technologically and economically feasible to require in Valley.

Federal requirements such as NSPS, NESHAP, MACT, CTGs, and ACTs and state regulations are not applicable to this source category.

How does District Rule 4565 compare to rules in other air districts?

District staff compared District Rule 4565 with the rules for biosolids, animal manure, and poultry litter operations from other California air districts. District staff only located one other air district rule that applied to similar sources, which was SCAQMD Rule 1133.2. No other air district rules that applied to similar sources were found.

SCAQMD

- SCAQMD Rule 1133.2 - Emission Reductions from Co-Composting Operations *(Adopted January 10, 2003)*

SCAQMD Rule 1133.2 was adopted in 2003, and the rule has not since been amended. This rule applies to new and existing co-composting operations in the SCAQMD. The table below summarizes the significant differences between SCAQMD Rule 1133.2 and District Rule 4565. For purposes of this analysis, the NH3 control efficiency for the requirements of District Rule 4565 are assumed to be the same as the VOC control

efficiency for these requirements since the same measures generally result in similar control efficiencies for both VOC and NH3 from these operations.

For example, covering compost with a waterproof covering, finished compost, or soil is assumed to have a control efficiency of 60% for both VOCs and NH3. As discussed above, a properly designed and operated biofilter can achieve a control efficiency of greater than 90% for NH3 and VOC emissions, but will conservatively assumed to have a control efficiency of 80% for purposes of this analysis.

It should also be noted that in practice, the facilities that are actually subject to SCAQMD Rule 1133.2 will have much larger throughputs than 1,000 ton per year throughput threshold given in the rule. SCAQMD Rule 1133.2 includes the following exemptions for existing co-composting operations with a design capacity of less than 35,000 tons of throughput per year containing no more than 20 percent biosolids by volume and new and existing municipal facilities using aeration and processing less than 5,000 tons of biosolids or manure per year. Many operations in the SCAQMD have found it to be economical to transport these materials to other jurisdictions for processing. An example of this is the Synagro South Kern Compost Manufacturing Facility, which is a newer facility located in the Valley and processes biosolids transported from SCAQMD.

Because some mitigation measures are only cost-effective for larger facilities, District staff developed the concept of Class One and Class Two mitigation measures. Class One mitigation measures are cost-effective options for all facilities, regardless of size. These measures are management practices found to be best practices for all composting operations. Class Two mitigation measures are the technology options and achieve reductions greater than Class One mitigation measures; however, they were determined to not be cost-effective for facilities with throughputs of less than 100,000 wet tons per year. District Rule 4565 requires reductions from two additional categories (landfilling and land applying) when compared to SCAQMD Rule 1133.2. For the third category, composting, District staff determined it is not cost-effective to require in-vessel (enclosed) composting.

Category	SCAQMD Rule 1133.2	SJVUAPCD Rule 4565	Reason
Facilities Other Than Co-Composting (Landfilling, Land Applying)	Rule does not apply to these operations	Management practice requirements	Knowledge of control options has increased since Rule 1133.2 adoption and staff believes that cost-effective methods of controlling VOC and NH3 emissions from these facilities exist.
Co-Composting Threshold for Applicability	Facilities with at least 1,000 tpy throughput	Facilities that handle 100 tpy or more of biosolids, animal manure, or poultry litter	Staff believes that there are reasonable options that are not exceedingly costly for facilities with throughputs of ≥100 tpy that would not impose an undue burden on operators.
Composting Control Requirements	In-vessel composting with 70% control efficiency for VOC and NH3 for existing facilities and 80% control efficiency for VOC and NH3 for new facilities	Control efficiency of 10%-80% for VOC (and NH3) depending on type of operation and facility throughput	Management practices (mitigation measures) are effective, reasonable, and have been achieved in practice for smaller facilities. In-vessel composting is not cost-effective for smaller or medium facilities and there are no known, unsubsidized facilities in the SCAQMD that would comply with such rule requirements.

Additional Emission Reduction Opportunities

Beyond the review of current regulation and rule requirements, the District performed an extensive review of the feasibility of expanding applicability or removal of exemptions for this source category, technologies and measures that have been implemented in practice in other regions, and potential new technologies and measures that may be feasible for implementation in the near future. Based on this review, District staff did not find any additional measures currently available or that will be available prior to the 2025 attainment deadline date that could improve the effectivity of this rule.

Evaluation Findings

While BACM and MSM requirements do not apply to ammonia since it is not a significant precursor to PM2.5 formation in the Valley, District staff concludes that District Rule 4565 and major sources of ammonia in the Valley satisfy BACM and MSM requirements for ammonia emissions from biosolids, animal manure, and poultry litter operations.

RULE 4566 (ORGANIC MATERIAL COMPOSTING OPERATIONS)

Discussion

District Rule 4566 (Organic Material Composting Operations) was adopted on August 18, 2011, to limit VOC emissions from composting facilities whose feedstock consists of greenwaste and/or food waste. The rule applies to new and existing organic material composting and stockpiling facilities in which the feedstock consists of green material (e.g. vegetative waste material generated from gardening, agriculture, or landscaping activities, etc.) and/or food waste with <100 ton/yr biosolids or manure. In addition to limiting VOC emissions, the measures required by District Rule 4566 have also been demonstrated to limit ammonia (NH3) emissions from these operations. However, it

should be noted that the NH3 emissions from greenwaste and food waste composting are generally low, with the NH3 measurements often resulting in values below the detection limit of measurement methods.[113]

NH3 emissions from green material and food waste result from the microbial decomposition of nitrogenous compounds in these materials and the subsequent volatilization of the ammonia that is produced. The mitigation measures required by District Rule 4566 include management practices that facilitate stabilization of the nitrogen during composting operations and reduce volatilization of gaseous pollutants. Examples of the mitigation measures required by District Rule 4566 that reduce VOC and NH3 emissions include use of a watering system to maintain sufficient moisture in the compost and covering windrows with at least six inches of finished compost. In addition, District Rule 4566 requires the largest green material and food waste composting facilities to demonstrate VOC reductions of at least 80% during the active phase through use of a control device, such as a biofilter, which would also reduce NH3 emissions.

Additional information on the ways in which the mitigation measures required by District Rule 4566 reduce NH3 emissions is provided below:

- Watering Systems: The use of watering systems to maintain sufficient moisture in the compost windrows reduces NH3 emissions from the compost because NH3 is very soluble in water; therefore, when sufficient moisture is maintained in the compost windrows much of the NH3 will dissolve in the water, thereby reducing emissions. Regarding the effect that moisture has on the NH3 emission rate from manure, the draft EPA report Emissions from Animal Feeding Operations (August 2001) [114] states "*Because of its high solubility in water, the loss of ammonia to the atmosphere will be more rapid when drying of manure occurs."* This is also true for NH3 emissions from composting because NH3 emissions from composting and manure are the result of the same basic processes. In addition, because NH3 is a weak base, when NH3 dissolves in water, a portion of the NH3 will be converted to ammonium (NH4+), which unlike NH3, is not volatile. This results in a greater amount of ammonical nitrogen (NH3/NH4+) remaining in the windrows and becoming stabilized in the compost rather than volatilizing to the air. The additional moisture from the watering system will also reduce the air-filled porosity at the surface of compost windrows, thereby reducing the diffusion of NH3 to the surface of the windrow and subsequent volatilization. Information from the report Gaseous Emissions from Management of Solid Waste: a Systematic Review (2015) indicates that the measured NH3 emissions from solid waste under moist conditions was 33% lower than under dry

[113] For example the CalRecycle Report: Emissions Testing of Volatile Organic Compounds from Greenwaste Composting at the Modesto Compost Facility in the San Joaquin Valley (Revised May 2008). Publication #442-07-009. Available at: https://www2.calrecycle.ca.gov/Publications/Download/860 states, "*Note that ammonia was not detected by the laboratory to a method detection limit of 0.02 ppmv*"

[114] US EPA Emissions Standards Division, Office of Air Quality Planning and Standards (August 2001). Emissions from Animal Feeding Operations (Draft). EPA Contract 68-D6-0011. Available at: https://www3.epa.gov/ttn/chief/ap42/ch09/draft/draftanimalfeed.pdf

conditions.[115] In addition, the final report Comparison of Mitigation Measures for Reduction of Emissions from Greenwaste Composting (2011)[116] prepared for the San Joaquin Valleywide Air Pollution Study Agency (SJVAPSA) demonstrated a significant VOC control efficiency (at least 20%) for irrigation of compost windrows. Although, the NH3 emissions from composting of greenwaste are much lower than VOC emissions, based on the available information, the control efficiency for NH3 is expected to be similar.

- Covering Compost Piles with Finished Compost: Covering the compost piles with finished compost or soil reduces emissions in the same manner as a biofilter; microorganisms in the finished compost or soil facilitate conversion of VOCs and NH3 to carbon dioxide, nitrogen, water, and biomass before the compounds are emitted to the atmosphere. The report prepared by CalRecycle for the San Joaquin Valley Air Pollution Control District Technology Advancement Program (TAP) project: Greenwaste Compost Site Emissions Reductions from Solar-Powered Aeration and Biofilter Layer (5/14/2013)[117]demonstrated control efficiencies greater than 90% for VOC and between 53% to greater than 83% for NH3 for compost piles covered with one foot of finished compost.

- District and EPA Approved Mitigation Measures that Demonstrates at Least 80% VOC Reduction by Weight: For the largest green material and food waste composting facilities with annual throughputs of at least 750,000 wet tons per year, District Rule 4566 requires implementation of a mitigation measure that demonstrates a VOC control efficiency of 80% during the active phase of composting. There are currently no greenwaste or food waste composting operations of this size in the San Joaquin Valley that would be subject to District Rule 4566. However, because of practical and economic considerations, large composting operations that must control emissions and/or odors almost universally use biofilters as control devices. Although District Rule 4566 only specifies a VOC control efficiency, when biofilters are designed and operated to achieve the required VOC control efficiency, they also result in a similar control efficiency for NH3 emissions. The SCAQMD Final Staff Report for Proposed Amended Rule 1133.1 – Chipping and Grinding Activities and Proposed Rule 1133.3 – Emission Reductions from Greenwaste Composting Operations (July 2011)[118] states "*Based on the information collected on existing biofilter composting applications, overall control efficiencies of about 80 to 90 percent for*

[115] Pardo, G., Moral, R., Aguilera, E., Del Prado, A. (2015) Gaseous Emissions from Management of Solid Waste: a Systematic Review; (2015); Global Change Biology; 21, 2015, 1313-1327. https://doi.org/10.1111/gcb.12806

[116] Büyüksönmez, F. (2011) Comparison of Mitigation Measures for Reduction of Emissions from Greenwaste Composting. Funded by and prepared for t the San Joaquin Valleywide Air Pollution Study Agency (SJVAPSA). 09-01-CCOS. Available at: http://valleyair.org/busind/pto/emission_factors/Criteria/Criteria/Composting/FINAL-COMPOST-STUDY-REPORT.pdf

[117] CalRecycle – Principal Study Author Robert Horowitz (5/14/2013) Greenwaste Compost Site Emissions Reductions from Solar-Powered Aeration and Biofilter Layer. Funded by and prepared for the San Joaquin Valley Air Pollution Control District Technology Advancement Program (TAP). Available at: http://www.valleyair.org/Grant_Programs/TAP/documents/C-15636-ACP/C-15636_ACP_FinalReport.pdf

[118] South Coast AQMD (July 2011) Final Staff Report for Proposed Amended Rule 1133.1 – Chipping and Grinding Activities and Proposed Rule 1133.3 – Emission Reductions from Greenwaste Composting Operations. Available at: http://www.aqmd.gov/docs/default-source/Agendas/Governing-Board/2011/2011-jul8-037.pdf?sfvrsn=2

> *VOC and 70 to over 90 percent for ammonia have been achieved*." and also states "*Based on source tests data from existing cocomposting operations (Inland Empire Regional Composting Facilities and City of Los Angeles Sanitation Bureau), properly designed and maintained biofilters have demonstrated over 90 percent destruction efficiencies for both VOC and ammonia emissions.*"

Composting facilities subject to District Rule 4566 fall into one of three categories based on the wet tons of compostable materials processed at the facility annually (annual throughput): facilities with throughputs less than 200,000 wet tons per year; those with throughputs of at least 200,000 wet tons per year, but less than 750,000 wet tons per year; and those with throughputs of at least 750,000 wet tons per year.

The mitigation measures required by District Rule 4566 focus on the active phase of composting because the active phase of composting is the part of the composting process in which the compost feedstock is rapidly decomposing resulting in the highest emissions. The District document "Compost VOC Emission Factors" (September 15, 2010)[119] indicates that 90% of composting VOC emissions are attributed to the active phase and 10% to the curing phase. Based on the information from the source test reports, the NH3 emissions measurements resulted in a similar profile with vast majority of NH3 emissions occurring during the active phase of composting. Therefore, the same ratio of 90% of emissions from the active phase of composting and 10% for the curing phase of composting will be assumed for NH3 emissions.

Source Category

As discussed above, the mitigation measures required by District Rule 4566 will reduce both VOC and NH3 from these operations. As previously mentioned, the report Gaseous Emissions from Management of Solid Waste: a Systematic Review (2015) indicates that the measured NH3 emissions from solid waste under moist conditions was 33% lower than under dry conditions; however, for purposes of this analysis, the NH3 control efficiency achieved for implementation of the watering system mitigation measure will be conservatively assumed to be equivalent to the minimum required VOC control efficiency of 19%. The NH3 control efficiency for implementation of the Finished Compost Cover Mitigation measure will also be assumed to be equivalent to the minimum required VOC control efficiency of 60% for facilities with an annual throughput of 200,000 wet tons to less than 750,000 wet tons. As discussed above, this control efficiency is supported by the information in the report prepared by CalRecycle for the San Joaquin Valley Air Pollution Control District Technology Advancement Program (TAP) project: Greenwaste Compost Site Emissions Reductions from Solar-Powered Aeration and Biofilter Layer (5/14/2013). For the largest greenwaste and food waste composting operations with annual throughputs 750,000 wet tons or more, it is expected that they will use a biofilter as a control device, which will achieve a minimum NH3 control efficiency of 75%.

[119] San Joaquin Valley Air Pollution Control District [SJVAPCD]. (September 15, 2010). Compost VOC Emission Factors. Fresno, CA: San Joaquin Valley Air Pollution Control District. Available at: http://www.valleyair.org/busind/pto/emission_factors/Criteria/Criteria/Composting/Compost%20EF.pdf

District Rule 4566 Control Measure Efficiencies:
The minimum expected overall District Rule 4566 NH3 control efficiencies for green material and food waste composting facilities with throughputs of less than 200,000 wet tons per year, 200,000 wet tons but less than 750,000 wet tons per year, and 750,000 wet tons per year or more are summarized in the tables below.

Estimated Minimum Overall NH3 Control Efficiencies for Rule 4566 Mitigation Measures for Greenwaste and Food Waste Composting Facilities of Different Sizes

Facility Throughput (wet tons/yr)	Rule 4566 Requirements	Estimated Overall NH3 Control Efficiency*
< 200,000 wet tons per year	For windrow composting only, implement at least three turns during the active phase and one of the mitigation measures for the Watering Systems in Table 1. or Implement an APCO and EPA approved alternative mitigation measure that demonstrates at least a 19% reduction, by weight, in VOC emissions.	17.1%
200,000 but < 750,000 wet tons per year	For windrow composting only, implement all of the following: - At least three turns during the active phase; - One of the mitigation measures for the Watering Systems in Table 1; and - The Finished Compost Cover mitigation measure. or Implement an APCO and EPA approved alternative mitigation measure that demonstrates at least 60% reduction, by weight, in VOC emissions.	54%
≥ 750,000 wet tons per year	An operator of a composting operation with a total throughput of greater than or equal to 750,000 wet tons per year of organic material shall implement an APCO and EPA approved mitigation measure that demonstrates at least 80% reduction, by weight, in VOC emissions for organic material during the active phase.	67.5%**

** These mitigation measures are only required during the active phase of composting. Based on the emission measurements at composting operations, it is assumed that 90% of the total VOC and NH3 emissions occur during the active phase of composting; therefore, the overall control efficiency will be the minimum required control efficiency multiplied by 90%.*

*** NH3 control efficiency conservatively assumed to be 75% for active phase of composting*

How does District Rule 4566 compare with federal and state rules and regulations?

Federal requirements such as NSPS, NESHAP, MACT, CTGs, and ACTs and state regulations are not applicable to this source category.

How does District Rule 4566 compare to rules in other air districts?

District staff compared District Rule 4566 with the rules for greenwaste and foodwaste composting operations from other California air districts. The results of the analysis are

discussed below. District staff only located one other air district rule that applied to similar sources: SCAQMD Rule 1133.3. No rules that apply to organic materials composting operations were located for Bay Area Air Quality Management District, Sacramento Metropolitan Air Quality Management District, or Ventura County Air Pollution Control District.

SCAQMD

- SCAQMD Rule 1133.3 - Emission Reductions from Greenwaste Composting Operations *(Adopted July 8, 2011)*

The purpose of SCAQMD Rule 1133.3 is to reduce emissions of VOCs and NH3 from greenwaste and food waste composting operations. The table below compares the significant similarities and differences between District Rule 4566 and SCAQMD Rule 1133.3. For purposes of this analysis, the ammonia control efficiencies achieved by the requirements of District Rule 4566 are assumed to be the same as the VOC control efficiencies since the same control measures will reduce both VOC and NH3 from these operations. Greenwaste/food waste composting produces about 16% of the ammonia emissions on a per ton basis compared to co-composting.[120]

As shown in the table below, based on discussions with SCAQMD permitting and rule development staff, SCAQMD does not have any greenwaste composting production facilities subject to the 80% ammonia reduction requirement of Rule 1133.3.

In previous conversations and correspondence with District staff, SCAQMD staff has indicated that the SCAQMD does not currently permit open windrow composting operations or require them to comply with SCAQMD Rule 1133.2.[121] This would be the majority of composting operations, particularly in the District where there is more land available.

Based on the information from SCAQMD staff, there is currently only one facility (Inland Empire Regional Composting Facility) in the SCAQMD that performs full-scale co-composting inside a building that vents the exhaust through a biofilter.[122]

Rancho Las Virgenes Composting Facility may also have enclosed composting vented to a biofilter. However, this facility appears to be exempt from SCAQMD Rule 1133.2 since it is an existing composting operation (composting began in 1993 or 1994) with less than 10,000 tons per year of throughput. Controls were likely added to prevent nuisance odors from affecting the surrounding area. Moreover the throughput for Las Virgenes has been nil since 2012 according to SCAQMD's annual emissions reporting.

It must also be noted that many operations in the SCAQMD have found it to be economical to transport materials to other jurisdictions, such as the District, for composting. An example of this is the Synagro South Kern Compost Manufacturing

[120] SCAQMD Rule 1133.3, baseline NH_3 emissions from greenwaste/foodwaste composting = 0.46 lb-NH3/ton-throughput. SCAQMD Rule 1133.2, baseline NH_3 emissions from co-composting = 2.93 lb-NH3/ton-throughput.
[121] Email correspondence between SJVAPCD Air Quality Engineer, Brian Clerico, and SCAQMD Planning and Rules Manager, Tracy Goss, June 16, 2015.
[122] Email correspondence between SJVAPCD Air Quality Engineer, Brian Clerico, and SCAQMD Air Quality Specialist, Jong Hoon Lee, June 25, 2015.

Facility, which is a facility located in the San Joaquin Valley and processes biosolids transported from SCAQMD. Because SCAQMD has no existing production greenwaste composting facilities that are subject to the 80% ammonia control requirement of Rule 1133.3, and the new facilities are permitted under experimental research exemptions, then Rule 1133.3 should not be used to establish BACM or MSM as 80% for that category/throughput level of greenwaste composting.

Rule Section	SCAQMD Rule 1133.3	District Rule 4566	Explanation of Differences
Applicability	New and existing greenwaste and food waste composting operations.	New and existing organic material composting and stockpiling facilities. (Organic material is defined as green material, food material, or mixtures of the two, with <100 ton/yr biosolids or manure.)	SCAQMD Rule 1133.3 limits food waste stockpiling time (48 hr), whereas District Rule 4566 limits organic material stockpiling time (3 or 10 days, depending on throughput).
Exemptions	Applicability/exemptions based on facility type, not throughput.	Applicability/exemptions based on facility type, not throughput.	The same types of facilities are exempt in both rules: facilities subject to a co-composting rule (SCAQMD Rule 1133.2 or District Rule 4565), nursery, household, recreational, and community composting facilities. District Rule 4566 also exempts agricultural facilities which are subject to District Rules 4204, 4550, or 4570.
Compost-ing Control Requirements	• ≤5,000 ton/yr food waste or ≤20% manure (watering and finished compost cover or ≥20% control for NH3) • >5,000 ton/yr food waste, (emission control device with ≥80% control for NH3)	• <200,000 ton/yr organic material (watering system or ≥19% control for NH3) • ≥200,000 and <750,000 ton/yr organic material (watering system and finished compost cover or ≥60% control for NH3) • ≥750,000 ton/yr organic material (emission control device with ≥80% control for NH3)	The throughput/control levels in Rule 4566 are based on cost-effectiveness and socioeconomic studies conducted by the District as part its Final Staff Report for the Revised Proposed New Rule 4566 (Appendices C and D, August 18, 2011). Rule 4566 requires the same management practices and control requirements as Rule 1133.3; however, the throughput levels at which the stricter control requirements in Rule 4566 become triggered are much higher than in Rule 1133.3. Thus, on paper, Rule 1133.3 appears to be more stringent than Rule 4566. However, SCAQMD does not have any greenwaste composting facilities (that are not under an experimental research permit) subject to the 80% control requirements of Rule 1133.3.

Additional Emission Reduction Opportunities

District Rule 4566 (Organic Material Composting) is the most stringent rule in the nation for controlling emissions from composting operations; additional controls are infeasible.

Evaluation Findings

While BACM and MSM requirements do not apply to ammonia since it is not a significant precursor to PM2.5 formation in the Valley, District staff concludes that District Rule 4566 meets BACM and MSM requirements for ammonia emissions from

greenwaste and foodwaste composting operations. The District evaluated the feasibility of additional ammonia emissions reductions and did not identify any additional feasible measures. The District has taken every regulatory action feasible to reduce emissions from this source and continues to seek additional methods to reduce emissions through innovative strategies, such as the support of research and technology demonstrations.

C.26 EMISSION INVENTORY CODE (EIC) TABLE

Control Measure	Emission Inventory Codes
Rule 4103 (Open Burning)	670-660-0262-9842; 670-660-0262-9862; 670-660-0262-9874; 670-660-0262-9884; 670-660-0262-9888; 670-660-0262-9892; 670-662-0262-9878; 670-668-0200-9858; 670-668-0200-9872; 670-668-0200-9886; 670-995-0240-9848
Rule 4104 (Reduction of Animal Matter)	420-995-6004-0000
Rule 4106 (Prescribed Burns)	670-666-0200-0000; 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 4301 (Fuel Burning Equipment)	
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 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

Control Measure	Emission Inventory Codes
Rule 4311 (Flares)	110-132-0130-0000; 110-132-0146-0000; 120-132-0136-0000; 130-132-0110-0000; 130-132-0130-0000; 130-132-0136-0000; 310-320-0010-0000; 310-320-0110-0000; 310-320-0120-0000; 310-320-0130-0000; 310-320-0136-0000; 310-320-1600-0000; 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 CARB 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 4641 (Cutback, Slow Cure, and Emulsified Asphalt, Paving and Maintenance Operations)	540-560-0400-0000; 540-562-0400-0000; 540-564-0400-0000; 540-566-0400-0000
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 Water Heaters)	610-608-0110-0000
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.

Control Measure	Emission Inventory Codes
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 CARB Emissions Inventory database does not contain emissions data on unpaved vehicle and equipment traffic areas.
Rule 8081 (Ag Sources)	645-646-5400-0000
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

APPENDIX H

Appendix D from the *2022 Ozone Plan*

This page intentionally blank.

Appendix D

Mobile Source Control Strategy

This page intentionally blank.

TABLE OF CONTENTS

TABLE OF FIGURES

TABLE OF TABLES

Appendix D: Mobile Source Control Strategy

D.1 KEY MOBILE SOURCE REGULATIONS AND PROGRAMS PROVIDING EMISSION REDUCTIONS

[This section provided by California Air Resources Board]

Given the severity of California's air quality challenges and the need for ongoing emission reductions, the California Air Resources Board (CARB or Board) has implemented the most comprehensive mobile source emissions control program in the nation. CARB's comprehensive program relies on four fundamental approaches:

- Stringent emissions standards that minimize emissions from new vehicles and equipment;
- In-use programs that target the existing fleet and require the use of the cleanest vehicles and emissions control technologies;
- Cleaner fuels that minimize emissions during combustion; and,
- Incentive programs that remove older, dirtier vehicles and equipment and replace those vehicles with the cleanest technologies.

This multi-faceted approach has spurred the development of increasingly cleaner technologies and fuels and achieved significant emission reductions across all mobile source sectors that go far beyond national programs or programs in other states. These efforts extend back to the first mobile source regulations adopted in the 1960s, and pre-date the federal Clean Air Act Amendments (Act) of 1970, which established the basic national framework for controlling air pollution. In recognition of the pioneering nature of CARB's efforts, the Act provides California unique authority to regulate mobile sources more stringently than the federal government by providing a waiver of preemption for its new vehicle emission standards under Section 209(b). This waiver provision preserves a pivotal role for California in the control of emissions from new motor vehicles, recognizing that California serves as a laboratory for setting motor vehicle emission standards. Since then, CARB has consistently sought and obtained waivers and authorizations for its new motor vehicle regulations. CARB's history of progressively strengthening standards as technology advances, coupled with the waiver process requirements, ensures that California's regulations remain the most stringent in the nation.

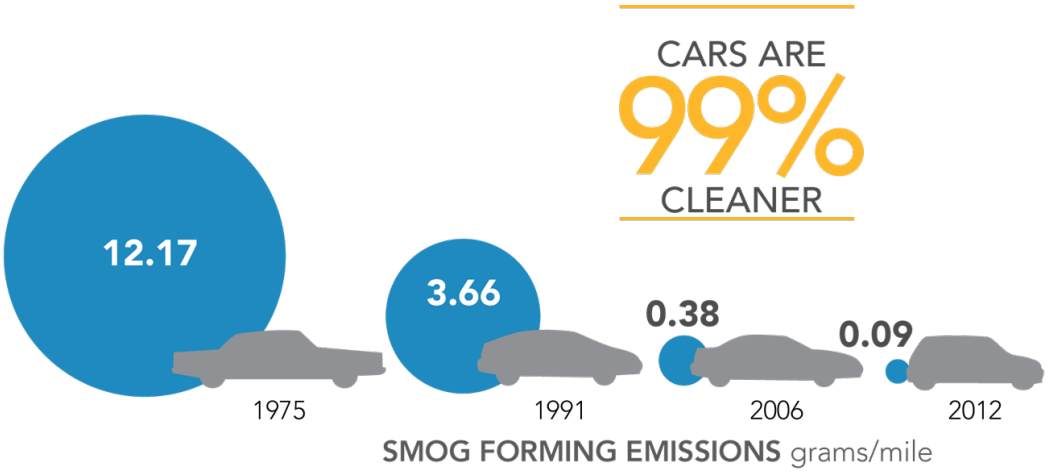
In 1998, CARB identified diesel particulate matter as a toxic air contaminant. Since then, CARB adopted numerous regulations aimed at reducing exposure to diesel particulate matter while concurrently providing reductions in oxides of nitrogen (NOx) from freight transport sources like heavy-duty diesel trucks, transportation sources like passenger cars and buses, and off-road sources like large construction equipment. Phased implementation of these regulations will continue to produce emission reduction benefits through 2037 and beyond, as the regulated fleets are retrofitted, and as older and dirtier portions of the fleets are replaced with newer and cleaner models at an accelerated pace.

Further, CARB and District staff work closely on identifying and distributing incentive funds to accelerate cleanup of vehicles and engines. Key incentive programs include: Low Carbon Transportation, Air Quality Improvement Program, VW Mitigation Trust, Community Air Protection, Carl Moyer Program, Goods Movement Program, Clean Off-Road Equipment (CORE) and Funding Agricultural Replacement Measures for Emission Reductions (FARMER). These incentive-based programs work in tandem with regulations to accelerate deployment of cleaner technology.

D.1.1 Light-Duty Vehicles

Figure D-1 illustrates the trend in CARB smog forming emission standards for light-duty vehicles. Cars are 99 percent cleaner than they were in 1975 due to CARB's longstanding light-duty mobile source program. Since setting the nation's first motor vehicle exhaust emission standards in 1966 that led to the first pollution controls, California has dramatically tightened emission standards for light-duty vehicles. In 1970, CARB required auto manufacturers to meet the first standards to control NOx emissions along with hydrocarbon emissions. The simultaneous control of emissions from motor vehicles and fuels led to the use of cleaner-burning reformulated gasoline (RFG) that has removed the emissions equivalent of 3.5 million vehicles from California's roads. Since CARB first adopted it in 1990, the Low Emission Vehicle Program (LEV and LEV II) and Zero-Emission Vehicle (ZEV) Program have resulted in the production and sales of hundreds of thousands of zero-emission vehicles (ZEVs) in California.

Figure D-1 Light-Duty Emission Standards



As a result of these efforts, light-duty vehicle emissions in the San Joaquin Valley have been reduced significantly since 1990 and will continue to go down through 2037. From today, light-duty vehicle NOx emissions are projected to decrease by over 64 percent in 2037. Key light-duty programs include Advanced Clean Cars (ACC), On-Board Diagnostics, Reformulated Gasoline, Incentive Programs, and the Enhanced Smog Check Program.

D.1.1.1 Advanced Clean Cars

CARB's groundbreaking ACC program is now providing the next generation of emission reductions in California, and ushering in a new zero emission passenger transportation system. The success of this program is evident: California is the world's largest market for Zero Emission Vehicles (ZEVs), with over 87 models available today, including battery-electric, plug-in hybrid electric, and fuel cell electric vehicles. A wide variety are now available at lower price points, attracting new consumers. As of February 2022, Californians, who drive only 10 percent of the nation's cars, now account for over 40 percent of all zero-emission cars in the country. The U.S. makes up about half of the world market. This movement towards commercialization of advanced clean cars has occurred due to CARB's ZEV requirements, part of ACC, which affects passenger cars and light-duty trucks.

CARB's ACC Program, approved in January 2012, is a pioneering approach of a 'package' of regulations that - although separate in construction - are related in terms of the synergy developed to address both ambient air quality needs and climate change. The ACC program combines the control of smog, soot causing pollutants, and greenhouse gas (GHG) emissions into a single coordinated package of requirements for model years 2015 through 2025. The program assures the development of environmentally superior cars that will continue to deliver the performance**,** utility, and safety vehicle owners have come to expect

The ACC Program also included amendments affecting the current ZEV requirements through the 2017 model year in order to enable manufacturers to successfully meet 2018 and subsequent model year requirements. These ZEV amendments are intended to achieve commercialization through simplifying the regulation and pushing technology to higher volume production in order to achieve cost reductions. The ACC Program will continue to achieve benefits into the future as new cleaner cars enter the fleet and displace older and dirtier vehicles.

Going beyond these regulations, California will be transitioning to zero emissions. In support of California's transition to zero-emission vehicles, in 2020, Governor Newsom signed Executive Order N-79-20[1] which established a goal that 100 percent of California sales of new passenger cars and trucks be zero-emission by 2035. Advanced Clean Cars II (ACC II), a measure in the 2016 State SIP Strategy, is a significant effort critical to meeting air quality standards, and was adopted recently by the CARB Board in August 2022. ACC II is consistent with the Governor Newson's Executive Order and has the goal of cutting emissions from new combustion vehicles while taking all new vehicle sales to 100 percent zero-emission no later than 2035.

With this order and many other recent actions, Governor Newsom has recognized that air pollution remains a challenge for California that requires bold action. Zero-emission vehicle commercialization in the light-duty sector is well underway. Longer-range

[1] Executive Order N-79-20 https://www.gov.ca.gov/wp-content/uploads/2020/09/9.23.20-EO-N-79-20-Climate.pdf

battery electric vehicles are coming to market that are cost-competitive with gasoline fueled vehicles and hydrogen fuel cell vehicles are now also seeing significant sales. Autonomous and connected vehicle technologies are being installed on an increasing number of new car models. A growing network of retail hydrogen stations is now available, along with a rapidly growing battery charger network.

D.1.1.2 On Board Diagnostics (OBD)

OBD systems serve an important role in helping to ensure that engines and vehicles maintain low emissions throughout their full life. OBD systems are designed to identify when a vehicle's emission control systems or other emission-related computer-controlled components are malfunctioning, causing emissions to be elevated above the vehicle manufacturer's specifications. Many states currently use the OBD system as the basis for passing and failing vehicles in their inspection and maintenance programs, as is exemplified by California's Smog Check program.

California's first OBD regulation required manufacturers to monitor some of the emission control components on vehicles starting with the 1988 model year. In 1989, CARB adopted OBD II, which required 1996 and subsequent model year passenger cars, light duty trucks, and medium duty vehicles and engines to be equipped with second-generation OBD systems. The Board has modified the OBD II regulation in regular updates since initial adoption to address manufacturers' implementation concerns and, where needed, to strengthen specific monitoring requirements. Most recently, the Board amended the regulation in 2021 to require manufacturers to implement Unified Diagnostic Services (UDS) for OBD communications, which will provide more information related to emissions-related malfunctions that are detected by OBD systems, improve the usefulness of the generic scan tool to repair vehicles, and provide needed information on in-use monitoring performance. UDS implementation would be required for all 2027 and subsequent model year light- and medium-duty vehicles and engines, as well as some heavy-duty vehicles and engines.

D.1.1.3 California Enhanced Smog Check Program

The Bureau of Automotive Repair (BAR) is the State agency charged with administration and implementation of the Smog Check Program. The Smog Check Program is designed to reduce air pollution from California registered vehicles by requiring periodic inspections for emission-control system problems, and by requiring repairs for any problems found. In 1998, the Enhanced Smog Check program began in which Smog Check stations relied on the BAR-97 Emissions Inspection System (EIS) to test tailpipe emissions with either a Two-Speed Idle (TSI) or Acceleration Simulation Mode (ASM) test depending on where the vehicle was registered. For instance, vehicles registered in urbanized areas received an ASM test, while vehicles in rural areas received a TSI test.

In 2009, the following requirements were added in to improve and enhance the Smog Check Program, making it more inclusive of motor vehicles and effective on smog reductions:

- Low pressure evaporative test;
- More stringent pass/fail cutpoints;
- Visible smoke test; and
- Inspection of light- and medium-duty diesel vehicles.

The next major change in the Program was due to AB 2289, adopted in October 2010, a new law restructuring California's Smog Check Program, streamlining and strengthening inspections, increasing penalties for misconduct, and reducing costs to motorists. This new law, supported by CARB and BAR, promised faster and less expensive Smog Check inspections by talking advantage of the second generation of OBD software installed on all vehicles. The new law also directs vehicles without this equipment to high-performing stations, helping to ensure that these cars comply with current emission standards. This program will reduce consumer costs by having stations take advantage of diagnostic software that monitors pollution-reduction components and tailpipe emissions. Beginning mid-2013, testing of passenger vehicles using OBD was required on all vehicles model years 2000 or newer.

D.1.1.4 Reformulated Gasoline (CaRFG)

Since 1992, CARB has been regulating the formulation of gasoline through the California Reformulated Gasoline program (CaRFG). The CaRFG program has been implemented in three phases, and has resulted in California gasoline being the cleanest in the world. California's cleaner-burning gasoline regulation is one of the cornerstones of the State's efforts to reduce air pollution and cancer risk. Reformulated gasoline is fuel that meets specifications and requirements established by CARB, which reduced motor vehicle toxics by about 40 percent and reactive organic gases by about 15 percent. The results from cleaning up fuel can have an immediate impact as soon as it is sold in the State. Vehicle manufacturers design low-emission vehicles to take full advantage of cleaner-burning gasoline properties.

D.1.1.5 Incentive Programs

There are many different incentive programs focusing on light-duty vehicles that produce extra emission reductions beyond traditional regulations. Incentive programs encourage both the early retirement of dirty, older cars and the purchase of newer, lower-emitting vehicle engines and technologies. Several State and local incentive funding pools have been used historically -- and remain available -- to fund the accelerated turnover of on-road heavy-duty vehicles.

The State, in partnership with the local air districts, has a well-established history of using incentive programs to advance technology development and deployment, and to achieve early emission reductions. Since 1998, CARB and California's local air districts

have been administering incentive funding to accelerate the deployment and turnover to cleaner vehicles, starting with the Moyer Program. In recognition of the key role that incentives play in complementing State and local air quality regulations to reduce emissions, the scope and scale of California's air quality incentive programs has since greatly expanded. Each of CARB's incentive programs has its own statutory requirements, goals, and categories of eligible projects that collectively provide for a diverse and complex incentives portfolio. CARB uses this portfolio approach to incentives to accelerate development and early commercial deployment of the cleanest mobile source technologies and to improve access to clean transportation.

The Fiscal Year (FY) 2021-22 State Budget included an unprecedented level of investment in ZEVs, with $2.3 billion allocated for CARB over the next three years, specifically dedicated to incentive-based turnover of mobile source vehicles and equipment, as part of a $3.9 billion comprehensive, multi-agency package to accelerate progress toward the State's zero-emission vehicle goals established under Executive Order N-79-20. With the 2022-23 State Budget, Governor Newsom is further reinforcing California's commitment to transitioning away from combustion vehicles with an additional $6.1 billion in ZEV investments over the next 5 years.

a) Low Carbon Transportation Investments and Air Quality Improvement Program (Clean Transportation Incentives)

California's Low Carbon Transportation Investments and the Air Quality Improvement Program form CARB's major incentive funding program, which works in concert with the State's larger portfolio of clean transportation investments. Together, the Low Carbon Transportation Investments and Air Quality Improvement Program are known as the Clean Transportation Incentives program; they provide mobile source incentives to reduce greenhouse gas, criteria pollutant, and toxic air contaminant emissions through the deployment of advanced technology and clean transportation in the light-duty and heavy-duty sectors.

The Clean Transportation Incentives Program is part of California Climate Investments, and is designed to accelerate the transition to advanced technology low carbon freight and passenger transportation, with a priority on providing health and economic benefits to California's most disadvantaged communities, and with a focus on increasing deployment of zero-emission vehicles and equipment wherever possible. Low Carbon Transportation Investments are supported by California's Cap-and-Trade auction proceeds. The Air Quality Improvement Program (AQIP) is a mobile source incentive program that focuses on reducing criteria pollutant and diesel particulate emissions with concurrent GHG reductions. AQIP is appropriated from the Air Quality Improvement Fund.

Each year, the legislature appropriates funding to CARB for the Low Carbon Transportation Investments and Air Quality Improvement Programs, and allocations are used to fund multiple programs in the passenger vehicle, on-road heavy-duty, and off-road vehicle sectors, including: the Clean Vehicle Rebate Project (CVRP); Enhanced

Fleet Modernization Program and Plus-Up Pilot Project (Clean Cars 4 All); and the Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project (HVIP).

i. Clean Vehicle Rebate Program (CVRP)

As one of the programs funded through the Clean Transportation Incentives program, CVRP is a vehicle purchasing incentives program that provides consumer rebates to reduce the price for new ZEV purchases, and is designed to offer vehicle rebates on a first-come, first-serve basis for light-duty ZEVs, plug-in hybrid electric vehicles, and zero-emission motorcycles. In FY 2021-22, CVRP was allocated $525 million.

ii. Clean Cars 4 All (CC4A)

Clean Cars 4 All (formerly known as the Enhanced Fleet Modernization Program Plus-Up Pilot Project) is another Clean Transportation Incentives program for passenger vehicles. Clean Cars 4 All provides incentives for lower-income consumers living in and near disadvantaged communities who scrap their old vehicles and purchase new or used hybrid, plug-in hybrid, or zero-emission vehicle replacement vehicles. The budget for FY 2021-22 included $75 million for the statewide expansion of CC4A.

iii. Other Clean Transportation Equity Investments

CARB also funds a suite of transportation equity pilot projects aimed at increasing access to clean transportation and mobility options for priority populations in disadvantaged and low-income communities, and for lower-income households. This includes clean vehicle ownership projects, clean mobility options, streamlining access to funding and financing opportunities, and increasing community outreach, education and exposure to clean technologies. Clean Transportation Equity pilot projects exemplify the importance of understanding the unique needs across communities and provide lessons for how we most directly address barriers to collectively achieve our equity, air quality, and climate goals. Major Clean Transportation Equity Investment programs include: Clean Mobility Options, Clean Mobility in Schools, Financing Assistance; and Sustainable Transportation Equity Project **(**STEP). Clean Transportation Equity Investment projects were allocated $150 million in the FY 2021-22 budget, which includes the $75 million for CC4A mentioned above.

Financing Assistance provides eligible consumers buy-down and financing opportunities to purchase or lease a new or used clean vehicle, such as a conventional hybrid electric vehicle (HEV), plug-in hybrid (PHEV), or battery electric vehicle (BEV). Clean Mobility in Schools Projects are located within disadvantaged communities, and are intended to encourage and accelerate the deployment of new zero-emission school buses, school fleet vehicles, passenger cars, lawn and garden equipment, and can incorporate alternative modes of transportation like transit vouchers, active transportation elements, and bicycle share programs. In the light-duty sector, some of the Clean Mobility Options programs that CARB funds include the Clean Mobility Options Voucher Pilot Program (CMO). CMO provides voucher-based funding for low-income, tribal, and

disadvantaged communities to fund zero-emission shared and on-demand services such as carsharing, ridesharing, bike sharing, and innovative transit services. STEP is a new transportation equity pilot program that funds zero-emission carsharing, bike sharing, public transit and shared mobility subsidies, among other projects.

b) Consumer Assistance Program

California's voluntary vehicle retirement program, the Consumer Assistance Program (CAP), is administered by BAR and provides low-income consumers repair assistance including up to $1,200 in emissions-related repairs if their vehicle fails its biennial Smog Check Test inspection, and/or up to $1,500 per vehicle for retiring operational vehicles at BAR-contracted dismantler sites.

D.1.2 Medium- and Heavy-Duty On-Road Trucks

Due to the benefits of CARB's longstanding heavy-duty mobile source program, heavy-duty on-road vehicle emissions in the San Joaquin Valley have been reduced significantly since 1990 and will continue to decrease through 2037. From today, medium- and heavy-duty NOx emissions are projected to decrease by over 79 percent in 2037. Key programs contributing to those reductions include new heavy-duty engine standards, cleaner diesel fuel requirements, California's Truck and Bus Regulation and incentive programs.

D.1.2.1 Heavy-Duty Engine Standards

Since 1990, heavy-duty engine NOx emission standards have become dramatically more stringent, dropping from 6 grams per brake horsepower--hour (g/bhp-hr) in 1990 down to the current 0.2 g/bhp-hr standard, which took effect in 2010. In addition to mandatory NOx standards, there have been several generations of optional lower NOx standards put in place over the past 15 years. Most recently in 2015, engine manufacturers were allowed to certify to three optional NOx emission standards of 0.1 g/bhp--hr, 0.05 g/bhp-hr, and 0.02 g/bhp-hr (i.e., 50 percent, 75 percent, and 90 percent lower than the current mandatory standard of 0.2 g/bhp-hr). The optional standards allow local air districts and CARB to preferentially provide incentive funding to buyers of cleaner trucks, and to encourage the development of cleaner engines.

D.1.2.2 Optional Low-NOx Standards for Heavy-Duty Diesel Engines

In 2013, California established optional low-NOx standards for heavy-duty diesel engines (Optional Reduced Emissions Standards for Heavy-Duty Engines regulation), with the most aggressive standard being 0.02 g/bhp-hr, 90 percent below the federally required standard. The optional low-NOx standards were developed to pave the way for more stringent mandatory standards by encouraging manufacturers to develop and certify low-NOx engines, and incentivizing potential customers to purchase these low-NOx engines. By 2019, a total of fifteen engines families, some using natural gas and others using liquefied petroleum gas, had been certified to the optional low-NOx

standards.

D.1.2.3 Heavy-Duty Engine and Vehicle Omnibus Regulation

In 2021, CARB comprehensively overhauled how NOx emissions from new heavy-duty engines are regulated in California through the adoption of the Heavy-Duty Engine and Vehicle Omnibus Regulation, which reduces NOx emissions from the engines in medium- and heavy-duty vehicle classes. The Omnibus Regulation includes NOx certification emission standards and in-use standards that significantly reduce tailpipe NOx emissions during most vehicle operating modes such as high-speed steady-state, transient, low load urban driving, and idling modes of operation. Additionally, revisions to the emissions warranty, useful life, emissions warranty and reporting information and corrective action procedures, and durability demonstration procedures provide additional emission benefits by encouraging more timely repairs to emission-related malfunctions and encouraging manufacturers to produce more durable emission control components, thereby reducing the rate at which engine emission controls fail and emissions increase.

D.1.2.4 Cleaner In-Use Heavy-Duty Trucks (Truck and Bus Regulation)

California's Truck and Bus Regulation or In-Use Heavy-Duty Truck Rule was first adopted in December 2008. This rule represents a multi-year effort to turn over the legacy fleet of heavy-duty on-road engines and replace them with the cleanest technology available. In December 2010, CARB revised specific provisions of the In-Use Heavy-duty Truck Rule, in recognition of the deep economic effects of the recession on businesses and the corresponding decline in emissions.

Starting in 2012, the Truck and Bus Regulation phases in requirements applicable to an increasingly larger percentage of California's truck and bus fleet over time, so that by 2023 nearly all older vehicles will be upgraded to have exhaust emissions meeting 2010 model year engine emissions levels. The regulation applies to nearly all diesel-fueled trucks and buses with a gross vehicle weight rating (GVWR) greater than 14,000 pounds that are privately or federally owned, including on-road and off-road agricultural yard goat trucks, and privately and publicly owned school buses. Moreover, the regulation applies to any person, business, school district, or federal government agency that owns, operates, leases or rents affected vehicles. The regulation also establishes requirements for any in-State or out-of-state motor carrier, California-based broker, or any California resident who directs or dispatches vehicles subject to the regulation. Finally, California sellers of a vehicle subject to the regulation would have to disclose the regulation's potential applicability to buyers of the vehicles. Approximately 170,000 businesses in nearly all industry sectors in California, and almost a million vehicles that operate on California roads each year are affected. Some common industry sectors that operate vehicles subject to the regulation include: for-hire transportation, construction, manufacturing, retail and wholesale trade, vehicle leasing and rental, bus lines, and agriculture.

In 2017, California passed legislation ensuring compliance with the Truck and Bus Regulation through the California Department of Motor Vehicles (DMV) vehicle registration program. Starting January 1, 2020, DMV verifies compliance to ensure that vehicles subject to the Truck and Bus Regulation meet the requirements prior to obtaining DMV vehicle registration. The law requires the DMV to deny registration for any vehicle that is non-compliant or has not reported to CARB as compliant or exempt from the Truck and Bus Regulation.

CARB compliance assistance and outreach activities that are key in support of the Truck and Bus Regulation include:

- The Truck Regulations Upload and Compliance Reporting System (TRUCRS), an online reporting tool developed and maintained by CARB staff;
- The Truck and Bus regulation's fleet calculator, a tool designed to assist fleet owners in evaluating various compliance strategies;
- Targeted training sessions all over the State; and
- Out-of-state training sessions conducted by a contractor.

CARB staff also develops regulatory assistance tools, conducts and coordinates compliance assistance and outreach activities, administers incentive programs, and actively enforces the entire suite of regulations. Accordingly, CARB's approach to ensuring compliance is based on a comprehensive outreach and education effort.

D.1.2.5 Heavy-Duty Inspection and Maintenance Regulation

To ensure heavy-duty trucks remain clean in-use, CARB adopted in 2021 the Heavy-Duty Inspection and Maintenance Regulation, which requires periodic demonstrations that vehicles' emissions control systems are properly functioning in order to legally operate within the State. This regulation is designed to achieve criteria emissions reductions by ensuring that malfunctioning emissions control systems are repaired in a timely fashion.

D.1.2.6 Heavy-Duty On-Board Diagnostics (HD OBD)

OBD systems serve an important role in helping to ensure that engines and vehicles maintain low emissions throughout their full life. OBD systems monitor virtually all emission controls on gasoline and diesel engines, including catalysts, particulate matter (PM) filters, exhaust gas recirculation systems, oxygen sensors, evaporative systems, fuel systems, and electronic powertrain components as well as other components and systems that can affect emissions when malfunctioning. The systems also provide specific diagnostic information in a standardized format through a standardized serial data link on-board the vehicles. The use and operation of OBD systems ensure reductions of in-use motor vehicle and motor vehicle engine emissions through improvements in emission system durability and performance.

The Board originally adopted comprehensive Heavy-Duty OBD regulations in 2005 for model year 2010 and subsequent heavy-duty engines and vehicles, referred to as HD OBD. In 2009, the Board updated the HD OBD regulation, adopted specific enforcement requirements, and aligned the HD OBD with OBD requirements for medium-duty vehicles. In 2021, the Board again amended the HD OBD regulation; the 2021 amendments require manufacturers to implement Unified Diagnostic Services for OBD communications, which will provide more information related to emissions-related malfunctions that are detected by OBD systems, improve the usefulness of the generic scan tool to repair vehicles, and provide needed information on in-use monitoring performance.

D.1.2.7 Clean Diesel Fuel

Since 1993, CARB has required that diesel fuel have a limit on the aromatic hydrocarbon content and sulfur content of the fuel. Diesel powered vehicles account for a disproportionate amount of diesel particulate matter, which is considered a toxic air contaminant in California. In 2006, CARB required a low-sulfur diesel fuel to be used not only by on-road diesel vehicles but also for off-road engines. The diesel fuel regulation allows alternative diesel formulations as long as emission reductions are equivalent to the CARB formulation.

D.1.2.8 Advanced Clean Truck Regulation (ACT)

In June 2020, CARB adopted the Advanced Clean Trucks regulation, a first of its kind regulation requiring medium- and heavy-duty manufacturers to produce ZEVs as an increasing portion of their sales beginning in 2024. The Advanced Clean Trucks regulation is a manufacturers ZEV sales requirement and a one-time reporting requirement for large entities and fleets. This regulation is expected to result in roughly 100,000 heavy-duty ZEVs operating on California's roads by 2030 and nearly 300,000 heavy-duty ZEVs by 2035. With the adoption of the Advanced Clean Trucks regulation, CARB Resolution 20-19 directs staff to return to the Board with a zero-emission fleet rule and sets the following targets for transitioning California's heavy-duty vehicle sectors to ZEVs:

- 100 percent zero-emission drayage, last mile delivery, and government fleets by 2035;
- 100 percent zero-emission refuse trucks and local buses by 2040;
- 100 percent zero-emission-capable vehicles in utility fleets by 2040; and
- 100 percent zero-emission everywhere else, where feasible, by 2045.

As mentioned earlier, the Governor signed Executive Order N-79-20 in September 2020, which directs CARB to adopt regulations to transition the State's transportation fleet to ZEVs. This includes transitioning the State's drayage fleet to ZEVs by 2035 and transitioning the State's truck and bus fleet to ZEVs by 2045 where feasible.

D.1.2.9 Innovative Clean Transit (ICT) and Zero-Emission Airport Shuttle Regulation

To achieve the needed emission reductions from heavy-duty applications, CARB is driving the use of zero-emission heavy-duty vehicles in strategic applications, including urban transit buses and airport ground transportation. The Innovative Clean Transit regulation was the first of these programs. It was adopted in December 2018 and requires all public transit agencies to gradually transition to a 100 percent zero-emission bus fleet and encourages them to provide innovative first- and last-mile connectivity and improved mobility for transit riders. Beginning in 2029, 100 percent of new purchases by transit agencies must be Zero-Emission Buses, with a goal for full transition by 2040. It applies to all transit agencies that own, operate, or lease buses in California with a GVWR greater than 14,000 lbs. It includes standard, articulated, over-the-road, double-decker, and cutaway buses.

The Zero-Emission Airport Shuttle Regulation, adopted in June 2019, requires airport shuttle operators in California to transition to 100 percent ZEV technologies. Airport shuttle operators must begin adding zero-emission shuttles to their fleets in 2027, and complete the transition to ZEVs by the end of 2035. The regulation applies to airport shuttle operators who own, operate, or lease vehicles at any of the 13 California airports regulated under this rule.

D.1.2.10 Incentive Programs

There are many different incentive programs focusing on heavy-duty vehicles that accelerate turnover to cleaner technologies, and thereby produce extra emission reductions beyond traditional regulations. Several State and local incentive funding pools have been used historically -- and remain available -- to fund the accelerated turnover of on-road heavy-duty vehicles.

a) Low Carbon Transportation Investments and Air Quality Improvement Program (Clean Transportation Incentives)

In addition to funding passenger vehicle incentive programs, the Low Carbon Transportation Investments and the Air Quality Improvement Program (Clean Transportation Incentives) also provides incentive funding for heavy-duty vehicles. This program both funds projects to accelerate fleet and engine turnover to cleaner existing technologies through the Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project (HVIP) and Truck Loan Assistance program, as well as funding demonstration and pilot projects.

Beyond the vehicle purchasing incentives programs (CVRP and Clean Cars 4 All) and Clean Transportation Equity Investments, an additional $873 million was allocated in the FY 2020-2021 budget for on-road heavy-duty trucks and off-road equipment. CARB provides these incentive funds following the principles of the portfolio approach, meaning that funding is provided across multiple sectors and applications – as well as

across multiple technologies to support both the technologies that are providing emission reductions today, as well as those that are needed to meet future goals as the technology matures. This includes funding for demonstration and pilot projects, vouchers for advanced clean technologies, and financing and support for small fleets transitioning to cleaner technologies. Additionally, this year funding was set aside specifically for drayage trucks, transit buses, and school buses, all of which are primed to rapidly transition to zero-emission.

i. Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project (HVIP)

CARB's Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project (HVIP) serves as the cornerstone program in CARB's advanced technology heavy-duty incentive portfolio. HVIP has provided funding since 2010 to support the long-term transition to cleaner combustion and zero-emission vehicles in the heavy-duty market. The program helps offset the higher costs of clean vehicles, and additional incentives are available for providing disadvantaged community benefits. HVIP responds to a key market challenge by making clean vehicles more affordable for fleets through point of purchase price reductions. With an HVIP voucher, technology-leading vehicles can be as affordable as their traditional fossil-fueled counterparts, enabling fleets of all sizes to deploy advanced technologies that are cleaner and quieter. HVIP is the earliest model in the United States to demonstrate the function, flexibility, and effectiveness of first-come first-served incentives that reduce the incremental cost of commercial vehicles. HVIP is fleet-focused, providing a streamlined and user-friendly option to encourage purchases and leases of advanced clean trucks and buses throughout California. Approved dealers are a key part of HVIP success and are trained to facilitate the application process. Vocations include freight and drayage trucks, delivery vans, utility vehicles, transit, school, and shuttle buses, refuse trucks, and more. In FY 2021-22, the Legislature allocated $569.5 million for HVIP.

ii. Truck Loan Assistance Program

CARB's Truck Loan Assistance Program was created through a one-time appropriation of approximately $35 million in the 2008 State Budget to implement a heavy-duty loan program that assists on-road fleets affected by the Truck and Bus Regulation and the Heavy-Duty Tractor-Trailer Greenhouse Gas Regulation. CARB has continued to operate this program with subsequently appropriated AQIP funds of around $28 million annually to provide financing opportunities to small business truckers who don't meet conventional lending criteria and are unable to qualify for traditional financing for cleaner trucks. As of February 2022, about $187 million in Truck Loan Assistance Program funding has been provided to small business truckers for the purchase of approximately 36,000 cleaner trucks, exhaust retrofits, and trailers. In FY 2021-22, $28.6 million was allocated for the Truck Loan Assistance Program.

iii. Demonstration and Pilot projects

In addition to funding HVIP and the Truck Loan Assistance Program, the Clean Transportation Incentives program is the only program in CARB's portfolio, and one of the only programs in the State, that funds demonstration and pilot projects to support early market deployment of nascent zero-emission technologies. The purpose of the Advanced Technology Demonstration and Pilot Projects is to help accelerate the next generation of advanced technology vehicles, equipment, or emission controls, which are not yet commercialized. As such, it provides a testing ground for innovative projects focused on improving access to clean transportation for priority communities. In FY 2021-22, $80 million was allocated for heavy-duty advanced technology demonstration and pilot projects, which are intended to help bring to market readiness zero-emission (ZE) heavy-duty technologies that are poised to deploy commercially in the near future in both on- and off-road applications. This includes zero-emission long-haul trucks, strategic truck range extenders, and ZE applications along freight facilities/corridors.

In heavy-duty applications, the goods movement sector is a focus for incentive funding, with CARB funding multiple demonstration and pilot programs to drive zero-emission technologies in last mile delivery trucks, drayage trucks, and heavy-duty trucks and tractors. The *USPS Zero-Emission Delivery Truck Pilot Commercial Deployment Project* is deploying battery electric last-mile delivery trucks in the USPS fleet, together with the associated charging infrastructure. The project will demonstrate the practicality and economic viability of the widespread adoption of a variety of ZE medium- and heavy-duty vehicle technologies in delivery applications. The *Battery Electric Drayage Truck Demonstration* project is a $40 million Statewide demonstration of forty-four zero-emission battery electric and plug-in hybrid drayage trucks that, since 2018, have been in operation serving major California ports in five air districts (San Joaquin Valley, South Coast, Bay Area, Sacramento, and San Diego). Battery electric drayage trucks are used to transport cargo to or from California's ports and intermodal rail yards. Installation of charging infrastructure that enables safe charging of the trucks for statewide demonstration is also included as part of this project. To accelerate the deployment of zero-emission technologies in heavier freight applications, the $44.8 million *Volvo Low Impact Green Heavy Transportation Solutions* project is funding Class 8 heavy-duty battery electric trucks equipped with battery electric tractors to facilitate creation of a zero-emission goods movement system from the Ports of Long Beach and Los Angeles to four freight handling facilities in disadvantaged communities.

Clean transportation incentives have also funded demonstration and pilot projects for ZE urban transit buses. The $22.3 million *Fuel Cell Electric Bus Commercialization Consortium* in the Bay Area and Southern California is funding battery and fuel cell urban transit buses, which will better serve communities' transit needs, substantially reduce greenhouse gas emissions, eliminate criteria pollutants, and provide economic benefits.

iv. Clean Transportation Equity Investments

As mentioned earlier, Clean Mobility in Schools Projects are also encouraging and accelerating the deployment of new zero-emission heavy-duty engines and vehicles, including battery electric school buses and clean school fleet vehicles.

b) Moyer Program

The Carl Moyer Memorial Air Quality Standards Attainment Program (Moyer Program), funded by dedicated revenue from the DMV's smog abatement fee and a fee on the purchase of new tires, provides approximately $60 million in grant funding annually through local air districts for cleaner-than-required engines and equipment. Since 1998, approximately $1 billion has been allocated to date. The Moyer Program provides monetary grants to private companies and public agencies to clean up their heavy-duty engines beyond that required by law through retrofitting, repowering or replacing their engines with newer and cleaner ones. These grants are issued locally by air districts. Projects that reduce emissions from heavy-duty on-road engines qualify, including heavy-duty trucks, drayage trucks, emergency vehicles, public agency and utility vehicles, school buses, solid waste collection vehicles, and transit fleet vehicles.

As the regulatory, technological, and incentives landscape has changed significantly since the creation of the Moyer Program and to address evolving needs, the Legislature has periodically modified the program to better serve California. Most recently, Senate Bill (SB) 513 (Beall, 2015) has provided new opportunities for the Moyer Program to contribute significant emission reductions alongside implemented regulations, advance zero and near-zero technologies, and combine program funds with those of other incentive programs.

In the FY 2021-22 budget, the Legislature appropriated an additional $45 million in Moyer Program funding to support the replacement of diesel trucks with ultra-low NOx trucks certified to meet the 0.02 g/bhp-hr NOx standard or lower. Currently, only the San Joaquin Valley Air Pollution Control District and the South Coast Air Quality Management District would be eligible for these funds. In November 2021, the Board approved increases to the Moyer Program cost-effectiveness limits and funding caps for optional advanced technology and zero-emission replacement projects for on-road heavy-duty trucks. Increasing the cost-effectiveness thresholds is designed to increase funding opportunities, and ensures that the Moyer Program continues to focus on developing the most advanced zero-emission and low emission technologies, consistent with encouraging further emissions reductions. These changes included increasing the threshold for on-road zero-emission vehicles, which includes zero-emission school buses, from $100,000 to $500,000 per unit.

The Moyer Program also funds CARB's On-Road Heavy-Duty Voucher Incentive Program (VIP), which provides funding opportunities for small fleet owners with 10 or fewer vehicles to quickly replace their older heavy-duty diesel or alternative fuel vehicles. Under this program, fleet owners may be eligible for funding of up to $410,000

for replacing their existing vehicle(s) to be scrapped and replaced by new trucks (zero-emission or certified to the optional 0.02 g/bhp-hr NOx standard), or up to $50,000 for replacing their existing fleet with used vehicles with 2013 model year or later engines. Air districts have the discretion to set certain local eligibility requirements based upon local priorities.

c) Goods Movement Emission Reduction Program (Prop 1B)

The Prop 1B Program was created to reduce exposure for populations living near freight corridors and facilities that were being adversely impacted by emissions from goods movement. This program provided incentives to owners of equipment used in freight movement to upgrade to cleaner technologies sooner than required by law or regulation. Voters approved $1 billion in total funding for the air quality element of the Prop 1B Program to complement $2 billion in freight infrastructure funding under the same ballot initiative.

Beginning in 2008, the Goods Movement Emission Reduction Program funded by Prop 1B has funded cleaner trucks for the region's transportation corridors; the final increment of funds implemented projects through 2020. The $1 billion program was a partnership between CARB and local agencies, air districts, and seaports to quickly reduce air pollution emissions and health risk from freight movement along California's trade corridors. While all Prop 1B Program funds have been awarded to the local air districts for implementation, the program framework exists to serve as a mechanism to award clean truck funds through newer funding programs.

d) Volkswagen (VW) Mitigation Trust

In 2015, after a CARB-led investigation, in concert with the United States Environmental Protection Agency (U.S. EPA), VW admitted to deliberately installing emission defeat devices on nearly 600,000 VW, Audi, and Porsche diesel vehicles sold in the United States, approximately 85,000 of which were sold in California. The VW California settlement agreement includes both a Mitigation Trust to mitigate the excess NOx emissions caused by the company's use of illegal defeat devices in their vehicles, as well as a ZEV Investment Commitment to help grow the State's expanding ZEV program. The Mitigation Trust includes approximately $423 million for California to be used as specified in the settlement agreement. Per the Beneficiary Mitigation Plan approved by CARB in 2018, this funding will be used to replace older heavy-duty trucks, buses, and freight vehicles and equipment with cleaner models, with a focus on zero-emission technologies where available and cleaner combustion everywhere else, as well as to fund light-duty ZEV infrastructure. In addition, there have been mitigation funds established as the result of other settlements from which funding is used to support clean technologies.

e) Community Air Protection Incentives (AB 617 | Community Air Protection Program)

Since the 2016 State SIP Strategy elucidated the need for additional legislative assistance in funding turnover programs to accelerate the deployment and adoption of cleaner technologies, the Legislature has since 2017 established a number of new incentive programs that are implemented through CARB through various budget bills. The State Legislature has provided substantial funding to achieve early emissions reductions in the communities most impacted by air pollution. In its 2018 funding allocation, the Legislature expanded the possible uses of AB 617 funds to include Moyer and Proposition 1B eligible projects with a priority on zero-emission projects, zero-emission charging infrastructure, stationary source projects, and additional projects consistent with the CERPs.

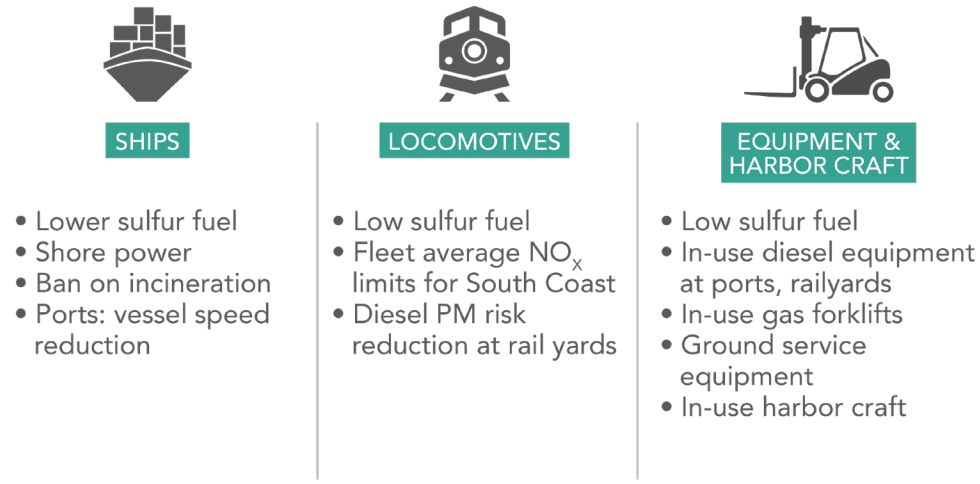
CARB and air districts partner to run the programs, with CARB developing guidelines and the districts administering funds for their regions. In most cases throughout the State, selected communities have identified mobile source emissions as a target for reductions. It is likely that a significant portion of the AB 617-allocated funding will incentivize the accelerated turnover to cleaner vehicles and equipment in and around low-income and disadvantaged communities.

D.1.3 Off-Road Sources

Off-road sources encompass equipment powered by an engine that does not operate on the road. Sources vary from ships to lawn and garden equipment and for example, include sources like locomotives, aircraft, tractors, harbor craft, off-road recreational vehicles, construction equipment, forklifts, and cargo handling equipment.

Figure D-2 illustrates the comprehensive suite of emission control measures applicable to the broad variety of engines and vehicle that fall under the Off-Road category. As a result of these emission control efforts, off-road emissions in the San Joaquin Valley have been reduced significantly since 1990 and will continue to decrease through 2037. From today, off-road NOx emissions are projected to be reduced by over 51 percent by 2037. Key programs in this sector include the Off-Road Engine Standards, Locomotive Engine Standards, Clean Diesel Fuel, Cleaner In-Use Off-Road Regulation and In-Use Large Spark Ignition (LSI) Fleet Regulation.

Figure D-2 Off-Road Vehicle and Equipment Control Programs



D.1.3.1 Off-Road Engine Standards

The Clean Air Act preempts states, including California, from adopting requirements for new off-road engines less than 175 HP used in farm or construction equipment. California may adopt emission standards for in-use off-road engines pursuant to Section 209(e)(2), but must receive authorization from U.S. EPA before it may enforce the adopted standards.

CARB first approved regulations to control exhaust emissions from small off-road engines (SORE) such as lawn and garden equipment in December 1990 with amendments in 1998, 2003, 2010, 2011, 2016, and 2021. The 1990 - 2016 regulations were implemented through three tiers of progressively more stringent exhaust emission standards that were phased in between 1995 and 2008. The most recent suite of amendments (December 2021) requires most newly manufactured SORE engines be zero-emission starting in 2024.

Manufacturers of forklift engines are subject to new engine standards for both diesel and Large Spark Ignition (LSI) engines. Off-road diesel engines were first subject to engine standards and durability requirements in 1996 while the most recent Tier 4 Final emission standards were phased in starting in 2013. Tier 4 emission standards are based on the use of advanced after-treatment technologies such as diesel particulate filters and selective catalytic reduction. LSI engines have been subject to new engine standards that include both criteria pollutant and durability requirements since 2001 with the cleanest requirements phased in starting in 2010.

To control emissions from Transport Refrigeration Units (TRUs), CARB adopted in 2004 the Airborne Toxic Control Measure (ATCM) for In-Use Diesel-Fueled TRUs, TRU Generator Sets, and Facilities where TRUs Operate, which set increasingly stringent engine standards to reduce diesel particulate matter emissions from TRUs and TRU generator sets. The ATCM for TRUs was subsequently amended in 2010 and 2011,

and most recently in February 2022, as the first phase of CARB's current push to develop new requirements to transition diesel-powered TRUs to zero-emission technology in two phases. The February 2022 adoption, Part 1 amendments to the existing TRU Airborne Toxic Control Measure (ATCM), requires the transition of diesel-powered truck TRUs to zero-emission. CARB plans to develop a subsequent Part 2 regulation to require zero-emission trailer TRUs, domestic shipping container TRUs, railcar TRUs, and TRU generator sets, for future Board consideration.

D.1.3.2 Cleaner In-Use Off-Road Equipment (Off-Road Regulation)

The Off-Road Regulation was first approved in 2007 and subsequently amended in 2010 in light of the impacts of the economic recession. Equipment affected by this regulation are used in construction, manufacturing, the rental industry, road maintenance, airport ground support and landscaping. In December 2011, the Off-Road Regulation was modified to include on-road trucks with two diesel engines.

The Off-Road Regulation will significantly reduce emissions of diesel PM and NOx from the over 150,000 in-use off-road diesel vehicles that operate in California. The Regulation affects dozens of vehicle types used in thousands of fleets by requiring owners to modernize their fleets by replacing older engines or vehicles with newer, cleaner models, retiring older vehicles or using them less often, or by applying retrofit exhaust controls.

The Off-Road Regulation imposes idling limits on off-road diesel vehicles, requires a written idling policy, and requires a disclosure when selling vehicles. The Regulation also requires that all vehicles be reported to CARB and labeled, restricts the addition of older vehicles into fleets, and requires fleets to reduce their emissions by retiring, replacing, or repowering older engines, or installing verified exhaust retrofits. The requirements and compliance dates of the Off-Road Regulation vary by fleet size.

Fleets are subject to increasingly stringent restrictions on adding older vehicles. The regulation also sets performance requirements. While the regulation has many specific provisions, in general by each compliance deadline, a fleet must demonstrate that it has either met the fleet average target for that year, or has completed the Best Available Control Technology requirements. The performance requirements of the Off-Road Regulation were phased in from January 1, 2014 through January 1, 2019.

Compliance assistance and outreach activities in support of the Off-Road Regulation include:

- The Diesel Off-road On-line Reporting System, an online reporting tool developed and maintained by CARB staff;
- The Diesel Hotline (866-6DIESEL), which provides the regulated public with questions about the regulations and access to CARB staff. Staff is able to respond to questions in English, Spanish and Punjabi; and

- The Off-road Listserv, providing equipment owners and dealerships with timely announcement of regulatory changes, regulatory assistance documents, and reminders for deadlines.

D.1.3.3 Clean Diesel Fuel

Since 1993, CARB has required that diesel fuel have a limit on the aromatic hydrocarbon content and sulfur content of the fuel. Diesel powered vehicles account for a disproportionate amount of the diesel particulate matter which is considered a toxic air contaminant by the State of California. In 2006, CARB required a low-sulfur diesel fuel to be used not only by on-road diesel vehicles but also for off-road engines. The diesel fuel regulation allows alternative diesel formulations as long as emission reductions are equivalent to the CARB formulation.

D.1.3.4 Locomotive Engine Standards

The Clean Air Act and the U.S. EPA national locomotive regulations expressly preempt states and local governments from adopting or enforcing "any standard or other requirement relating to the control of emissions from new locomotives and new engines used in locomotives" (U.S. EPA interpreted new engines in locomotives to mean remanufactured engines, as well). U.S. EPA has approved two sets of national locomotive emission regulations (1998 and 2008). In 1998, U.S. EPA approved the initial set of national locomotive emission regulations. These regulations primarily emphasized NOx reductions through Tier 0, 1, and 2 emission standards. Tier 2 NOx emission standards reduced older uncontrolled locomotive NOx emissions by up to 60 percent, from 13.2 to 5.5 g/bhphr.

In 2008, U.S. EPA approved a second set of national locomotive regulations. Older locomotives upon remanufacture are required to meet more stringent particulate matter (PM) emission standards which are about 50 percent cleaner than Tier 0-2 PM emission standards. U.S. EPA refers to the PM locomotive remanufacture emission standards as Tier 0+, Tier 1+, and Tier 2+. The new Tier 3 PM emission standard (0.1 g/bhphr), for model years 2012-2014, is the same as the Tier 2+ remanufacture PM emission standard. The 2008 regulations also included new Tier 4 (2015 and later model years) locomotive NOx and PM emission standards. The U.S. EPA Tier 4 NOx and PM emission standards further reduced emissions by approximately 95 percent from uncontrolled levels.

In April 2017, CARB petitioned U.S. EPA for rulemaking, seeking the amendment of emission standards for newly built locomotives and locomotive engines and lower emission standards for remanufactured locomotives and locomotive engines. The petition asks U.S. EPA to update its standards to take effect for remanufactured locomotives in 2023 and for newly built locomotives in 2025. The new emission standards would provide critical criteria pollutant reductions, particularly in the disadvantaged communities that surround railyards. U.S. EPA has not yet responded to this petition.

D.1.3.5 Marine Sources and Ocean-Going Vessels (OGVs)

To reduce emissions from Ocean Going Vessels (OGV), CARB has adopted the Ocean-Going Vessel Fuel Regulation, "Fuel Sulfur and Other Operational Requirements for Ocean-Going Vessels within California Waters and 24 Nautical Miles of the California Baseline" (2008) and the Ocean-Going Vessels At Berth Regulation (2007).

The At-Berth Regulation requires container ships, passenger ships, and refrigerated-cargo ships at six California ports to meet compliance requirements for auxiliary engines while they are docked, including emission or power reduction requirements. Reduced vessel speeds also provide emission reduction benefits, and programs are operated by local air districts along the California coast to incentivize lower speeds. CARB staff received comments during the public process about including a statewide vessel speed reduction program. In the 2022 State SIP Strategy, the CARB measure for 'Future Emissions Reductions from Ocean-Going Vessels' considers options available under CARB authority to achieve further emissions reductions, including developing a statewide vessel speed reduction program.

In 2007, CARB adopted the Commercial Harbor Craft Regulation (CHC Regulation), which reduces toxic and criteria emissions. Commercial harbor craft include any private, commercial, government, or military marine vessels including, but not limited to ferries, excursion vessels, tugboats (including ocean-going tugboats), barges, and commercial and commercial passenger fishing boats. This regulation was subsequently amended in 2010, and again in March 2022, to establish expanded and more stringent in-use requirements to cover more vessel categories and mandate accelerated deployment of zero-emission and advanced technologies in vessel categories where technology feasibility has been demonstrated.

To control emissions from personal watercraft, CARB staff is also exploring development of Spark-Ignition Marine Engine Standards, as described in the 2022 State SIP Strategy. For this measure, CARB would develop and propose catalyst-based standards for outboard and personal watercraft engines greater than or equal to 40 kW in power that will gradually reduce emission standards to approximately 70 percent below current levels, and consider actions that would require a percentage of outboard and personal watercraft vessels to be propelled by zero-emission technologies for certain applications.

D.1.3.6 Large Spark-Ignition (LSI) Engines and Forklifts

Forklift fleets are subject to in-use fleet requirements either under the LSI fleet regulation, if fueled by gasoline or propane, or under the off-road diesel fleet regulation, if fueled by diesel. Both regulations require fleets to retire, repower, or replace higher-emitting equipment in order to maintain fleet average standards.

Large spark-ignition engines, which are defined as spark-ignition (i.e., Otto-cycle) engines greater than 25 horsepower, are used in a variety of equipment, including, but not limited to, forklifts, airport ground support equipment (GSE), sweeper/scrubbers, industrial tow tractors, generator sets, and irrigation pumps. LSI equipment is found in approximately 2,000 fleets throughout the state operating at warehouses and distribution centers, seaports, airports, railyards, manufacturing plants, and many other commercial and industrial facilities.

CARB first adopted emission standards for off-road LSI engines in 1998. The original LSI regulation required engine manufacturers to certify new LSI engines to a 3.0 gram per brake horsepower-hour (g/bhp-hr) standard that, by 2004, represented a 75 percent reduction in emissions compared with uncontrolled LSI. Building on this success, in 2002, U.S. EPA subsequently harmonized the national standard with California's standard, starting with the 2004 model year and adopted a more stringent 2.0 g/bhp-hr standard for 2007 and subsequent model year engines. The federal program demonstrated that additional reductions from new engines were technically feasible and cost-effective. In the 2003 State Implementation Plan for Ozone (2003 SIP), California committed to two additional LSI measures—one for the development of more stringent new engine standards and another for the development of in-use fleet requirements.

CARB adopted these two LSI measures in a 2006 rulemaking, which harmonized California's standard with U.S. EPA's 2.0 g/bhp-hr standard starting with the 2007 model year, set forth a more stringent 0.6 g/bhp-hr California standard starting with the 2010 model year, and established in-use LSI fleet requirements. The 0.6 g/bhp-hr standard represents a 95 percent emission reduction versus uncontrolled LSI engines and is still in effect today.

The in-use element of the 2006 rulemaking, adopted as the Large Spark-Ignition Engine Fleet Requirements Regulation (LSI Fleet Regulation), which was eventually amended in 2010 and 2016, requires fleet operators with four or more LSI forklifts to meet fleet average emission standards. The 2006 LSI rulemaking and 2010 amendments required specific hydrocarbon + NOx fleet average emission level standards that became increasingly more stringent over time. The focus of the 2016 amendments was to collect data from fleet operators in order to inform the development of requirements that would support the broad-scale deployment of Zero-Emission equipment in LSI applications. The 2016 amendments also required fleet operators to report key compliance information to CARB, and extended to 2023 requirements from the prior LSI Fleet Regulations that were otherwise due to sunset in 2016.

D.1.3.7 Cargo Handling Equipment (CHE)

Cargo handling equipment (CHE) include yard trucks (hostlers), rubber-tired gantry cranes, container handlers, forklifts, dozers, and other types. The Cargo Handling Equipment (CHE) Regulation established requirements for in-use and newly purchased diesel-powered equipment at ports and intermodal rail yards. CARB adopted the CHE in 2005, which established best available control technology (BACT) for new and in-use

mobile CHE that operate at California's ports and intermodal rail yards through accelerated turnover of older equipment through retrofits and/or replacement to cleaner on- or off-road engines. Since 2006, the CHE Regulation has resulted in reductions of diesel PM and NOx at ports and intermodal rail yards throughout California.

D.1.3.8 Incentive Programs

There are many different incentive programs focusing on off-road mobile sources that increase the penetration of cleaner technologies into the market. The incentive programs encourage the purchase of cleaner off-road combustion engines and equipment, and zero-emission technologies. CARB is expanding incentives for zero-emission off-road equipment through targeted demonstration and pilot project categories in the off-road sector, and increased funding.

a) Low Carbon Transportation Investments and Air Quality Improvement Program (Clean Transportation Incentives)

As mentioned earlier, $873 million was allocated in the FY 2020-2021 budget for off-road equipment and on-road heavy-duty trucks under the Clean Transportation Incentives programs. In the off-road sector, major programs include the Clean Off-Road Equipment Voucher Incentive Project (CORE), and Demonstration and Pilot Programs. Off-road equipment categories that are prioritized for funding include agricultural and construction equipment, small off-road engines (SORE) such as lawn and garden equipment, heavier cargo handling equipment (CHE), and ZE applications at railyards, marine ports, freight facilities, and along freight corridors.

i. Clean Off-Road Equipment Voucher Incentive Project

The Clean Off-Road Equipment Voucher Incentive Project (CORE) is a voucher project similar to HVIP, but for advanced technology off-road equipment. CORE is intended to accelerate deployment of advanced technology in the off-road sector by providing a streamlined way for fleets to access funding that helps offset the incremental cost of such technology. CORE targets commercial-ready products that have not yet achieved a significant market foothold. By promoting the purchase of clean technology over internal combustion options, the project is expected to reduce emissions, particularly in areas that are most impacted, help build confidence in zero-emission technology in support of CARB strategies and subsequent regulatory efforts where possible, and provide other sector-wide benefits, such as technology transferability, reductions in advanced-technology component costs, and larger infrastructure investments. CORE provides vouchers to California purchasers and lessees of zero-emission off-road equipment on a first-come, first-served basis, with increased incentives for equipment located in disadvantaged communities.

CARB launched CORE at the end of 2019 through a one-time $40 million allocation in the fiscal year 2017-18 Funding Plan to support zero-emission freight equipment through CORE. Since that time, CORE has been allocated significant additional funds,

including $194.95 million from the FY 2021-22 budget. This allocation includes $30 million of dedicated funds appropriated by the Legislature in SB 170 to provide incentives for professional landscaping services in California operated by small businesses or sole proprietors to purchase zero-emission small off-road equipment.

ii. Demonstration and Pilot Projects

As mentioned earlier, in FY 2021-22, $80 million was allocated for off-road and on-road heavy-duty advanced technology demonstration and pilot projects. CARB is focusing funding on off-road demonstration and pilot projects that include heavier cargo handling equipment (CHE), clean equipment in rail, marine, and ports applications, and zero-emission equipment along freight facilities/corridors.

For the *Port of LA Multi-Source Facility Demonstration Project*, the Los Angeles Harbor Department (Port of LA) was awarded $14.5 million to operate multiple near zero- or zero-emission technologies to move goods from ships through the Green Omni Terminal. This project is demonstrating the viability of electrified CHE, forklifts, and a ships at-berth vessel emissions control system. The *Zero-Emission Freight "Shore to Store"* Project will use $41.1 million to fund electric yard tractors, hydrogen fuel cell Class 8 on-road trucks, and a large capacity hydrogen fueling station in Ontario, CA. Additional zero- and near zero-emission freight facility projects include a $5.8 million *Zero-Emission for California Ports* project at the Port of LA, which will fund hybrid fuel cell and electric yard trucks, as well as hydrogen fueling stations. Further, the San Joaquin Valley's *Net-Zero Farming and Freight Facility Demonstration Project* is funding battery electric trucks equipped with all-electric transport refrigeration units (eTRUs) to facilitate clean freight transport, and transportation of agricultural produce between packing and warehouse facilities.

b) Funding Agricultural Replacement Measures for Emission Reductions (FARMER)

California's agricultural industry consists of approximately 77,500 farms and ranches, providing over 400 different commodities, making agriculture one of the State's most diverse industries. In recognition of the strong need and this industry's dedication to reducing their emissions, the Legislature has allocated over $323 million towards the Funding Agricultural Replacement Measures for Emission Reductions (FARMER) Program since 2017. The program provides funding through local air districts for incentivizing the introduction of lower-emissions agricultural harvesting equipment, heavy-duty trucks, agricultural pump engines, tractors, and other equipment used in agricultural operations. Since October 2019, the FARMER Program also includes a project category for demonstration projects and modifications to the zero-emission agricultural utility terrain vehicle (UTV), heavy-duty agricultural truck, and off-road mobile agricultural equipment trade-up pilot project categories. As of September 30, 2021, the FARMER Program has spent $289.7 million on over 6,600 pieces of agricultural equipment and will reduce 1,120 tons of PM2.5 and 18,700 tons of NOx over the lifetime of the projects, Statewide.

c) Moyer Program

In addition to funding on-road incentives, the Moyer Program provides monetary grants to reduce emissions from off-road equipment such as construction and agricultural equipment, marine vessels and locomotives, forklifts, TRUs, and airport ground support equipment.

d) Goods Movement Emission Reduction Program (Prop 1B)

As discussed earlier, Proposition 1B was a $1 billion partnership between CARB and local agencies, air districts, and seaports to quickly reduce air pollution emissions and health risk from freight movement along California's trade corridors. Over the course of six years, the program has upgraded ships at-berth, cargo handling equipment, locomotives, TRUs, and harbor craft.

D.1.4 Conclusion

In conclusion, CARB has implemented the most comprehensive mobile source emissions control program in the nation. CARB's mobile source control program is robust and targets all sources of emissions through a four-pronged approach. First, increasingly stringent emissions standards drive the use of the cleanest available engines and equipment, and minimize emissions from new vehicles and equipment. Second, to speed the turnover of older, dirtier engines and equipment to cleaner new equipment, in-use programs target emissions from the existing fleet by requiring vehicle and fleet owners to transition legacy fleets and vehicles to the cleanest vehicles and emissions control technologies. Third, incentive programs help fleet owners to replace older, dirtier vehicles and equipment with the cleanest technologies, while also facilitating the development of the next generation of clean technologies that are needed to meet future air quality targets. Finally, cleaner fuels minimize emissions from all combustion engines being used across the State.

This multi-faceted approach has not only spurred the development and use of increasingly cleaner technologies and fuels, it has also provided significant emission reductions across all mobile source sectors that go far beyond national programs or programs in other states.

D.2 DISTRICT INNOVATIVE MOBILE SOURCE STRATEGIES

Although the District does not have direct regulatory authority over mobile source emissions standards, the District collaborates with its interagency partners and uses innovative approaches to reduce mobile source emissions. In addition to operating amongst the largest and comprehensive incentive grant programs in the nation (detailed in Appendix E), the District has adopted innovative regulations such as District Rule 9510 (Indirect Source Review) and District Rule 9410 (Employer Based Trip Reduction) to reduce emissions from mobile sources utilizing specific authorities provided under state and federal law. In addition to these measures, the District continues to evaluate additional opportunities to further reduce emissions from mobile sources.

D.2.1 Rule 9510 Indirect Source Review

Rule 9510 (Indirect Source Review, or ISR), adopted in 2005 and subsequently amended in 2017, is the first and only rule of its kind in the State of California and throughout the nation. The purpose of this rule is to reduce growth in both NOx and PM10 emissions from mobile and area sources associated with construction and operation of new development projects in the Valley by encouraging clean air designs to be incorporated into the development project.

To address the rule requirements and achieve emissions reductions at the project site and within local communities, developers incorporate clean air measures into their project designs to reduce emissions impacts at project locations. Some examples include: use of clean, newer model-year off-road construction equipment, zero emission and or near-zero emission heavy duty on-road truck and van fleets, zero emission on-site equipment, installation of electric vehicle charging infrastructure, solar power, installation of bike paths and sidewalks, and high-efficiency buildings.

If on-site clean air measures implemented by a developer do not achieve the emission reductions mandated by the ISR rule, the developer must pay an off-site mitigation fee for balance of the emission reductions required for the project. One hundred percent of off-site mitigation fees are used by the District to fund emission reduction projects through its incentive grant programs.

In addition to reducing the development project's impact on air quality through compliance with the District's Indirect Source Review rule, a developer can further

reduce the project's impact on air quality by entering into a "Voluntary Emission Reduction Agreement" (VERA) with the District to address the mitigation requirements under the California Environmental Quality Act (CEQA) or National Environmental Policy Act (NEPA). Under a VERA, the developer may fully mitigate project emission impacts by providing funds to the District, which are then used by the District to administer emission reduction projects.

To date, in addition to avoiding over 19,000 tons of NOx and PM10 emissions from new development through the incorporation of on-site mitigation and clean-air design measures into projects subject to the ISR rule, the District has achieved over 17,000 tons of reductions in NOx and PM10 emissions through the investment of over $140 million dollars in ISR and VERA funds through its emission reduction grants and incentives programs.

The District's rule is recognized as the benchmark, or best available control, for regulating these indirect sources of emissions. State and federal laws establish the District's authority regulating indirect sources.[2] These complex legal requirements were well documented and litigated as the District spent over five years successfully defending its existing rule through the highest courts at the state and federal levels.

In May 2021, the South Coast Air Quality Management District (SCAQMD) replicated the District's success in the development of their own ISR rule, utilizing the District's experience and regulatory language to help guide their efforts. SCAQMD Rule 2305 applies to both the operators and owners of new and existing warehouses greater than or equal to 100,000 square feet in size, and targets exhaust emission from mobile sources. Implementation of this rule will require warehouses to be phased in over a 3-year period based on their size.

The general approach of the SCAQMD ISR rule is similar to the District's ISR rule in that it requires clean air project design elements to reduce NOx and particulate emissions, and payment of a mitigation fee, if necessary, to achieve remaining rule requirements. It differs in that it applies to operational mobile source emissions from existing and new warehouses only, whereas, the District's ISR rule applies to both construction and operational mobile and area source emissions from various new residential, commercial, industrial, transportation, and other development projects, including warehouses. As was the case with the District's ISR rule, SCAQMD ISR rule is being challenged and is currently under litigation due to a lawsuit filed in 2021 by the California Trucking Association. The District is currently monitoring this case and will evaluate the outcomes and potential opportunities as future enhancements to the District's ISR rule are considered.

D.2.2 Rule 9410 Employer Based Trip Reduction

Although the District does not have authority to regulate tailpipe emissions, the District is authorized by state and federal law to adopt regulatory approaches to promote the

[2] California Health and Safety Code section 40604 and CAA section 110(a)(5)(A)(i)

reduction of vehicle miles traveled.[3] Rule 9410 (Employer Based Trip Reduction, or eTRIP) was adopted by the District Governing Board on December 17, 2009. The goal of eTRIP is to reduce single-occupancy-vehicle work commutes by requiring the Valley's larger employers to select and implement workplace measures that make it easier for their employees to choose ridesharing and alternative transportation. The eTRIP Rule can apply to worksites in incorporated cities with a population of at least 10,000 people OR worksites where at least 50% of all employees work at least 2,040 hours per year. Out of the worksites that meet these criteria, the eTRIP Rule applies to employers with at least 100 eligible employees at a worksite. For the eTRIP Rule, a worksite includes any satellite buildings within one mile of a central location.

Employers subject to the Rule must establish an Employer Trip Reduction Implementation Plan to encourage employees to reduce single-occupancy vehicle trips, thus reducing pollutant emissions associated with work commutes. Because of the diversity of employers covered by eTRIP, the rule was built with a flexible, menu-based approach. Using eTRIP, employers choose from a list of measures, each contributing to a workplace that encourages employees to reduce their dependence on single-occupancy vehicles. Each measure has a point value, and Employer Trip Reduction Implementation Plans must reach specified point targets for each strategy over a phased-in compliance schedule (2010–2015).

D.2.3 Clean Landscaping Equipment and Practices

The District has long supported efforts to address emissions from the use of landscaping equipment, including through the deployment of clean zero-emissions equipment under the Clean Green Yard Machines (CGYM) program, which provides funding for the replacement of old gas-powered lawn and garden equipment with new electric equipment. The Residential CGYM program, launched in 2001, has replaced over 7,400 lawn mowers with over $1.5 million in funding. In May 2019, the District launched the Commercial CGYM program, which provides incentive funding for the replacement of gas powered landscape maintenance equipment, with battery operated zero emission technology. Additionally, the Commercial CGYM program provides incentive funds for up to two batteries and one charger to ensure that the equipment is capable of operating for a full day of work. In support of the District's efforts, the District has been awarded $6 million in state funding to be utilized by the District to continue deployment of clean landscaping equipment.

The District does not currently have any prohibitory rules specifically addressing lawn care emissions, though the 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.

[3] California Health and Safety Code sections 40612(a)(2) and 40601(d), and CAA sections 182(d)(1)(B) and 182(e)

State and Federal Regulations

Existing CARB and EPA emission standards for small off-road engines (SORE), which primarily includes lawn and garden equipment, have led to substantial emission reductions in California. Since 2000, emissions of pollutants that contribute to ozone and PM2.5 formation from SORE have decreased by 50 percent. Even so, in California, SORE emit more NOx and reactive organic gases (ROG) than light-duty passenger cars, both in summer and annually.[4]

In September 2020, Governor Gavin Newsom issued Executive Order (EO) N-79-20, which set a goal to transition to 100 percent zero-emission off-road vehicles and equipment by 2035 where feasible. Additionally, the Governor approved Assembly Bill (AB) 1346 in October of 2021, which required CARB to adopt cost-effective and technologically feasible regulations by July 1, 2022, to prohibit engine exhaust and evaporative emissions from new small off-road engines, applicable to engines produced on or after January 1, 2024, or as soon as feasible.

CARB's SORE rule, adopted in 1990 and amended several times, establishes tiered exhaust and evaporative emission standards for small off-road engines rated at or below 25 horsepower. In December of 2021, CARB adopted amendments to the SORE regulation to require most newly manufactured SORE engines be zero-emission starting in 2024, which will help achieve further emission reductions from lawn and garden equipment.[5] Deployment of zero-emission equipment is key to meeting the expected emission reductions in CARB's 2016 State SIP Strategy, the goals of EO N-79-20, and the requirements of AB1346.

CARB's amended rule sets SORE emission standards to zero in two phases. First, for model year (MY) 2024 and all subsequent model years, exhaust and evaporative emission standards are zero. These emission standards of zero apply for engines used in all equipment types produced for sale or lease for operation in California, except generators. Generator emission standards will be more stringent than the existing emission standards starting in MY 2024, but will not be zero. CARB will implement the second phase starting in MY 2028, when the emission standards for generators will be zero. These amendments update emission standards for new SORE in California and do not affect equipment already in use.

To support the deployment of zero-emission SORE, CARB has made funding available for landscape professionals to purchase discounted zero-emission lawn mowers, blowers, and other equipment through their Clean Off-Road Equipment Voucher Incentive Project (CORE). The CORE program, administered by CALSTART, has more

[4] CARB. *Staff Report: Initial Statement of Reasons for the Proposed Amendments to the Small Off-Road Engine Regulations: Transition to Zero Emissions.* October 12, 2021. Retrieved from https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2021/sore21/isor.pdf

[5] CARB. CARB approves updated regulations requiring most new small off-road engines be zero emission by 2024. December 9, 2021. Retrieved from: https://ww2.arb.ca.gov/news/carb-approves-updated-regulations-requiring-most-new-small-road-engines-be-zero-emission-2024

than $27 million of voucher funds allocated for professional landscape services operated by small businesses or sole proprietors as of November 2022.

Emission Reduction Opportunities

In light of new opportunities, the District will work with landscaping services and local jurisdictions to pursue options for accelerating the deployment of newly available commercial zero-emissions equipment, promoting landscaper training and green certification programs, and promoting best practices to reduce exposure through episodic and zoning recommendations (e.g. limiting leaf blower use around children during school hours, "green zones"). See Chapter 3.

- ***Accelerated Deployment of New Commercial Zero-Emission Equipment:*** In recent years, there has been a significant increase in the availability of zero emission lawn and garden equipment, for both residential and professional use. The level of performance, number of brands, and number of equipment options have increased greatly and continue to do so today. Battery and electric motor technology has advanced rapidly in recent years, while costs have declined. New technologies, such as brushless electric motors, have led to a significant increase in the efficiency of equipment. Using zero emission equipment is technologically feasible in many cases, and can offer significant cost-savings to professional users. The District will evaluate opportunities to accelerate the deployment of this equipment through significantly expanded funding opportunities and strong outreach efforts in partnership with local organizations, cities, counties, and other Valley partners.

- ***Landscaper Training and Green Certification Programs:*** The District will evaluate opportunities to promote and potentially provide training and hands-on exposure to landscapers on the operation of zero-emission equipment, to ensure proper use and promote safe and efficient practices, and promote green certification programs.

- ***Promotion of Best Management Practices to Reduce Exposure:*** Another potential control strategy would be to assist in the development and promotion of Best Management Practices (BMPs) for the use of lawn and garden equipment in residential, commercial, educational, and other settings. This BMP option would focus on developing guidance, outreach materials, and recommendations for conducting landscaping operations as cleanly as possible through the use of zero-emissions equipment and enhanced practices. Through this effort, the District will evaluate potential recommendations for episodic control during high-pollution days, or zoning, such as promoting "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," could potentially be included as a part of the Healthy Air Living outreach program to individual businesses, schools, cities, and counties.

D.3 TRANSPORTATION CONFORMITY

[This section provided by California Air Resources Board]

D.3.1 Introduction

The California Air Resources Board (CARB) has prepared the motor vehicle emissions budget (MVEB)[6] for the 70 parts per billion (ppb) 8-hr ozone National Ambient Air Quality Standard (NAAQS). The MVEB is the maximum allowable emissions from motor vehicles within an air basin and is used for determining whether transportation plans and projects conform to the applicable State Implementation Plan (SIP).

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

The MVEBs are set for each criteria pollutant or its precursors for each milestone year and the attainment year of the SIP. Subsequent transportation plans and programs produced by transportation planning agencies must conform to the budgets by demonstrating that the emissions from the proposed plan, program, or project do not exceed the MVEBs established in the applicable SIP. The MVEBs established in this SIP apply as a “ceiling” or limit on transportation emissions for the eight San Joaquin Valley metropolitan planning organizations (MPO)[7] for the years in which they are defined and for all subsequent years until another year for which a different budget is specified, or until a SIP revision modifies the budget. For the San Joaquin Valley Air Pollution Control District’s (District) 70 ppb 8-hr ozone SIP, the milestone years and the attainment year of the SIP (also referred to as the plan analysis years) are 2023, 2026, 2029, 2032, 2035, and 2037.

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

[7] This includes the Fresno Council of Governments (FCOG), Kern Council of Governments (KCOG) [SJV portion of KCOG], Kings County Association of Governments (KCAG), Madera County Transportation Commission (MCTC), Merced County Association of Governments (MCAG), San Joaquin Council of Governments (SJCOG), Stanislaus Council of Governments (StanCOG), and Tulare County Association of Governments (TCAG).

D.3.2 Methodology

The MVEB for 70 ppb ozone SIP is established based on guidance from the U.S. EPA on the motor vehicle emission categories and precursors that must be considered in transportation conformity determinations as found in the transportation conformity regulation and final rules as described below.

The MVEB must be clearly identified and precisely quantified, and consistent with applicable CAA requirements for reasonable further progress and attainment toward meeting NAAQS. Further, it should be consistent with the emission inventory and control measures in the SIP.

The 70 ppb 8-hr ozone SIP establishes budgets for Reactive Organic Gases (ROG) and Nitrogen Oxide (NOx) emission precursors using emission rates from California's motor vehicle emission model, EMFAC2017 (V.1.0.3)[8], using activity data (vehicle miles traveled [VMT] and speed distributions) from the eight SJV MPOs from their 2019 Federal State Transportation Improvement Program (FSTIP) amendment.[9]

On August 15, 2019, the U.S. EPA approved EMFAC2017 for use in SIPs and to demonstrate transportation conformity.[10] The EMFAC model estimates emissions from two combustion processes (start and running) and four evaporative processes (hot soak, running loss, diurnal, and resting loss). In addition, the emissions output from the EMFAC2017 model was adjusted to account for the impacts of recently adopted regulations and regulations currently under development that are not reflected in the EMFAC2017 model using off-model adjustments.[11] The regulations incorporated in this way are the Heavy-Duty (HD) Warranty Phase 1, Innovative Clean Transit (ICT), Amendments to the Heavy-Duty Vehicle Inspection Program (HDVIP), Periodic Smoke Inspection Program (PSIP), Advanced Clean Trucks (ACT), Heavy-Duty (HD) Omnibus, Advanced Clean Cars II (ACC II), and Advanced Clean Fleets (ACF).

The MVEB for this SIP was developed to be consistent with the on-road emissions inventory[12] and attainment demonstration, using the following method:

1) Used the EMFAC2017 model to produce an initial/preliminary calculation of the on-road motor vehicle emissions totals (average summer day) for the appropriate pollutants (ROG and NOx) using 2019 FSTIP activity data.
2) Applied the off-model adjustments to account for recently adopted regulations.

[8] More information on data sources can be found in the EMFAC technical support documentation at: https://ww2.arb.ca.gov/our-work/programs/mobile-source-emissions-inventory/msei-road-documentation
[9] 2019 Federal Statewide Transportation Improvement Program (FSTIP) (ca.gov)
[10] U.S. EPA approval of EMFAC2017 can be found at 84 FR 41717 https://www.federalregister.gov/d/2019-17476
[11] Off-Model Adjustment Factors to Account for Recently Adopted Regulations in EMFAC2017 Model https://ww2.arb.ca.gov/our-work/programs/mobile-source-emissions-inventory
[12] More information about the on-road motor vehicle emissions inventory can be found in Appendix B of the plan.

3) Expected emission reductions from ACC II and ACF were subtracted to be consistent with the on-road control measures committed in the 2022 State SIP Strategy for the San Joaquin Valley region.[13]
4) Rounded the totals for both ROG and NOx to the nearest tenth ton.

D.3.3 Motor Vehicle Emissions Budgets

The MVEB in Table D-1 was established according to the methodology outlined above and in consultation[14] with the eight SJV MPOs, the air district, U.S. EPA, Federal Highway Administration (FHWA), and Federal Transit Administration (FTA). The MVEB is consistent with the emission inventories and control measures in the 70 ppb 8-hr ozone SIP. These budgets will be effective once U.S. EPA determines it is adequate.

[13] 2022 State Strategy for the State Implementation Plan https://ww2.arb.ca.gov/resources/documents/2022-state-strategy-state-implementation-plan-2022-state-sip-strategy
[14] To satisfy the requirements established in 40 CFR Part 93, Section 118(e)(4)(ii).

Table D-1 contains the Summary MVEB for the eight San Joaquin Valley MPO regions. This includes ozone precursor pollutants of ROG and NOx emissions for milestone and attainment years using the EMFAC2017 model and 2019 FSTIP activity data.

Table D-1 Summary MVEB for the 70 ppb Ozone Standard (Summer Season) for each MPO within the SJV Region (tons per day)

	2023		2026		2029		2032		2035		2037	
MVEB (tpd)	**ROG**	**NOx**	**ROG**	**NOx**	**ROG**	**NOx**	**ROG**	**NOx**	**ROG**	**NOx**	**ROG**	**NOx**
Fresno (FCOG)	5.3	11.6	4.8	8.0	4.3	6.5	3.9	5.7	3.6	5.1	3.0	3.0
Kern (KCOG)	3.9	13.5	3.9	8.8	3.7	7.3	3.4	6.4	3.2	5.9	2.7	4.0
Kings (KCAG)	0.8	2.5	0.8	1.6	0.7	1.3	0.7	1.2	0.6	1.1	0.6	0.8
Madera (MCTC)	1.1	2.5	0.9	1.6	0.8	1.3	0.7	1.1	0.7	1.0	0.6	0.6
Merced (MCAG)	1.6	5.5	1.4	3.5	1.3	2.8	1.1	2.4	1.0	2.2	0.8	1.5
San Joaquin (SJCOG)	3.6	7.0	3.2	4.8	2.9	3.9	2.6	3.3	2.4	2.9	2.0	1.5
Stanislaus (StanCOG)	2.4	4.5	2.2	3.2	2.0	2.6	1.7	2.2	1.6	2.0	1.3	1.0
Tulare (TCAG)	2.3	4.2	2.0	2.9	1.8	2.3	1.6	1.9	1.4	1.7	1.2	0.8

Tables D-2 through D-7 contain detailed MVEBs for each milestone and attainment year for the eight San Joaquin Valley MPO regions. In addition, it provides emissions from the EMFAC 2017 model, recently adopted regulations, and regulations currently under development using off-model adjustments for both ROG and NOx emissions. The final MVEBs were rounded upwards to the nearest tenth.

Table D-2 MVEB for the 70 ppb Ozone Standard (Summer Season) for 2023

Emissions (Tons/Day)	Fresno		Kern		Kings		Madera		Merced		San Joaquin		Stanislaus		Tulare	
	ROG	NOx	ROG	NOx	ROG	NOx	ROG	NOx	ROG	NOx	ROG	NOx	ROG	NOx	ROG	NOx
Vehicular Exhaust	5.3	12.2	4.2	14.4	0.8	2.6	1.0	2.6	1.6	5.9	3.6	7.3	2.4	4.7	2.3	4.3
Reductions from recently adopted regulations using off-model adjustment[a]	0.00	0.66	0.00	0.93	0.00	0.17	0.00	0.15	0.00	0.38	0.00	0.36	0.00	0.21	0.00	0.19
Reductions from regulations under development using off-model adjustment[b]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total[c]	5.27	11.6	4.23	13.5	0.83	2.44	1.03	2.48	1.56	5.47	3.57	6.94	2.38	4.50	2.30	4.16
Motor Vehicle Emission Budget[d]	5.3	11.6	4.3	13.5	0.9	2.5	1.1	2.5	1.6	5.5	3.6	7	2.4	4.5	2.3	4.2

[a] This reflects the adjustment factor for HD Warranty Phase 1, ICT, HDVIP/PSIP, ACT, and HD Omnibus regulations.

[b] This reflects the on-road commitments for ACCII and ACF from the 2022 State SIP Strategy.

[c] Values from EMFAC2017 v1.03 may not add up due to rounding.

[d] Motor vehicle emission budgets calculated are rounded up to the nearest tenth of a tpd.

Source: EMFAC2017 v1.03

Table D-3 MVEB for the 70 ppb Ozone Standard (Summer Season) for 2026

Emissions (Tons/Day)	Fresno		Kern		Kings		Madera		Merced		San Joaquin		Stanislaus		Tulare	
	ROG	NOx	ROG	NOx	ROG	NOx	ROG	NOx	ROG	NOx	ROG	NOx	ROG	NOx	ROG	NOx
Vehicular Exhaust	4.7	11.9	3.9	14.3	0.8	2.6	0.9	2.4	1.3	5.7	3.1	6.8	2.1	4.4	2.0	3.9
Reductions from recently adopted regulations using off-model adjustment[a]	0.00	3.95	0.00	5.57	0.00	1.02	0.00	0.83	0.00	2.24	0.00	2.08	0.00	1.25	0.00	1.08
Reductions from developing regulations using off-model adjustment[b]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total[c]	4.72	7.92	3.88	8.76	0.76	1.58	0.86	1.57	1.35	3.45	3.13	4.71	2.10	3.16	1.98	2.83
Motor Vehicle Emission Budget[d]	4.8	8	3.9	8.8	0.8	1.6	0.9	1.6	1.4	3.5	3.2	4.8	2.2	3.2	2	2.9

[a] This reflects the adjustment factor for HD Warranty Phase 1, ICT, HDVIP/PSIP, ACT, and HD Omnibus regulations.

[b] This reflects the on-road commitments for ACCII and ACF from the 2022 State SIP Strategy.

[c] Values from EMFAC2017 v1.03 may not add up due to rounding.

[d] Motor vehicle emission budgets calculated are rounded up to the nearest tenth of a tpd.

Source: EMFAC2017 v1.03

Table D-4 MVEB for the 70 ppb Ozone Standard (Summer Season) for 2029

Emissions (Tons/Day)	Fresno		Kern		Kings		Madera		Merced		San Joaquin		Stanislaus		Tulare	
	ROG	NOx	ROG	NOx	ROG	NOx	ROG	NOx	ROG	NOx	ROG	NOx	ROG	NOx	ROG	NOx
Vehicular Exhaust	4.3	11.5	3.6	14.2	0.7	2.6	0.8	2.3	1.2	5.5	2.9	6.4	1.9	4.2	1.8	3.6
Reductions from recently adopted regulations using off-model adjustment[a]	0.01	5.01	0.01	7.01	0.00	1.27	0.00	1.04	0.00	2.77	0.01	2.63	0.00	1.64	0.00	1.36
Reductions from developing regulations using off-model adjustment[b]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total[c]	4.28	6.47	3.63	7.20	0.70	1.29	0.76	1.26	1.20	2.77	2.85	3.81	1.90	2.59	1.76	2.25
Motor Vehicle Emission Budget[d]	4.3	6.5	3.7	7.3	0.7	1.3	0.8	1.3	1.3	2.8	2.9	3.9	2	2.6	1.8	2.3

[a] This reflects the adjustment factor for HD Warranty Phase 1, ICT, HDVIP/PSIP, ACT, and HD Omnibus regulations.

[b] This reflects the on-road commitments for ACCII and ACF from the 2022 State SIP Strategy.

[c] Values from EMFAC2017 v1.03 may not add up due to rounding.

[d] Motor vehicle emission budgets calculated are rounded up to the nearest tenth of a tpd.

Source: EMFAC2017 v1.03

Table D-5 MVEB for the 70 ppb Ozone Standard (Summer Season) for 2032

Emissions (Tons/Day)	Fresno		Kern		Kings		Madera		Merced		San Joaquin		Stanislaus		Tulare	
	ROG	NOx	ROG	NOx	ROG	NOx	ROG	NOx	ROG	NOx	ROG	NOx	ROG	NOx	ROG	NOx
Vehicular Exhaust	3.9	11.3	3.4	14.3	0.7	2.6	0.7	2.3	1.1	5.4	2.6	6.2	1.7	4.1	1.6	3.4
Reductions from recently adopted regulations using off-model adjustment[a]	0.02	5.68	0.02	7.89	0.00	1.43	0.00	1.17	0.01	3.00	0.01	2.96	0.01	1.88	0.01	1.53
Reductions from developing regulations using off-model adjustment[b]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total[c]	3.87	5.61	3.37	6.37	0.65	1.15	0.69	1.09	1.05	2.36	2.60	3.27	1.70	2.19	1.56	1.87
Motor Vehicle Emission Budget[d]	3.9	5.7	3.4	6.4	0.7	1.2	0.7	1.1	1.1	2.4	2.6	3.3	1.7	2.2	1.6	1.9

[a] This reflects the adjustment factor for HD Warranty Phase 1, ICT, HDVIP/PSIP, ACT, and HD Omnibus regulations.

[b] This reflects the on-road commitments for ACCII and ACF from the 2022 State SIP Strategy.

[c] Values from EMFAC2017 v1.03 may not add up due to rounding.

[d] Motor vehicle emission budgets calculated are rounded up to the nearest tenth of a tpd.

Source: EMFAC2017 v1.03

Table D-6 MVEB for the 70 ppb Ozone Standard (Summer Season) for 2035

Emissions (Tons/Day)	Fresno		Kern		Kings		Madera		Merced		San Joaquin		Stanislaus		Tulare	
	ROG	NOx	ROG	NOx	ROG	NOx	ROG	NOx	ROG	NOx	ROG	NOx	ROG	NOx	ROG	NOx
Vehicular Exhaust	3.6	11.3	3.2	14.4	0.6	2.6	0.6	2.3	0.9	5.3	2.4	6.1	1.5	4.0	1.4	3.3
Reductions from recently adopted regulations using off-model adjustment[a]	0.03	6.27	0.04	8.60	0.01	1.57	0.01	1.29	0.01	3.20	0.02	3.24	0.01	2.10	0.01	1.67
Reductions from developing regulations using off-model adjustment[b]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total[c]	3.52	5.03	3.13	5.81	0.60	1.05	0.61	0.98	0.94	2.10	2.37	2.90	1.52	1.92	1.38	1.62
Motor Vehicle Emission Budget[d]	3.6	5.1	3.2	5.9	0.6	1.1	0.7	1	1	2.2	2.4	2.9	1.6	2	1.4	1.7

[a] This reflects the adjustment factor for HD Warranty Phase 1, ICT, HDVIP/PSIP, ACT, and HD Omnibus regulations.

[b] This reflects the on-road commitments for ACCII and ACF from the 2022 State SIP Strategy.

[c] Values from EMFAC2017 v1.03 may not add up due to rounding.

[d] Motor vehicle emission budgets calculated are rounded up to the nearest tenth of a tpd.

Source: EMFAC2017 v1.03

Table D-7 MVEB for the 70 ppb Ozone Standard (Summer Season) for 2037

Emissions (Tons/Day)	Fresno		Kern		Kings		Madera		Merced		San Joaquin		Stanislaus		Tulare	
	ROG	NOx	ROG	NOx	ROG	NOx	ROG	NOx	ROG	NOx	ROG	NOx	ROG	NOx	ROG	NOx
Vehicular Exhaust	3.4	11.4	3.1	14.6	0.6	2.7	0.6	2.3	0.9	5.3	2.3	6.1	1.5	4.0	1.3	3.3
Reductions from recently adopted regulations using off-model adjustment[a]	0.04	6.63	0.04	9.03	0.01	1.65	0.01	1.36	0.01	3.32	0.02	3.41	0.02	2.23	0.01	1.75
Reductions from developing regulations using off-model adjustment[b]	0.40	1.83	0.36	1.65	0.07	0.31	0.07	0.33	0.12	0.54	0.28	1.29	0.17	0.80	0.16	0.71
Total[c]	2.96	2.94	2.66	3.93	0.50	0.70	0.51	0.60	0.77	1.45	1.98	1.44	1.27	0.99	1.13	0.79
Motor Vehicle Emission Budget[d]	3	3	2.7	4	0.6	0.8	0.6	0.6	0.8	1.5	2	1.5	1.3	1	1.2	0.8

[a] This reflects the adjustment factor for HD Warranty Phase 1, ICT, HDVIP/PSIP, ACT, and HD Omnibus regulations.

[b] This reflects the on-road commitments for ACCII and ACF from the 2022 State SIP Strategy.

[c] Values from EMFAC2017 v1.03 may not add up due to rounding.

[d] Motor vehicle emission budgets calculated are rounded up to the nearest tenth of a tpd.

Source: EMFAC2017 v1.03

D.3.4 Local Reasonably Available Control Measures (RACM)

[This section provided by the Valley Metropolitan Planning Organizations]

Transportation control measures (TCMs), as defined in Section §108(f)(1)(A) of the Clean Air Act, were also considered as part of the RACM analysis for this Plan to meet RFP requirements and demonstrate attainment as expeditiously as practicable. In the spring of 2022, SJV MPOs contracted with Trinity Consultants to conduct a local RACM analysis focusing on identifying new candidate TCMs for each of the eight agencies. As transportation planning agencies, the SJV MPOs are responsible for TCM implementation and transportation conformity regulations require that the MPOs show timely implementation of all measures committed to a SIP.

Currently, qualifying TCMs are already being implemented in the Valley through planning efforts such as the Congestion Mitigation and Air Quality (CMAQ) cost-effectiveness policy adopted in 2007 by the SJV MPOs. The CMAQ program provides funding for transportation projects or programs that contribute to attainment or maintenance of federal air quality standards. The SJV CMAQ policy includes distributing at least 20 percent of the CMAQ funds to projects that meet a cost-effectiveness threshold for emission reductions. This policy focuses on achieving the most cost-effective emissions reductions while maintaining flexibility to meet local needs. The policy feasibility and minimum cost-effectiveness standard were most recently revisited in 2021 for the 2022 Regional Transportation Plans (RTPs) and 2023 Federal Transportation Improvement Plans (FTIPs).[15]

Every four years, each SJV MPO is required by federal law to update its long-range RTP, which is the blueprint for the region's investments in transportation projects in the Valley. Senate Bill 375 (SB 375) requires that all California MPOs adopt a Sustainable Community Strategy (SCS) with each RTP to demonstrate how per capita greenhouse gas (GHG) emission targets can be achieved by each agency through sustainable transportation and land-use planning. Although the focus of an SCS is on GHG emission reductions, the strategies contained in the SCS also produce criteria pollutant co-benefits (not quantified for this Plan).

As part of the 2022 RTP/2023 FTIP development, the SJV MPOs made every effort to address improvements to the regional multimodal transportation system in the following areas:

- *Active transportation*
- *Transportation demand management (TDM) efforts like telecommuting and employer-based trip reduction requirements*
- *Transportation system management (TSM) and other traffic flow improvements*
- *Improved transit options and frequency*
- *Clean bus replacement*

[15] The most recent Regional Transportation Plans (RTPs) and Federal Transportation Improvement Programs (FTIPs) are available on the websites for each of the Valley Metropolitan Planning Organizations.

- *Electricity charging station citing efforts*
- *Rideshare and vanpooling programs*
- *Land use planning*

Despite these efforts, the RACM analysis found that a number of additional candidate measures should be considered for implementation. These TCMs were grouped into the following categories:

1. *Non-Motorized Use Facilities (All)*
    a. Complete Streets/Transit Oriented Development. These projects focus on multi-modal ATP efforts near transit or that provide connectivity to other transit options.
    b. Informational Campaigns aiming to promote bike/ped transportation options (except Kern)
2. *Traffic Flow Improvements (All)*
    a. Educational Campaign on eco-driving
3. *Transit Improvements (Merced Only)*
    a. Educational and marketing campaign to promote the Bus and YARTS service
4. *Reduce SOV Travel (StanCOG Only)*
    a. Informational campaign to promote rideshare/vanpool/carpool options.

The local RACM analysis methodology and results are documented in the "Local Transportation Control Measure Review and Reasonably Available Control Measure Analysis for the San Joaquin Valley 2022 Ozone State Implementation Plan" technical memorandum dated June 25, 2022 by Trinity Consultants (Attachment A). The new TCMs identified as part of this RACM analysis for each MPO individually are listed in Tables D-8 through D-15 below.

The existing and newly identified TCMs strengthen SJV MPOs' commitment to continue contributing to the region's air quality attainment goals, as well as support statewide climate change efforts through SCS development and implementation.

Table D-8 Fresno New TCM Listing

TCM	Description	Project ID	Agency/City	Implementation Timeline
Complete Streets and Transit Oriented Development	California Ave between Fruit Ave and Mayor Ave/Tupman St; Install Class IV bicycle facilities, sidewalks, HAWK crossing, street lights along corridor, intersection reconfigurations.	LSTMP799	City of Fresno	2029
	Blackstone Ave between McKinley Ave to Shields Ave; Install Class IV bicycle facilities, traffic calming infrastructure, curb ramps and median nose recon, bus stop platforms, signing and striping.	LSTMP720	City of Fresno	2029
Encouragement of Pedestrian Travel	Promote pedestrian travel by implementing an informational campaign on new pedestrian facilities, safety and air quality benefits through updates to FCOG website.	NA	FCOG	2024
Encouragement of Bicycle Travel	Promote bike travel by implementing an informational campaign on bicycle transportation opportunities, safety, and air quality benefits through updates to FCOG website.	NA	FCOG	2024
Eco-driving educational program	Include information on eco-driving and related air quality benefits and fuel savings through FCOG website update.	NA	FCOG	2024

Table D-9 Kern New TCM Listing

TCM	Description	Project ID	Agency/City	Implementation Timeline
Complete Streets and Transit Oriented Development	Downtown Bicycle Connectivity Project	KER161011	City of Bakersfield	2026
Eco-driving educational program	Include information on eco-driving and related air quality benefits and fuel savings by updating CommuteKern.org website.	KER220501	KCOG	2024

Table D-10 Kings New TCM Listing

TCM	Description	Project ID	Agency/City	Implementation Timeline
Complete Streets and Transit Oriented Development	Construct sidewalks, ADA ramps, lighted crosswalks, and bike routes on Orange Ave and North Ave.	216-0000-0169	City of Corcoran	2023
	Construct sidewalks along various school routes, install high visibility crosswalks and ADA curb ramps.	216-0000-0169	City of Corcoran	2025
	Construct sidewalk and bicycle facility improvements on Whitley Ave. Provide connections to other bicycle paths and transit access.	216-0000-0169	City of Corcoran	2026
Encouragement of Pedestrian Travel	Promote pedestrian travel by implementing an informational campaign on new pedestrian facilities, safety and air quality benefits through updates to KCAG website.	NA	KCAG	2024

TCM	Description	Project ID	Agency/City	Implementation Timeline
Encouragement of Bicycle Travel	Promote bike travel by implementing an informational campaign on bicycle transportation opportunities, safety, and air quality benefits through updates to KCAG website.	NA	KCAG	2024
Eco-driving educational program	Include information on eco-driving and related air quality benefits and fuel savings through KCAG website update.	NA	KCAG	2024

Table D-11 Madera New TCM Listing

TCM	Description	Project ID	Agency/City	Implementation Timeline
Complete Streets and Transit Oriented Development	Construct Bicycle and Pedestrian Path; Road 225; Willow Creek Drive to Road 228	MAD102059	Madera County	2028
	City of Madera; Bicycle/Pedestrian Facilities - Fresno River Trail Between North-South Trail Behind Montecito Park and Granada Drive	MAD202086	City of Madera	2028
	City of Madera; Pedestrian facilities around Washington School	MAD217036	City of Madera	2028
	Riverside Avenue, 8th Street, & Kings Avenue Pedestrian Improvements Project	MAD302058	City of Chowchilla	2028
Encouragement of Pedestrian Travel	Promote pedestrian travel by implementing an informational campaign on new pedestrian facilities, safety and air quality benefits through updates to MCTC website.	NA	MCTC	2024

TCM	Description	Project ID	Agency/City	Implementation Timeline
Encouragement of Bicycle Travel	Promote bike travel by implementing an informational campaign on bicycle transportation opportunities, safety, and air quality benefits through updates to MCTC website.	NA	MCTC	2024
Eco-driving educational program	Include information on eco-driving and related air quality benefits and fuel savings through MCTC website update.	NA	MCTC	2024

Table D-12 Merced New TCM Listing

TCM	Description	Project ID	Agency/City	Implementation Timeline
Complete Streets and Transit Oriented Development	Livingston Phase 2 Max Foster Multiuse Path	205-0000-0317	City of Livingston	2024
	Gustine Pedestrian Improvements on 3rd Ave, East Ave, & South Ave	205-0000-0301	City of Gustine	2024
	Gustine Phase 3 Multiuse Path on Railroad, Meredith, & South Aves	205-0000-0316	City of Gustine	2025
	Merced Childs Ave Multiuse Path	205-0000-0319	City of Merced	2025
	Merced Pedestrian Improvements on McGregor, Woodward, Home, Windsor, and Parkwest	205-0000-0320	City of Merced	2026
Encouragement of Pedestrian Travel	Promote pedestrian travel by implementing an informational campaign on new pedestrian facilities, safety and air quality benefits through periodic updates to MCAG website.	NA	MCAG	Ongoing
Encouragement of Bicycle Travel	Promote bike travel by implementing an informational campaign on bicycle transportation opportunities, safety, and air quality benefits through periodic updates to MCAG website.	NA	MCAG	Ongoing

TCM	Description	Project ID	Agency/City	Implementation Timeline
Eco-driving educational program	Include information on eco-driving and related air quality benefits and fuel savings through periodic MCAG website updates.	NA	MCAG	Ongoing
Public education, outreach & marketing for "The Bus"	Promotion of "The Bus" transit service, overseen by the Transit Joint Powers Authority of Merced County (TJPAMC), through public outreach, education, and marketing campaigns at various community events and online for the transit-dependent public.	NA	TJPAMC	Ongoing
Public education, outreach & marketing for YARTS	Promotion of the Yosemite Area Regional Transportation System (YARTS) service including public outreach, community events, and extensive marketing, such as through Amtrak or in surrounding regions with informative materials and tools to prospective Yosemite visitors.	NA	YARTS	Ongoing

Table D-13 San Joaquin New TCM Listing

TCM	Description	Project ID	Agency/City	Implementation Timeline
Complete Streets and Transit Oriented Development	Various multi-modal connectivity projects throughout San Joaquin County.	212-0000-0780	Various	Ongoing
Encouragement of Pedestrian Travel	Promote pedestrian travel by implementing an informational campaign on new pedestrian facilities, safety and air quality benefits through periodic updates to SJCOG website.	NA	SJCOG	Ongoing
Encouragement of Bicycle Travel	Promote bike travel by implementing an informational campaign on bicycle transportation opportunities, safety, and air quality benefits through periodic updates to SJCOG website.	NA	SJCOG	Ongoing

TCM	Description	Project ID	Agency/City	Implementation Timeline
Eco-driving educational program	Include information on eco-driving and related air quality benefits and fuel savings through periodic SJCOG website updates.	NA	SJCOG	Ongoing

Table D-14 Stanislaus New TCM Listing

TCM	Description	Project ID	Agency/City	Implementation Timeline
Complete Streets and Transit Oriented Development	F St from Oakdale-Waterford Highway, Lateral Number Two Path (Proposed) to Dorsey St, Separated Bike Lane	RTP/SCS W20	City of Waterford	2025
	F St, from Bentley St to Hickman Rd, Separated Bike Lane	RTP/SCS W21	City of Waterford	2025
	The Robertson Road Elementary Safe Crossing and Active Transportation Connectivity Project	214-0000-0672	Stanislaus County	2026
	Waterford Safe Routes to School Project – Yosemite Blvd	214-0000-0672	City of Waterford	2026
	The Bret Harte Elementary Safe Crossing and Active Transportation Connectivity Project	214-0000-0672	Stanislaus County	2026
Encouragement of Pedestrian Travel	Promote pedestrian travel by implementing an informational campaign on new pedestrian facilities, safety and air quality benefits through periodic updates to StanCOG website.	NA	StanCOG	Ongoing
Encouragement of Bicycle Travel	Promote bike travel by implementing an informational campaign on bicycle transportation opportunities, safety, and air quality benefits through periodic updates to StanCOG website.	NA	StanCOG	Ongoing

TCM	Description	Project ID	Agency/City	Implementation Timeline
Eco-driving educational program	Include information on eco-driving and related air quality benefits and fuel savings through periodic StanCOG website updates.	NA	StanCOG	Ongoing
Rideshare/Carpool Informational Campaign	Promote carpool ad rideshare programs through information posted on StanCOG website linking to rideshare services available in the county.	NA	StanCOG	Ongoing

Table D-15 Tulare New TCM Listing

TCM	Description	Project ID	Agency/City	Implementation Timeline
Complete Streets and Transit Oriented Development	Development of an active transportation corridor (approximately 3.9 miles in length) to include solar lighting, water stations, wayfinding, benches, controlled lighted crossing systems.	215-0000-0726	City of Porterville	2032
Encouragement of Pedestrian Travel	Promote pedestrian travel by implementing an informational campaign on new pedestrian facilities, safety and air quality benefits through periodic updates to TCAG website.	NA	TCAG	Ongoing
Encouragement of Bicycle Travel	Promote bike travel by implementing an informational campaign on bicycle transportation opportunities, safety, and air quality benefits through periodic updates to TCAG website.	NA	TCAG	Ongoing
Eco-driving educational program	Include information on eco-driving and related air quality benefits and fuel savings through periodic TCAG website updates.	NA	TCAG	Ongoing

D.4 VEHICLE MILES TRAVELED (VMT) OFFSETS

Within two years of nonattainment designations for an ozone standard, CAA Section 182(d)(1)(A) requires states to submit enforceable transportation control strategies and transportation control measures to offset any growth in emissions from growth in vehicle miles traveled (VMT) or numbers of vehicle trips (VMT emissions offset demonstration) for severe and extreme areas[16].

On May 22, 2020, CARB staff published their 70 ppb Ozone SIP Submittal, consisting of the baseline emissions inventory and VMT emissions offset demonstrations for nonattainment areas for the 70 ppb 8-hour ozone standard, including the San Joaquin Valley[17]. The CARB Governing Board approved the 70 ppb Ozone SIP Submittal on June 25, 2020, and CARB subsequently submitted the document to U.S. EPA on July 27, 2020. CARB's 70 ppb Ozone SIP Submittal contains more information on the District's fulfillment of the CAA Section 182(d)(1)(A) requirements.

[16] CAA §182(d)(1)(A). https://www.govinfo.gov/content/pkg/USCODE-2013-title42/html/USCODE-2013-title42-chap85-subchapI-partD-subpart2-sec7511a.htm

[17] California Air Resources Board. *70 ppb Ozone SIP Submittal*. Released May 22, 2020. Retrieved from: https://ww3.arb.ca.gov/planning/sip/2017eivmt/ozone_sip_staff_report.pdf

This page intentionally blank.

Attachment A: Local Transportation Control Measure Review and Reasonably Available Control Measure Analysis for the San Joaquin Valley 2022 Ozone State Implementation Plan

[This Attachment provided by the Metropolitan Planning Organizations]

Trinity Consultants

MEMORANDUM

To: San Joaquin Valley Metropolitan Planning Organization (MPO) Staff

From: Alex Marcucci and Suriya Vallamsundar, Trinity Consultants

Date: June 25, 2022

RE: Local Transportation Control Measure Review and Reasonably Available Control Measure Analysis for the San Joaquin Valley 2022 Ozone State Implementation Plan

This memorandum presents the results and methodology for conducting local Reasonably Available Control Measure (RACM) analysis in support of the 2022 San Joaquin Valley (SJV) Ozone State Implementation Plan (SIP) for the 2015 8-hour ozone standard. In Spring of 2022, Trinity Consultants (Trinity) conducted a RACM analysis for the eight SJV Metropolitan Planning Organizations (MPOs) with a purpose to identify any additional transportation control measures (TCMs) in line with the requirements of the U.S. Environmental Protection Agency's (EPA's) Ozone Implementation Rule[1]. As regional transportation planning agencies, the SJV MPOs are responsible for TCM implementation and therefore are an important partner in conducting a RACM analysis during SIP development, given that any measure that is committed to in a SIP becomes federally enforceable upon EPA's approval of the plan and must be implemented (or correctly substituted) to maintain compliance with the federal requirements.

Background

On October 1, 2015, EPA issued a final rule strengthening the primary and secondary 8-hour ozone National Ambient Air Quality Standards (NAAQS) to 70 parts per billion (ppb). The SJV is currently designated as extreme nonattainment for 2015 8-hour ozone standard. According to the Ozone Implementation Rule, a RACM assessment must demonstrate that the region "has adopted all reasonable measures (including RACT) to meet Reasonable Further Progress (RFP) requirements and to demonstrate attainment as expeditiously as practicable." The purpose of the RACM analysis is to determine whether any additional TCMs exist that would advance the attainment date for nonattainment areas. Fulfillment of the RACM requirement is dependent on the selection of candidate control measures, assessment of their applicability to the region, and expedience of their implementation[2].

This RACM analysis focuses on TCMs or strategies that reduce travel and thereby achieve air quality benefits. Once TCMs are included in a SIP, SJV MPOs are legally bound to implement these measures in order to satisfy timely implementation demonstration (TID) requirements as part of the transportation planning process. If funds programmed for TCMs do not become available or if the schedule identified in a SIP cannot be met, the agency faces serious consequences, one of which could be a nonconforming regional transportation plan.

---

[1] *EPA, 2018. Implementation of the 2015 National Ambient Air Quality Standards for Ozone: State Implementation Plan Requirements. Final Rule. U.S. Environmental Protection Agency. Vol. 83. No. 234. December 6, 2018.*

[2] *EPA. 1999. Guidance on the Reasonably Available Control Measures (RACM) Requirement and Attainment Demonstration Submissions for Ozone Nonattainment Areas. Assessed at https://www3.epa.gov/ttn/naaqs/aqmguide/collection/cp2/19991130_seitz_racm_guide_ozone.pdf*

7919 Folsom Blvd Suite 320, Sacramento, CA 95826
P 916.444.6666 / F 916.444.8373

The criteria for identifying TCM projects and the requirements for timely implementation of these projects are defined in the EPA's Transportation Conformity Rule, 40 CFR Part 93:

> *A TCM is any measure that is specifically identified and committed to in the applicable implementation plan, including a substitute or additional TCM that is incorporated into the applicable SIP through the process established in CAA section 176(c)(8), that is either one of the types listed in CAA section 108, or any other measure for the purpose of reducing emissions or concentrations of air pollutants from transportation sources by reducing vehicle use or changing traffic flow or congestion conditions. Notwithstanding the first sentence of this definition, vehicle technology-based, fuel-based, and maintenance-based measures which control the emissions from vehicles under fixed traffic conditions are not TCMs for the purposes of this subpart.*

More specifically, the measures must meet the following criteria:

- Technological feasibility
- Economic feasibility
- Assessment of widespread and long-term adverse impacts
- Determination if the control measure is absurd, unenforceable, or impracticable
- If the control measures can advance the attainment date by at least one year

The methodology presented in this memo is specific to TCMs for transportation sources in the San Joaquin Valley and focuses on the following measures identified in Section 108(f)(1)(A) of the CAA:

(i) programs for improved public transit.
(ii) restriction of certain roads or lanes to, or construction of such roads or lanes for use by, passenger buses or high occupancy vehicles.
(iii) employer-based transportation management plans, including incentives.
(iv) trip-reduction ordinances.
(v) traffic flow improvement programs that achieve emission reductions.
(vi) fringe and transportation corridor parking facilities serving multiple occupancy vehicle programs or transit service.
(vii) programs to limit or restrict vehicle use in downtown areas or other areas of emission concentration particularly during periods of peak use.
(viii) programs for the provision of all forms of high occupancy, shared ride services.
(ix) programs to limit portions of road surfaces or certain sections of the metropolitan area to the use of non-motorized vehicles or pedestrian use, both as to time and place.
(x) programs for secure bicycle storage facilities and other facilities, including bicycle lanes, for the convenience and protection of bicyclists, in both public and private areas.
(xi) programs to control extended idling of vehicles.
(xii) programs to reduce motor vehicle emissions, consistent with title II, which are caused by extreme cold start conditions.
(xiii) employer-sponsored programs to permit flexible work schedules.
(xiv) programs and ordinances to facilitate non-automobile travel, provision, and utilization of mass transit, and to generally reduce the need for single-occupant vehicle travel, as part of transportation planning and development efforts of a locality, including programs and ordinances applicable to new shopping centers, special events, and other centers of vehicle activity.
(xv) programs for new construction and major reconstructions of paths, tracks or areas solely for the use by pedestrian or other non-motorized means of transportation when economically feasible and in the public interest.
(xvi) program to encourage the voluntary removal from use and the marketplace of pre-1980 model year light-duty vehicles and pre-1980 model light-duty trucks.

Control measures that have been implemented at the federal level, in other states, and in other local air districts should be considered. In addition, measures identified by EPA in any related guidance documents and measures that have been suggested during a public comment period must be considered. The TCMs may be voluntary or market-based programs, as long as they produce surplus, quantifiable, permanent, and enforceable emission reductions to be SIP-creditable. The TCM identified will need to be accompanied by information if the measures can be implemented and justification as to why measures would not be implemented based on technological, implementation authority, or economic grounds.

RACM Analysis Methodology

To ensure that sufficient evidence is compiled to support the inclusion or exclusion of an individual TCM, a step-by-step methodology for the assessment of RACM is detailed below.

Step 1: Identify measures currently implemented in the SJV

The first step consisted of developing a comprehensive listing of TCMs that are already being implemented in the eight SJV counties – Fresno, Kern, Kings, Madera, Merced, San Joaquin, Stanislaus, and Tulare. Several sources of data were explored to extract this information, such as the most recently approved and upcoming Regional Transportation Plan (RTP) and Federal Transportation Improvement Program (FTIP) project listings, Regional Active Transportation Plan (RATP), and existing TCM commitments for each MPO separately. In addition to county-specific projects, measures implemented at the Air Quality District and State levels in terms of rules, regulations, grants, incentives, and mitigation measures were also identified. Table 1 lists the data sources utilized for developing the comprehensive listing of current measures.

Table 1. Data Sources for Current SJV TCMs

MPO	Description	Data Source
Fresno	RACM/TID	2021/2023 FTIP, Conformity Analysis
	Exempt Project List	2018/2022 RTP, Appendix B
Kern	RACM/TID	2021/2023 FTIP, Conformity Analysis
	Exempt Project List	2018/2022 RTP, Appendix B
	State and Local Projects	2021/2023 FTIP, Appendix D
Kings	RACM/TID	2021/2023 FTIP, Conformity Analysis
	Exempt Project List	2018/2022 RTP, Appendix B
	GHG Reduction Project List	2018 RTP/SCS, Appendix C
Madera	RACM/TID	2021/2023 FTIP, Conformity Analysis
	Exempt Project List	2018/2022 RTP, Appendix B
	Regionally Significant Project List	2018/2022 RTP, Appendix B
	Priority Projects	2018/2022 RATP
Merced	RACM/TID	2021/2023 FTIP, Conformity Analysis
	Exempt Project List	2018/2022 RTP, Appendix B
	Regionally Significant Project List	2018/2022 RTP, Appendix B
San Joaquin	RACM/TID	2021/2023 FTIP, Conformity Analysis
	Exempt Project List	2018/2022 RTP, Appendix B
	Regionally Significant Project List	2018/2022 RTP, Appendix B
Stanislaus	RACM/TID	2021/2023 FTIP, Conformity Analysis
	Capital Improvement Project List	2018/2022 RTP, Appendix K
	Exempt Project List	2018/2022 RTP, Appendix B
	NMTP Project List	MPO
Tulare	RACM/TID	2021/2023 FTIP, Conformity Analysis

MPO	Description	Data Source
	Regionally Significant Project List	2018/2022 RTP, Appendix B
	Exempt Project List	2018/2022 RTP, Appendix B
	Priority Projects	2018/2022 RATP
Districtwide Measures	Rules and Regulations	*https://www.valleyair.org/rules/1ruleslist.htm#reg9*
	Grants and Incentives	*https://ww2.valleyair.org/grants/*
Statewide Measures	CARB Programs	*https://ww2.arb.ca.gov/our-work/programs*

Step 2: Develop a list of TCMs implemented in other nonattainment areas

Once existing TCMs were identified, the second step was to compile a list of all candidate TCMs that were implemented in other ozone nonattainment areas. For this analysis, the RACM review included relevant SIPs from ozone nonattainment areas for the 1997, 2008, and 2015 ozone standards. Due to the exhaustive nature of the TCMs implemented across the country, the focus of this step was on ozone nonattainment areas with most recent RACM assessments and most stringent ozone requirements. Table 2 shows the nonattainment areas, their designation, and the applicable SIPs reviewed for the SJV RACM analysis. A total of 230 TCMs were identified and further condensed to a total of 95 TCMs by utilizing only the measures that are significantly different in scope and emissions reduction potential. This master list formed the basis for the assessment of potential measures described in subsequent steps. It is important to note that some of the TCMs may be unique to the region where they are implemented and might not be feasible in the SJV. **Appendix A** contains the final TCM listing based on the SIP review for other areas.

Table 2. Ozone Nonattainment Areas Reviewed for Candidate TCMs

Region	Designation	Applicable SIP
Sacramento Area Council of Governments	Serious for 2008 Ozone Standards	2017 Sacramento Regional 2008 8-Hour Ozone Attainment and Further Progress Plan (inc. 2016 RACM Analysis)
San Diego Air Pollution Control District	Serious for 2008 Ozone Standards; Moderate for 2015 Ozone Standards	2020 Plan for Attaining the National Ozone Standards
Ventura County Air Pollution Control District	Serious for 2008 Ozone Standards	2016 Ventura Ozone SIP (inc. 2022 Ventura RACM Analysis)
South Coast Air Quality Management District (incl. Riverside and W. Mojave Desert)	Severe for 2008 Ozone Standards	2020 Air Quality Management Plan, South Coast Air Quality Management District (incl. 2016 RACM analysis)
Bay Area Air Quality Management District	Marginal for 2008 Ozone Standards	Final 2017 Clean Air Plan
Imperial County Air Pollution Control District	Moderate for 2008 Ozone Standards	2017 Imperial County State Implementation Plan for the 2008 8-hour Ozone Standard

The programs and regulations implemented in the SJV as a result of statewide or district-wide measures were also reviewed. The majority of these measures correspond to controlling extended idling of vehicles, encourage vehicle turnover, and employer-based trip reduction measures, etc. The District and Statewide programs are listed in Table 3 and Table 4, respectively.

Table 3. San Joaquin Valley Air District Control Measures

Transportation Control Measure	Implemented in SJV	Source
School Bus Fleets	Yes	SJV District Rules and Regulations
Employer Based Trip Reduction	Yes	SJV District Rules and Regulations
State Implementation Plan Credit for Emissions Reductions generated through Incentive Programs	Yes	SJV District Rules and Regulations
Indirect Source Review	Yes	SJV District Rules and Regulations
Rule 9410	Yes	SJV District Rules and Regulations
Emergency Vehicle Replacement Program	Yes	SJV Grants and Incentives
Clean Green Yard Machines: Commercial	Yes	SJV Grants and Incentives
Bike Paths	Yes	SJV Grants and Incentives
Alternate Fuel Mechanic Training	Yes	SJV Grants and Incentives
E-Mobility Commerce	Yes	SJV Grants and Incentives
Public Benefit	Yes	SJV Grants and Incentives
Charge Up	Yes	SJV Grants and Incentives
Electric School Bus Incentive Program	Yes	SJV Grants and Incentives
Plug in Electric Vehicle Resources Center	Yes	SJV Grants and Incentives
Public Transportation Subsidy and Park & Ride Lots	Yes	SJV Grants and Incentives
Heavy Duty Waste Haulers	Yes	SJV Grants and Incentives
Tune in Tune Up Car Repair Program	Yes	SJV Grants and Incentives
Drive Clean in the San Joaquin	Yes	SJV Grants and Incentives
Burn Cleaner	Yes	SJV Grants and Incentives
Vanpool Voucher	Yes	SJV Grants and Incentives
Clean Vehicle Fueling Infrastructure Program: Private Use	Yes	SJV Grants and Incentives
Clean Vehicle Fueling Infrastructure Program	Yes	SJV Grants and Incentives
Alternatives to Agricultural Open Burning Incentive Program	Yes	SJV Grants and Incentives
Low-Dust Nut Harvester Replacement Program	Yes	SJV Grants and Incentives
Farmer Ag Truck Replacement Program	Yes	SJV Grants and Incentives
Electrified Dairy Feed Mixing Program	Yes	SJV Grants and Incentives
Off-Road Replacement	Yes	SJV Grants and Incentives
Ag Pump Replacement	Yes	SJV Grants and Incentives
Hybrid Voucher Program	Yes	SJV Grants and Incentives
Agricultural Tractor Trade-Up Program	Yes	SJV Grants and Incentives
Tractor Replacement Program	Yes	SJV Grants and Incentives
Locomotives: Prop 1B	Yes	SJV Grants and Incentives
Off-Road Mobile Equipment Repowers	Yes	SJV Grants and Incentives
Trucks: Prop 1B	Yes	SJV Grants and Incentives
Truck Replacement	Yes	SJV Grants and Incentives
Public Transportation Subsidy and Park & Ride Lots	Yes	SJV Grants and Incentives
Zero-Emission Ag Utility Terrain Vehicle (UTV)	Yes	SJV Grants and Incentives
Locomotive Program	Yes	SJV Grants and Incentives
Restaurant Charbroiler Technology Partnership	Yes	SJV Grants and Incentives
Technology Advancement	Yes	SJV Grants and Incentives
Bicycle Infrastructure-Based Mitigation Measures (Provide bicycle enhancing infrastructure)	Yes	Mitigation Measures (Healthy Air Living)
Construction Equipment Mitigation Measures	Yes	Mitigation Measures (Healthy Air Living)
Control Measures for Construction Emissions of PM-10	Yes	Mitigation Measures (Healthy Air Living)
Other Operational Mitigation Measures (Implement NEV Network that corresponds to 'low speed vehicles' that are electric powered)	Yes	Mitigation Measures (Healthy Air Living)
Parking Operational Mitigation Measures: (a) Provide preferential parking, (b) Implement parking fees for single occupancy vehicle commuters, (c)Implement parking cash out program for employees	Yes	Mitigation Measures (Healthy Air Living)

Transportation Control Measure	Implemented in SJV	Source
Pedestrian Infrastructure-Based Mitigation Measures (Provide pedestrian Enhancing infrastructure)	Yes	Mitigation Measures (Healthy Air Living)
Rideshare Operational Mitigation Measures (Implement carpool/vanpool program)	Yes	Mitigation Measures (Healthy Air Living)
Services Operational Mitigation Measures: (a) Provide on-site shops and services for employees, (b) Provide on-site childcare, or contribute to offsite childcare within walking distance	Yes	Mitigation Measures (Healthy Air Living)
Shuttle Operational Mitigation Measures	Yes	Mitigation Measures (Healthy Air Living)
Transit Infrastructure-Based Mitigation Measures	Yes	Mitigation Measures (Healthy Air Living)
Transit Operational Mitigation Measures	Yes	Mitigation Measures (Healthy Air Living)
VMT Infrastructure-Based Mitigation Measures	Yes	Mitigation Measures (Healthy Air Living)

Table 4. California Air Resources Board Control Measures

Transportation Control Measure	Implementing Agency	Implemented in SJV?
Accessible Clean Transportation Options SB 350	ARB	Yes
Advanced Clean Cars (Low Emission Vehicle Standards IV LEV IV,), (Zero Emission Vehicle Regulation, ZEV)	ARB	Yes
Advanced Clean Fleets	ARB	Yes
Advanced Clean Trucks	ARB	Yes
Air Toxics Program	ARB	Yes
Airborne Toxic Control Measure to Limit Diesel-Fueled Commercial Motor Vehicle Idling	ARB	Yes
Alternative Diesel Fuels	ARB	Yes
Alternative Fuels	ARB	Yes
California Active Transportation Program	CTC	Yes
California Climate Investments	ARB	Yes
California Diesel Fuel Regulation	ARB	Yes
California Greenhouse Gas Emission Inventory Program	ARB	Yes
California Racing Vehicles	ARB	Yes
California Reformulated Gasoline	ARB	Yes
California's Parking Cash-out Law	ARB	Yes
Cargo Handling Equipment Regulation	ARB	Yes
Cargo Tank Vapor Recovery	ARB	Yes
Carl Moyer Program	ARB	Yes
Carpool Stickers	ARB	Yes
Clean Cars 4 All	ARB	Yes
Clean Miles Standard	ARB	Yes
Clean Off-Road Equipment Voucher Incentive Project	ARB	Yes
Clean Vehicle Rebate Project	ARB	Yes
Commercial Harbor Craft	ARB	Yes
Community Air Protection Incentives	ARB	Yes
Diesel Risk Reduction Plan	ARB	Yes
Drayage Truck Regulation	ARB	Yes
Electric Vehicle Supply Equipment (EVSE) Standards	ARB	Yes
Enhanced Fleet Modernization Program	ARB	Yes
FARMER Program	ARB	Yes
Fleet Rule for Transit Agencies	ARB	Yes
Freight Regulations Reporting System	ARB	Yes
Goods Movement Program/Proposition 1B	ARB/CTC	Yes
Greenhouse Gas Standards for Medium- and Heavy-Duty Engines and Vehicles	ARB	Yes
Heavy-Duty Diesel Inspection & Periodic Smoke Inspection Programs	ARB	Yes
Heavy-Duty Greenhouse Gas Certification Program	ARB	Yes
Heavy-Duty Greenhouse Gas Certification Program	ARB	Yes
Heavy-Duty Hybrid Electric Vehicle Certification Procedures	ARB	Yes
Heavy-Duty Low NOx	ARB	Yes
Heavy-Duty Vehicle Inspection Program	ARB/BAR	Yes
Hot Spots Analysis & Reporting Program	ARB	Yes
Hybrid Truck and Bus Voucher Incentive Program	ARB	Yes
Hydrogen Fueling Infrastructure	ARB	Yes
Idle Reduction Technologies for Sleeper Berth Trucks	ARB	Yes
Innovative Clean Transit	ARB	Yes
Innovative Technology Regulation	ARB	Yes
In-Use Off-Road Diesel Equipment Regulation	ARB	Yes
In-Use Off-Road Mobile Agricultural Equipment Regulation	ARB	Yes
Large Spark-Ignition (LSI) Engine Fleet Requirements Regulation	ARB	Yes
Low Carbon Transportation Investments and Air Quality Improvement Program	ARB	Yes
Low-Emission Vehicle Program	ARB	Yes
Lower-Emission School Bus Program	ARB	Yes

Transportation Control Measure	Implementing Agency	Implemented in SJV?
Minimizing Community Health Impacts from Freight	ARB	Yes
Mobile Source Emissions Research Program	ARB	Yes
OBD - On-Board Diagnostic Program	ARB	Yes
Ocean-Going Vessel Fuel Regulation	ARB	Yes
Ocean-Going Vessels At Berth Regulation	ARB	Yes
Off-Highway Recreational Vehicles	ARB	Yes
Off-Road Compression-Ignition Certification Program	ARB	Yes
Off-Road Large Spark-Ignition Equipment Regulation	ARB	Yes
On-Road Heavy-Duty Diesel Vehicles Regulation	ARB	Yes
On-Road Heavy-Duty Voucher Incentive Program	ARB	Yes
On-Road Light-Duty Vehicle Certification Program	ARB	Yes
On-Road Motorcycles	ARB	Yes
Optional Reduced NOx Standards for Heavy-duty Vehicles	ARB	Yes
Outboard Marine Tanks	ARB	Yes
Periodic Smoke Inspection Program	ARB/BAR	Yes
Plug-in Electric Vehicle Infrastructure	ARB	Yes
Portable Diesel Engines ATCM	ARB	Yes
Potential Amendments to the Diesel Engine Off-Road Emission Standards: Tier 5 Criteria Pollutants and CO2 Standards	ARB	Yes
Proposition 1B: Goods Movement Emission Reduction Program	ARB/SJV	Yes
Railyard Emission Reduction and Fuel Use Program	ARB	Yes
Reducing Rail Emissions in California	ARB	Yes
San Joaquin Valley Emission Reduction Credit Program Review	ARB	Yes
School Bus Idling ATCM	ARB	Yes
School Bus Retrofit Program	ARB/ SJV	Yes
School Buses	ARB/SJV	Yes
Small Off-Road Engines (SORE)	ARB	Yes
Solid Waste Collection Vehicle Rule	ARB	Yes
Spark-Ignition Marine Watercraft	ARB	Yes
Stationary Diesel ATCM	ARB	Yes
Sustainable Freight Transport	ARB	Yes
The California Sustainable Freight Action Plan	ARB	Yes
Tractor-Trailer Greenhouse Gas Regulations	ARB	Yes
Transport Refrigeration Unit	ARB	Yes
Transportation Refrigeration Unit ATCM	ARB	Yes
Truck and Bus Regulation	ARB	Yes
Truck Loan Assistance Program	ARB	Yes
Verification Procedure for In-Use Strategies to Control Emissions from Diesel Engines	ARB	Yes
Volkswagen Zero-Emission Vehicle (ZEV) Investment Commitment	ARB	Yes
Voluntary Accelerated Vehicle Retirement Program	ARB	Yes
Zero-Emission Airport Ground Support Equipment	ARB	Yes
Zero-Emission Airport Shuttle	ARB	Yes
Zero-Emission Forklifts	ARB	Yes
Zero-Emission Landscaping Equipment	ARB	Yes
Zero-Emission Powertrain Certification	ARB	Yes
Zero-Emission Transportation	ARB	Yes
Zero-Emission Vehicle Fleet	ARB	Yes
Zero-Emission Vehicle Program	ARB	Yes
Zero-Emission Airport Ground Support Equipment	ARB	Yes

Step 3: Evaluate Implementation Feasibility of Measures

Once a master list of potential TCMs was compiled, the next step was to collect sufficient information on each candidate measure to determine its feasibility for each SJV MPO based on the following metrics:

- ***Technological Feasibility:*** Factors that were considered for evaluating the technological feasibility included the availability of necessary infrastructure, technology availability and commercialization potential, successful implementation in other areas, and local specific conditions such as traffic and meteorology that might impact the implementation of the measure. All TCM measures identified were deemed technologically feasible. Some measures, however, were determined to be not applicable, such as rail connectivity projects where a region does not have any rail.

- ***Economic Feasibility:*** Another key factor that was considered is economic feasibility or the cost-effectiveness of the measure. The Congestion Mitigation and Air Quality (CMAQ) program provide funding for transportation projects or programs that contribute to the attainment or maintenance of the NAAQS[3]. All SJV MPOs adopted policies in 2007 for distributing at least 20 percent of the CMAQ funds to projects that meet a cost-effectiveness threshold for emission reductions. Given that economic growth is a top priority in the SJV, measures that are not cost-effective or would impact economic activity in the region (e.g., business closures on high ozone days) were excluded from the TCM listing. Instead, other more practicable TCMs were chosen that would result in greater emission reductions.

- ***Emission Reduction Potential/Advancing Attainment:*** Other criteria for RACM selection was to determine whether candidate measures would advance attainment by a year when considered collectively. In other words, the total emission reductions from all potential measures should be sufficient enough to attain the 2015 8-hour ozone standard by a year earlier than the current attainment deadline of 2037. Given the SJV experience with quantifying emission reductions from TCM-like projects and strategies as part of the CMAQ Policy requirements, as well as California SB 375 analysis, a portion of TCMs identified would result in emission reductions that were either too small or impossible to quantify. Some examples include free bikes, reversible lanes, and clean fleets for government employees.

- ***Enforceability:*** Another important consideration is TCM enforceability. If a local transportation agency does not have the authority to implement and enforce a TCM, it cannot be included in a SIP and therefore would not constitute a RACM. This applies to idling reduction, vehicle scrappage, and accelerated vehicle retirement programs that are generally implemented at the state level and may not be included for the local RACM analysis. The development of HOV/HOT or bus-only lanes requires state authority and funding. Parking restrictions and pricing are managed by individual cities. Finally, any VMT tax-related measures are passed by the state or individual counties; SJV MPOs do not have taxation authority.

- ***Feasibility in terms of environmental, economic, and social impacts:*** This metric considers the broader environmental, economic, and social impacts of TCMs from an implementation standpoint, once the measure has been deemed to be both technologically and economically feasible. Each candidate TCM should be analyzed to assess its impacts on the region's environment, economy, and population/travel behavior beyond what has been determined in other metrics. In addition, issues such as public acceptability and environmental justice should also be evaluated.

- ***Other Metrics:*** In addition to the above metrics, the TCMs were evaluated in the context of local specific emissions reduction efforts to ensure these measures do not counteract these existing efforts. For example, considering California's Senate Bill 375 requirements, TCMs should also be

[3] NAAQS: National Ambient Air Quality Standards

evaluated in the context of greenhouse gas (GHG) emission impacts to avoid adverse impacts on SJV's Sustainable Community Strategies (SCS) planning efforts.

The potential list of TCMs was evaluated in light of the metrics outlined above and only those measures that satisfy all the metrics were moved to the new TCM listing for each SJV MPO.

Step 4: Identify the Reasonably Available Control Measures

The final step consists of identifying TCMs for each SJV MPO based on the information in the steps above. **Appendix A** also shows TCMs that were excluded from RACM along with the justification for their disqualification based on the assessment of the metrics discussed in the previous step.

RACM Analysis Results

Once the new TCMs were identified, Trinity coordinated with each SJV MPO individually to confirm the existing measures and the feasibility of the new TCMs recommended for SIP inclusion. The "new" TCM listings for each MPO are shown in **Appendix B**, along with the agencies responsible for their implementation and implementation timeline. Note that the "ongoing" timeline indicates that the MPO is committed to continuous delivery and implementation of the projects identified.

In general, all CAA Section 108(f)(1)(A) TCM categories are already being implemented in the SJV. This is the result of the most stringent air quality and conformity requirements due to SJV's extreme non-attainment status for both 2008 and 2015 ozone standards. In addition, the SJV MPOs comply with California's SB 375 and have adopted Sustainable Community Strategies (SCSs) that address per capita GHG emission reductions through sustainable transportation and land-use planning. While the focus of SB 375 is on GHG emissions, there are some co-benefits on the air quality side as well due to reductions in VMT and other policies such as partnering with the state and the Air District on electric vehicle deployment. These emission reduction co-benefits are not being quantified at this time.

The new TCMs identified during the RACM analysis can be grouped into the following main categories:

1. Non-Motorized Use Facilities *(All 8)*
    a. Complete Streets/Transit Oriented Development. These projects focus on multi-modal ATP efforts near transit or that provide connectivity to other transit options.
    b. Informational Campaigns aiming to promote bike/ped transportation options (*Kern already implements this through the CommuteKern.org website)*
2. Traffic Flow Improvements *(All 8)*
    a. Educational campaign on eco-driving
3. Transit Improvements *(Merced Only)*
    a. Educational and marketing campaign to promote the Bus and YARTS transit services.
4. Reduce single occupancy vehicle (SOV) Travel *(Stanislaus Only)*
    a. Informational campaign to promote rideshare/vanpool/carpool options.

The RACM analysis highlights the Valley's commitment to its SCS strategies focusing on complete streets projects that promote non-motorized travel, deliver projects that connect multi-modal infrastructure options, and are centered around transit to discourage SOV travel. The other areas where SJV MPOs are planning to increase their efforts are informational and educational campaigns that promote bike and pedestrian travel, rideshare options, transit use, and eco-driving techniques that will provide health benefits, result in fuel savings, and help the region attain its air quality goals.

Once the 2022 SJV Ozone SIP receives final approval, the new TCMs identified as part of this RACM analysis will be included on the RACM/TID list for each MPO as part of future conformity analyses.

Appendix A

Table A1. SJV Transportation Control Measure RACM Analysis

TCM #	TCM	Description	Analysis	Comments
	i. Improved Public Transit			
1.1	Public transit facility improvements/operating assistance	Construct and/or improve bus or rail terminals, stations, and maintenance facilities	Existing	RTP/SCS
1.2	Expansion of public transportation services	Provide additional rail or bus service	Existing	RTP/SCS
1.3	Transit access to airports	Expand rail or bus services to airports	Existing where applicable	RTP/SCS
1.4	Free transit on specific days	Provide free alternative transportation on days during specific events or days with high-level ozone episodes	Not economically feasible	Similar emission reductions can be achieved with Complete Streets planning
1.5	Transit rehabilitation and retrofits	Rehabilitation of older vehicles or installation of retrofits on diesel-powered buses	Not Applicable	AFVs are required per CARB Zero Emission Transit Rule
1.6	Transit service improvement including parking management	Install park-and-ride facilities near transit stations, improve bicycle and pedestrian access, install lights and real-time information systems	Existing	RTP/SCS
1.7	Clean fuel buses	Purchase of alternative fuel buses	Existing/Statewide	CARB Zero Emission Transit Rule
1.8	Rail-to-bus/bus-to-rail transfers	Transit services at non-intermodal centers	Existing	RTP/SCS
1.9	Land use strategies to prioritize transit	Installing special lanes and signals to allow transit to get ahead in traffic, signal prioritization for transit, Shorter Distance from Buildings to Bus Stops	Existing	RTP/SCS
1.10	Transit Accessibility Programs	Provide transit vouchers to certain population groups (e.g., elderly, minorities, homeless) to reduce transit costs, paratransit, or provide transit means for certain population groups	Existing	RTP/SCS
1.11	Intermodal centers	Improve travel connection of various transportation modes	Existing	RTP/SCS

TCM #	TCM	Description	Analysis	Comments
1.12	Technology Improvements to Transit	Technological upgrades to improve transit ridership such as upgrades to passenger fare functionality, including mobile ticketing, hardware and software purchases/upgrades, and fare vending machines, real-time transit information systems.	No implementation authority	Managed by local Transit Agencies
1.13	Passenger Rail Improvements	Installation of additional platforms, double tracks, concrete ties, bridges, signal relocation.	Existing where applicable	RTP/SCS
	ii. Limit Access to Roads in Metro Area to Non-Vehicular Use			
2.1	Establish Auto Free Zones and Pedestrian Malls	Self-explanatory	Would not advance attainment	Minimal air quality benefits given the lack of large urban centers in the SJV
2.2	Close roads for use of non-motorized traffic or special events for use by bikes and pedestrians when/where appropriate	Self-explanatory	Not economically feasible	Similar emission reductions can be achieved with Complete Streets planning
2.3	Bus and carpool lanes on arterials	Provide fixed lanes for buses and carpools on arterial streets	No implementation authority	Would require state agency authority and funds
2.4	Express toll lanes/HOT lanes	Construct toll lanes to reduce congestion	No implementation authority	Would require state agency authority and funds
	iii. Bicycle Facilities			
3.1	Bike parking	Construct bike parking facilities	Existing	Active Transportation Plans
3.2	Free bikes	Provide free bikes to transit users	Would not advance attainment	This voluntary measure does not guarantee emission reductions. Consumers could sell bikes for profit
3.3	Bike racks	Install bike racks on buses, employers install bike racks at businesses	Existing	All new buses have bike racks
3.4	Bicycle facility improvements	Construct bike lanes, off-street bikeways, multi-use trails, route lighting, and street signage, bicycle storage	Existing	RTP/SCS
	iv. Control Extended Idling of Vehicles			
4.1	Truckstop electrification	Self-explanatory	Existing/Statewide	CARB Advanced Clean Trucks
4.2	Programs to reduce idling of vehicles	Reduce idling at drive-throughs, parking lots, in traffic, at schools, and other locations, etc. Use of APUs or special battery engines to keep air conditioning and other vehicle systems when the vehicle is not in use.	Existing/Statewide	CARB ATCM

TCM #	TCM	Description	Analysis	Comments
4.3	Control extended idling of Buses and Trucks	Step-up enforcement of existing regulations to prevent extended vehicle idling.	Existing/Statewide	CARB ATCM
4.4	Programs to reduce idling of vehicles	Use of APUs or special battery engines to keep air conditioning and other vehicle systems when vehicle is not in use, car dealers to limit the starting of vehicles for sale on their lot(s) to once every two weeks etc.	Existing/Statewide	CARB ATCM
	v. Reduce Extreme Cold-Start Emissions			
	None			
	vi. Employer-Sponsored Flexible Work Schedules			
6.1	Compressed work weeks/flexible work schedules	Encourage employers to implement alternate work schedules to reduce travel.	Existing/SJVAPCD	Employer Based Trip Reduction/Rule 9410
6.2	Telecommuting	Encourage employers to allow employees to work from home.	Existing/SJVAPCD	Employer Based Trip Reduction/Rule 9410
	vii. Planning and Development Efforts to Reduce SOV Travel			
7.1	Shared mobility program	Implement a shared mobility program (e.g. bikes) and provide planning efforts for potential regional expansion of cleaner alternative modes.	Existing	RTP/SCS
7.2	Government Action Days	Declare specific days (such as spare the air day, ozone action day) when ozone/ pollutant levels reach episodic thresholds so that the public is informed and encouraged to scale back activities generating pollutants.	Existing/SJVAPCD/ Statewide	Air Quality Information is available on District and CARB websites
7.3	Land Use Strategies	Grants, and technical assistance to help cities and nonprofit agencies to defined and implement land-use projects that support community plans to increase housing and density near transit centers and decrease urban sprawl and reduce overall travel, or promote environmentally sustainable land use in economically viable rural areas for landowners and local governments.	Existing	RTP/SCS
7.4	Implement taxation policies	Initiate legislation to put a vehicle tax on the household with two or more vehicles or increase state gas tax.	No implementation authority	The County has taxation authority
7.5	Display air quality data on billboards	Self-explanatory.	Existing/SJVAPCD	
7.6	Evaluation of the Air Quality Impacts of New Development	Evaluate the air quality impacts of new development and mitigate any adverse impacts or provide financial or other incentive to local cities that practice air quality sensitive development.	Existing/Statewide	CEQA requirement
	viii. Construction/Reconstruction of Paths for Non-Motorized Use			
8.1	Bicycle/pedestrian facilities	Construct sidewalks, curbs, gutters, landscaping, lighting for bike and pedestrian pathways, signage and stripping, bike and pedestrian bridges, and/or tunnels over major highways.	Existing	RTP/SCS

TCM #	TCM	Description	Analysis	Comments
8.2	Encouragement of Pedestrian Travel	Encourage the use of pedestrian travel as an alternative to automobile travel. Promotion of pedestrian travel could be included in air pollution public awareness efforts to remind people of this basic alternative.	New	Move to New TCM Listing* *- Existing for Kern; CommuteKern.org
8.3	Encouragement of Bicycle Travel	Promotion of bicycle travel to reduce automobile use and improve air quality. Potential action may include the development and distribution of educational materials regarding bicycle use and safety.	New	Move to New TCM Listing* *- Existing for Kern; CommuteKern.org
8.4	Safe Routes to School Programs	Encourage educational and encouragement programs for families and schools and support policies to improve pedestrian and bicycle safety.	Existing	RTP/SCS
8.5	Require inclusion of bicycle/pedestrian lanes on state and federally funded projects	Require bicycle/pedestrian lanes on all state and federally funded road projects or require the inclusion of paved shoulders adequate for bicycle/pedestrian use on state and federally funded roads that require reconstruction or widening.	No implementation authority	The COGs cannot implement this requirement.
8.6	Complete Streets/Transit Oriented Development	Install bicycle and pedestrian facilities, upgrade traffic control systems, urban design improvements, streetlights, first-and-last mile connection to transit.	New	Move to New TCM Listing
	ix. Pre-1980 Model-Year Vehicle Scrappage			
9.1	Accelerate retirements of trucks/ buses	Replace high mileage trucks and buses	Existing/Statewide	CARB Zero Emission Transit Rule
9.2	Purchase and Install Electric Charging Station	Purchase and install regular or solar-powered electric charging stations for charging electric powered cleaner buses	Existing/SJVAPCD	RTP/SCS and District's Charge Up! Program
	x. Transit-Only or High Occupancy Vehicle Lanes			
10.1	Express busways/dedicated bus lanes	Construct bus-only lanes	No implementation authority	Would require state agency authority and funds
10.2	HOV lanes	Measures to increase HOV lane usage. Measures may include constructing additional high occupancy vehicle (HOV) lanes, allowing use by alternative fuel vehicles, increased enforcement, increasing occupancy requirements, conversion of existing HOV lanes to bus-only lanes, and/or designation of any new carpool lanes as bus-only lanes; utilization of freeway shoulders for peak-period express bus use; commercial vehicle buy-in to HOV lanes; and appropriateness of HOV lanes for corridors that have considered congestion pricing or value pricing.	No implementation authority	Would require state agency authority and funds
	xi. Employer-Based Plans and Incentives			
11.1	Satellite work centers	Employers open new remote offices near employees' residences	Existing/SJVAPCD	Employer Based Trip Reduction/Rule 9410

TCM #	TCM	Description	Analysis	Comments
11.2	Employer Measures/Incentives	Encourage employers to give incentives to employees to move close to the worksite, encourage employers to purchase vans for employee commute travel, encourage employers to provide preferential parking for carpools and vanpools to reduce SOV trips or cash equivalent of the parking subsidy to employees who do not drive to work, subsidize the cost of transit, etc.	Existing/SJVAPCD	Employer Based Trip Reduction/Rule 9410
11.3	Bike to Workday	Conduct a one-day bike-to-work event. Provide outreach activities, education on the bike-to-work option, and provide assistance in trying bike to work.	Existing/SJVAPCD	Employer Based Trip Reduction/Rule 9410
11.4	Promote business closure on high ozone days	Self-explanatory	No implementation authority	Managed by the Air District
11.5	Tax Benefits	Income tax credit to telecommuters, or tax benefit to employees who ride their bikes to work	No implementation authority	The County has taxation authority
11.6	Commute Solutions	The federal law that complements parking cash-out is called the Commuter Choice Program. It provides benefits that employers can offer to employees to commute to work by methods other than driving alone.	Existing/SJVAPCD	Employer Based Trip Reduction/Rule 9410
11.7	Parking Cash-Out	State law requires certain employers who provide subsidized parking for their employees to offer a cash allowance instead of a parking space.	Existing/SJVAPCD	Employer Based Trip Reduction/Rule 9410
11.8	Employer Rideshare Program Incentives	Employer-based rideshare incentives and introduction of strategies designed to reduce single-occupant vehicle trips. Examples include public awareness campaigns, Transportation Management Associations among employers, alternative work hours, and financial incentives for TCM participants as well as tax breaks for employers. Provide outreach and possible financial incentives to encourage local employers to provide transit passes or subsidies to encourage less individual vehicle travel.	Existing/SJVAPCD	Employer Based Trip Reduction/Rule 9410
11.9	Implement Parking Charge Incentive Program	Evaluate the feasibility of an incentive program for cities and employers that convert free public parking spaces to paid spaces. Review existing parking policies as they relate to new development approvals.	Existing/SJVAPCD	Employer Based Trip Reduction/Rule 9410
11.10	Off-days for ozone alerts like sick days	On ozone alert days, notify employees through email that there is an ozone alert. Employees are given a pre-specified number of days they can decide not to come in to work on ozone forecast days.	Not economically feasible	Would impact economic activity in the region and would not be socially and economically acceptable.
	xii. Trip-Reduction Ordinances			
12.1	The state law prohibits mandatory employer-based trip reduction programs (California Health & Safety Code §40717.6).		Not Applicable	
	xiii. Traffic Flow Improvements			

TCM #	TCM	Description	Analysis	Comments
13.1	Intelligent Transportation Systems	Install ITS on freeways and arterials to increase traffic operations efficiency	Existing	FTIP/RTP
13.2	Speed limit reduction	Reduce freeway speed limit to 55mph, set speed limit during ozone season, etc.	No implementation authority	Managed by Caltrans
13.3	Intersection Improvements	Installation of turn lanes, curbs, traffic signals, and realign skewed intersections to provide better traffic flow and safety.	Existing	FTIP/RTP
13.4	Eco-driving educational program	Education program to improve vehicle efficiency by improving driving habits	New	Move to New TCM Listing
13.5	Ramp-Metering	Self Explanatory.	Existing where applicable	FTIP/RTP
13.6	Land-use strategies	Self Explanatory.	Existing	RTP/SCS
13.7	Freeway Service Patrol	Emergency services to clean up motor accidents in a timely fashion.	No implementation authority	Managed by Caltrans
13.8	Traffic Signal Synchronization/Traffic Signal Improvements	Install synchronized traffic signals, adaptive traffic signals, median dividers, turn lanes, and grade separations	Existing	FTIP/RTP
13.9	Truck only lanes	Construct or convert lanes for use by heavy-duty trucks only	No implementation authority	Would require state agency authority and funds
13.10	Site-Specific Transportation Control Measures	Relieving freeway/arterial bottlenecks by traffic control improvements at congested intersections or other locations. Examples may include programming left-turn signals at certain intersections to lag, the green time for through traffic, constructing roundabouts and removing stop signs as appropriate, redesignating streets as one-way to improve traffic,	Existing	FTIP/RTP
13.11	Impact of construction activities on travel	The measure may include having contractors pay incentives when lanes are closed, prohibiting lane closures during peak hours, and limiting construction to weekends or nights. Consider scheduling arterial and highway maintenance to exclude ozone action days if the maintenance activities require lane reductions on heavily utilized arterials and highways.	No implementation authority	Managed by Caltrans
13.12	Real-time traffic information	Reduce travel on highly congested roadways by providing accessible information on congestion and travel.	No implementation authority	Managed by Caltrans
13.13	Reroute trucks on ozone action days	Self-explanatory.	Not economically feasible	Would impact economic activity in the region; no alternate truck routes exist.
13.14	Pavement Resurfacing and Rehabilitation	Resurface unpaved, dirt roads and seal roads as a particulate matter control measure	Existing	FTIP/RTP

TCM #	TCM	Description	Analysis	Comments
13.15	Rail grade separation	Adjust road surface heights in line with rail to improve traffic flow	Existing where applicable	
	xiv. Fringe and Transportation Corridor Parking Facilities for Vanpools/Transit			
14.1	Preferential parking for alternative transportation modes	Preferential parking options, provide parking facilities, and designs to encourage carpools, vanpools, nonmotorized modes, cleaner vehicles (electric vehicles), etc.	Existing	RTP/SCS
14.2	Provide parking near transit facilities	Self-explanatory	Existing	RTP/SCS
14.3	Park-and-ride facilities	Construct park-and-ride lots near transit centers and transfer stations	Existing where applicable	
	xv. Limit or Restrict Vehicle Use in Downtown Areas			
15.1	Removal of on-street parking	Self-explanatory	Not economically feasible	Similar emission reductions can be achieved with Complete Streets planning
15.2	Parking Fee Regulations	Parking fees can be increased in different forms such as the highest charges for parking in central business districts, increase fees for parking garages to deter vehicle use during high ozone level days, and charging city-owned parking garage pass holders a fee for more than one entrance and exit each day, etc.	No implementation authority	Parking fees are set by each jurisdiction
15.3	Sustainable development/land use strategies	Encourage land-use planning that promotes development near transit centers	Existing	RTP/SCS
15.4	Reversible lanes	Change direction of travel during special events or during congestion periods	Would not advance attainment	Minimal emission reductions from this episodic strategy
15.5	Off-Peak Goods movement	Require trucks to operate during off-peak hours, cleaner trucks involved in goods movement, upgrade to cleaner technologies through locomotive replacement or retrofit or installation of a locomotive emissions capture and control system, etc.	Not economically feasible	Would impact economic activity in the region
15.6	Auto restricted zones	No vehicles allowed in certain areas where high emissions and, congestion contribute to ozone problems. Measure includes restricting vehicle use in downtown areas, high-use areas and ticket any vehicles present unless they are low emitting, alternative fueled or electric, implement an ordinance to restrict truck travel during peak periods, etc.	Not economically feasible	Similar emission reductions can be achieved with Complete Streets planning
15.7	Adjust school hours so they do not coincide with peak traffic periods and ozone seasons	Measure to reduce travel during peak periods and ozone-contributing periods in the early morning.	No implementation authority	School hours are set by local the School Districts

TCM #	TCM	Description	Analysis	Comments
15.8	Encourage cities and counties to employ good development practices	Provide incentives to cities and counties that practice air quality-sensitive development (e.g., REAP).	Existing	REAP
15.9	VMT Tax	Charge VMT tax per mile for all vehicles registered or garaged in the region.	No implementation authority	The County has taxation authority
15.10	Smart Parking Detection System	Utilize mobile communication devices to access the parking availability at multiple sites.	No implementation authority	Parking logistics are managed by each jurisdiction/city
	xvi. High-Occupancy and Ridesharing Programs			
16.1	Rideshare program	Provide rideshare service	Existing	
16.2	Transit voucher program	Provide transit vouchers to certain population groups (elderly, minorities, homeless) to reduce transit costs	Existing/SJVAPCD	REMOVE II
16.3	Vanpool program	Provide vanpool service for certain communities, emergency situations to transit riders, vanpool service from transit stations to parking lots. Purchase new vans.	Existing	Calvans, Dibs, KART, Commute Connections are vanpool providers in the SJV
16.4	Financial Incentives	Provide financial incentives or other benefits, such as free or subsidized bus passes and cash payments for not driving, in lieu of parking spaces for employees who do not drive to the workplace, cash incentives for carpoolers.	Existing/SJVAPCD	Employer Based Trip Reduction/Rule 9410
16.5	Subscription (Paratransit) Services	Van services to provide transportation for the elderly handicapped or other individuals who have no access to transportation.	Existing	ADA requirement
16.6	Rideshare/Carpool Promotion	Provide match-lists, route info, hours and contact information over the internet to assist individuals in joining or developing carpools, and using rideshare services	Existing	RTP/SCS Move to New TCM List for StanCOG
	Others			
17.1	Divert trucks from nonattainment areas	Require pass-through trucks to choose routes away	No implementation authority	Managed by Caltrans and/or Air District
17.2	Programs to encourage goods movement by rail	Self-explanatory	Existing/Statewide	CARB
17.3	Buy parking lots and convert to land use	Self-explanatory	No implementation authority	Parking lots are managed by each jurisdiction/city
17.4	Clean Fleet Vehicles for Government Employees	Provide alternative fuel vehicles for government employees.	Would not advance attainment	Minimal emission reductions granted the volume of government vehicles in the county

Appendix B

Table B1. Fresno New TCM Listing

TCM	Description	Project ID	Agency/City	Implementation Timeline
Complete Streets and Transit Oriented Development	California Ave between Fruit Ave and Mayor Ave/Tupman St; Install Class IV bicycle facilities, sidewalks, HAWK crossing, street lights along corridor, intersection reconfigurations.	LSTMP799	City of Fresno	2029
	Blackstone Ave between McKinley Ave to Shields Ave; Install Class IV bicycle facilities, traffic calming infrastructure, curb ramps and median nose recon, bus stop platforms, signing and striping.	LSTMP720	City of Fresno	2029
Encouragement of Pedestrian Travel	Promote pedestrian travel by implementing an informational campaign on new pedestrian facilities, safety and air quality benefits through updates to FCOG website.	NA	FCOG	2024
Encouragement of Bicycle Travel	Promote bike travel by implementing an informational campaign on bicycle transportation opportunities, safety, and air quality benefits through updates to FCOG website.	NA	FCOG	2024
Eco-driving educational program	Include information on eco-driving and related air quality benefits and fuel savings through FCOG website update.	NA	FCOG	2024

Table B2. Kern New TCM Listing

TCM	Description	Project ID	Agency/City	Implementation Timeline
Complete Streets and Transit Oriented Development	Downtown Bicycle Connectivity Project	KER161011	City of Bakersfield	2026
Eco-driving educational program	Include information on eco-driving and related air quality benefits and fuel savings by updating CommuteKern.org website.	KER220501	KCOG	2024

Table B3. Kings New TCM Listing

TCM	Description	Project ID	Agency/City	Implementation Timeline
Complete Streets and Transit Oriented Development	Construct sidewalks, ADA ramps, lighted crosswalks, and bike routes on Orange Ave and North Ave.	216-0000-0169	City of Corcoran	2023
	Construct sidewalks along various school routes, install high visibility crosswalks and ADA curb ramps.	216-0000-0169	City of Corcoran	2025
	Construct sidewalk and bicycle facility improvements on Whitley Ave. Provide connections to other bicycle paths and transit access.	216-0000-0169	City of Corcoran	2026
Encouragement of Pedestrian Travel	Promote pedestrian travel by implementing an informational campaign on new pedestrian facilities, safety and air quality benefits through updates to KCAG website.	NA	KCAG	2024
Encouragement of Bicycle Travel	Promote bike travel by implementing an informational campaign on bicycle transportation opportunities, safety, and air quality benefits through updates to KCAG website.	NA	KCAG	2024
Eco-driving educational program	Include information on eco-driving and related air quality benefits and fuel savings through KCAG website update.	NA	KCAG	2024

Table B4. Madera New TCM Listing

TCM	Description	Project ID	Agency/City	Implementation Timeline
Complete Streets and Transit Oriented Development	Construct Bicycle and Pedestrian Path; Road 225; Willow Creek Drive to Road 228	MAD102059	Madera County	2028
	City of Madera; Bicycle/Pedestrian Facilities - Fresno River Trail Between North-South Trail Behind Montecito Park and Granada Drive	MAD202086	City of Madera	2028
	City of Madera; Pedestrian facilities around Washington School	MAD217036	City of Madera	2028
	Riverside Avenue, 8th Street, & Kings Avenue Pedestrian Improvements Project	MAD302058	City of Chowchilla	2028
Encouragement of Pedestrian Travel	Promote pedestrian travel by implementing an informational campaign on new pedestrian facilities, safety and air quality benefits through updates to MCTC website.	NA	MCTC	2024
Encouragement of Bicycle Travel	Promote bike travel by implementing an informational campaign on bicycle transportation opportunities, safety, and air quality benefits through updates to MCTC website.	NA	MCTC	2024
Eco-driving educational program	Include information on eco-driving and related air quality benefits and fuel savings through MCTC website update.	NA	MCTC	2024

Table B5. Merced New TCM Listing

TCM	Description	Project ID	Agency/City	Implementation Timeline
Complete Streets and Transit Oriented Development	Livingston Phase 2 Max Foster Multiuse Path	205-0000-0317	City of Livingston	2024
	Gustine Pedestrian Improvements on 3rd Ave, East Ave, & South Ave	205-0000-0301	City of Gustine	2024
	Gustine Phase 3 Multiuse Path on Railroad, Meredith, & South Aves	205-0000-0316	City of Gustine	2025
	Merced Childs Ave Multiuse Path	205-0000-0319	City of Merced	2025
	Merced Pedestrian Improvements on McGregor, Woodward, Home, Windsor, and Parkwest	205-0000-0320	City of Merced	2026
Encouragement of Pedestrian Travel	Promote pedestrian travel by implementing an informational campaign on new pedestrian facilities, safety and air quality benefits through periodic updates to MCAG website.	NA	MCAG	Ongoing
Encouragement of Bicycle Travel	Promote bike travel by implementing an informational campaign on bicycle transportation opportunities, safety, and air quality benefits through periodic updates to MCAG website.	NA	MCAG	Ongoing
Eco-driving educational program	Include information on eco-driving and related air quality benefits and fuel savings through periodic MCAG website updates.	NA	MCAG	Ongoing
Public education, outreach & marketing for "The Bus"	Promotion of "The Bus" transit service, overseen by the Transit Joint Powers Authority of Merced County (TJPAMC), through public outreach, education, and marketing campaigns at various community events and online for the transit-dependent public.	NA	TJPAMC	Ongoing
Public education, outreach & marketing for YARTS	Promotion of the Yosemite Area Regional Transportation System (YARTS) service including public outreach, community events, and extensive marketing, such as through Amtrak or in surrounding regions with informative materials and tools to prospective Yosemite visitors.	NA	YARTS	Ongoing

Table B6. San Joaquin New TCM Listing

TCM	Description	Project ID	Agency/City	Implementation Timeline
Complete Streets and Transit Oriented Development	Various multi-modal connectivity projects throughout San Joaquin County.	212-0000-0780	Various	Ongoing
Encouragement of Pedestrian Travel	Promote pedestrian travel by implementing an informational campaign on new pedestrian facilities, safety and air quality benefits through periodic updates to SJCOG website.	NA	SJCOG	Ongoing
Encouragement of Bicycle Travel	Promote bike travel by implementing an informational campaign on bicycle transportation opportunities, safety, and air quality benefits through periodic updates to SJCOG website.	NA	SJCOG	Ongoing
Eco-driving educational program	Include information on eco-driving and related air quality benefits and fuel savings through periodic SJCOG website updates.	NA	SJCOG	Ongoing

Table B7. Stanislaus New TCM Listing

TCM	Description	Project ID	Agency/City	Implementation Timeline
Complete Streets and Transit Oriented Development	F St from Oakdale-Waterford Highway, Lateral Number Two Path (Proposed) to Dorsey St, Separated Bike Lane	RTP/SCS W20	City of Waterford	2025
	F St, from Bentley St to Hickman Rd, Separated Bike Lane	RTP/SCS W21	City of Waterford	2025
	The Robertson Road Elementary Safe Crossing and Active Transportation Connectivity Project	214-0000-0672	Stanislaus County	2026
	Waterford Safe Routes to School Project – Yosemite Blvd	214-0000-0672	City of Waterford	2026
	The Bret Harte Elementary Safe Crossing and Active Transportation Connectivity Project	214-0000-0672	Stanislaus County	2026
Encouragement of Pedestrian Travel	Promote pedestrian travel by implementing an informational campaign on new pedestrian facilities, safety and air quality benefits through periodic updates to StanCOG website.	NA	StanCOG	Ongoing
Encouragement of Bicycle Travel	Promote bike travel by implementing an informational campaign on bicycle transportation opportunities, safety, and air quality benefits through periodic updates to StanCOG website.	NA	StanCOG	Ongoing
Eco-driving educational program	Include information on eco-driving and related air quality benefits and fuel savings through periodic StanCOG website updates.	NA	StanCOG	Ongoing
Rideshare/Carpool Informational Campaign	Promote carpool ad rideshare programs through information posted on StanCOG website linking to rideshare services available in the county.	NA	StanCOG	Ongoing

Table B8. Tulare New TCM Listing

TCM	Description	Project ID	Agency/City	Implementation Timeline
Complete Streets and Transit Oriented Development	Development of an active transportation corridor (approximately 3.9 miles in length) to include solar lighting, water stations, wayfinding, benches, controlled lighted crossing systems.	215-0000-0726	City of Porterville	2032
Encouragement of Pedestrian Travel	Promote pedestrian travel by implementing an informational campaign on new pedestrian facilities, safety and air quality benefits through periodic updates to TCAG website.	NA	TCAG	Ongoing
Encouragement of Bicycle Travel	Promote bike travel by implementing an informational campaign on bicycle transportation opportunities, safety, and air quality benefits through periodic updates to TCAG website.	NA	TCAG	Ongoing
Eco-driving educational program	Include information on eco-driving and related air quality benefits and fuel savings through periodic TCAG website updates.	NA	TCAG	Ongoing

This page intentionally blank.

APPENDIX I

Direct PM2.5 Emission Control Option Analysis for Boilers and Steam Generators

This page intentionally blank.

Direct $PM_{2.5}$ Emission Control Option Analysis for Boilers and Steam Generators

I. Types of Permitted Natural Gas-Fired Equipment and their Exhaust Characteristics

The San Joaquin Valley has numerous permitted boilers and steam generators serving diverse types of operations. A detailed characterization of particulate matter (PM) emissions from natural gas (NG)-fired boilers and steam generators is provided in AP-42 Section 1.4. Assumptions adopted from this guidance include:

- PM results from incomplete combustion of gaseous fuel.
- All PM is less than 1 micron in size, therefore, all PM may be considered $PM_{2.5}$.
- 25% of total PM is filterable at the exhaust temperature. 75% of PM is condensable and forms solid PM upon cooling of the exhaust gas as it enters into the atmosphere.

The District has compiled a survey of PM_{10} source tests performed on permitted NG-fired boilers and steam generators. Based on this survey, it has been concluded that the PM emission factor listed in Section 1.4 of AP-42 greatly overestimates the PM emissions from NG-fired boilers and steam generators permitted in the San Joaquin Valley. Therefore, the District's practice is to use an emission factor of 0.003 lb-PM_{10}/MMBtu, which is based on the surveyed source test data with a conservative margin of compliance. As discussed above, since all of the PM is less than 1 micron in size, this emission factor is equivalent to 0.003 lb-$PM_{2.5}$/MMBtu.

Exhaust characteristics of representative NG-fired boilers and steam generators are presented in the Table 1 below.

Table 1: Representative Exhaust Characteristics

Equipment	Flow (cfm)[a]	Exhaust Temp (°F)	$PM_{2.5}$ Concentration (gr/ft^3)
NG 20 MMBtu Boiler with ultra-low NOx burner	5,765	400	0.002
NG 50 MMBtu Boiler with ultra-low NOx burner and economizer	10,221	150	0.002
NG 62.5 MMBtu Steam Generator with ultra-low NOx burner	14,872	250	0.002

Exhaust flow rate may be calculated based on fuel heat input, F-Factor, and temperature. Similarly, the quantity of PM emissions is proportional to fuel heat input. Therefore, the concentration of PM in the exhaust stream is determined by exhaust temperature and emission

[a] Calculated per 40 CFR part 60, Appendix A, Method 19. Heating value = 1,050 MMBtu/MMscf, F-Factor 10,610 Wscf/MMBtu.

factor. When converted to standard temperature the exhaust PM concentration becomes independent of heat input rating. As such, NG-fired equipment is expected to have an exhaust concentration of 0.002 gr/scf.

II. Potential Control Technologies for Direct Control of $PM_{2.5}$ Emissions

Baghouse (Pulse Jet[1]/Reverse Air[2], Ceramic Dust collector[3])

Baghouses force exhaust through filters which capture PM by impingement. Filter media may be cloth/paper bags, pleated cloth in cartridge form, or even packed ceramic media within cages. Per EPA fact sheets for this technology, Cloth/paper filters can only control filterable PM. Per manufacturer data, ceramic media can only provide limited control (≤20%) of condensable PM.

Wet[4]/Dry[5] ESP

Electro-Static Precipitators (ESP) use ionized gas and/or electromagnetic field to impart static charge to particles in the exhaust stream which are then attracted to collection plates held at high voltage. To clean the collection plates, dry ESP use mechanical or acoustical methods while wet ESP uses wash liquid. Per EPA fact sheets for this technology, a dry ESP can only control filterable PM and can have difficulty collecting particles with an aerodynamic diameter of 0.1 to 1 micron. Since all of the PM from NG-fuel combustion is assumed to be less than 1 micron in size, the $PM_{2.5}$ control efficiency of a dry ESP is assumed to be 90%.

Venturi Scrubber[6]

Venturi scrubbers introduce an atomized liquid into the exhaust stream upon which PM agglomerates. The liquid mist is subsequently removed by cyclonic separator and/or mist eliminator. Venturi Scrubbers require high differential pressure (20 to 24 inches water column) which may require additional fans.

Table 2: Typical Applications of Control Technologies

Control Technology	Recommended Inlet Loading (gr-$PM_{2.5}$/ft^3)	Inlet Temp (°F)	$PM_{2.5}$ Control Efficiency
Baghouse Cloth/Paper Filter	0.5 – 10	<500	99% of filterable, 0% of condensable
Baghouse Ceramic Filter	0.5 – 10	<800	99% of filterable, 20% of condensable
Wet ESP	0.5 – 5	<200	98% of total
Dry ESP	0.5 – 5	<500	90% of filterable, 0% of condensable
Venturi/wet Scrubber	0.1 – 50	<750	99% of total

As shown in the table above, the recommended inlet $PM_{2.5}$ loading concentrations where these control technologies are applied are orders of magnitude above the typical exhaust $PM_{2.5}$ concentrations produced by NG-fired boilers and steam generators. As the control device must be sized to accommodate the airflow, these devices must be substantially oversized for the quantity of PM they will control. All of these control technologies are able to provide good control efficiency of filterable PM. However, since the majority of total $PM_{2.5}$ from NG boilers and steam generators is condensable $PM_{2.5}$, baghouses with cloth/paper/ceramic filter media and dry ESPs are not well suited to control $PM_{2.5}$ emissions from NG-fired boilers and steam generators because these emission control technologies have minimal to no ability to control condensable $PM_{2.5}$ emissions.

Nonetheless, cost analyses for all of these control technologies listed in Table 2 above is presented in the following section.

III. Cost Analysis

Since the cost to deploy these technologies on a 50 MMBtu/hr boiler is similar to that of a 62.5 MMBtu/hr steam generator, a cost analysis is performed for each control technology for units at two heat input sizes: 20 MMBtu/hr and 62.5 MMBtu/hr. Purchased equipment costs were provided by equipment vendors. Detailed cost analyses units are included in Appendix A and summarized in Table 3, below.

Table 3: PM2.5 Reduction Cost Effectiveness for NG-Fired Boilers and Steam Generators

Control Technology	Cost Effectiveness ($/ton)	
	20 MMBtu/hr	62.5 MMBtu/hr
Baghouse - Fabric Filter	$1,850,704	$811,478
Baghouse - Ceramic Filter	$1,145,674	$506,243
Wet ESP	$1,777,505	$724,566
Dry ESP	$6,783,207	$2,363,826
Venturi/wet Scrubber	$1,042,138	$494,482

The cost effectiveness values in Table 3 above are based on assumed full time (8,760 hr/yr) operation at full capacity, which results in the largest possible $PM_{2.5}$ emission reductions. In reality, boilers and steam generators typically do not operate 8,760 hr/yr. Reduction in operational hours would reduce $PM_{2.5}$ emissions proportionally. Since the design capacity of these control devices must be suited to maximum flow, reductions in operational time would not reduce purchase and operational costs of the control device to the same extent. Therefore, the cost effectiveness values presented herein represent a lower limit, and the true cost of reductions are expected to be higher.

IV. Conclusion

As discussed in Section III, the typical exhaust $PM_{2.5}$ concentration from NG-fired boilers and steam generators is significantly below the recommended range of inlet loading concentrations for all of the $PM_{2.5}$ emission control technologies assessed. Further, with the exception of wet ESP and Venturi Scrubbers, these control technologies offer poor control of condensable $PM_{2.5}$ and therefore poor control of total $PM_{2.5}$ emissions from NG-fired boilers and steam generators.

Furthermore, this analysis shows that the cost of direct $PM_{2.5}$ control on NG-fired boilers and steam generators with these technologies ranges between $494,482 and $6,783,207 per ton of $PM_{2.5}$ emissions reduced.

Therefore, use of these emission control technologies to control direct $PM_{2.5}$ emissions from NG-fired boilers and steam generators is not cost effective.

Appendix A
Cost Analyses of Control Technologies Applied to NG-Fired Boilers/Steam Generators

20 MMBtu/hr NG-Fired Boiler Controlled by a Fabric Filter Baghouse

Boiler Size	**20**	**MMBtu/hr**	
Exhaust Temp < 400 Deg F			
	Item	**Method of Calculation**	**Cost**
	Direct Capital Costs		
A	Total Purchased Equip Cost	Western Pneumatics (7,300 acfm)	$100,000.00
B	Freight	5% Purchased Equip Cost (PEC)	$5,000.00
C	Sales Tax	8.25% PEC	$8,250.00
D	Direct Installation Costs	25% PEC	$25,000.00
E	Total Direct Capital Costs	A+B+C+D	$138,250.00
	Indirect Capital Costs		
F	Facilities	5% PEC	$5,000.00
G	Engineering	10% PEC	$10,000.00
H	Process Contingency	5% PEC	$5,000.00
I	Total Indirect Capital Costs	F+G+H	$20,000.00
J	Project Contingency	20% PEC	$20,000.00
K	Total Capital Costs	E+I+J	$178,250.00
L	**Annualized Capital Costs (10 Years @ 4%)**	0.123*K	$21,924.75
	Direct Annual Costs		
	Operating Costs		
M	Operator	0.5 hr/shift, $25/hr, 3 shifts/day	$13,687.50
N	Supervisor	15% of operator	$3,421.88
	Maintenance Costs		
O	Labor	0.5 hr/shift, $25/hr, 3 shifts/day	$13,687.50
P	Material	100% of Labor Cost	$13,687.50
	Utility Costs		
Q	Electricity Costs	0.1694/kw-hr EPA Cost Manual (452/B-02-001), Section 6, Chapter 1, Formula 1.14	$10,196.00
R	Total Direct Annual Costs	M+N+O+P+Q	$54,680.38
	Indirect Annual Costs		
S	Overhead	60% of O&M (M+N+O+P)	$26,690.63
T	Administrative	0.02 x PEC	$2,000.00
U	Insurance	0.01 x PEC	$1,000.00
V	Property Tax	0.01 x PEC	$1,000.00
W	Capital Recovery	0.13 x PEC	$13,000.00
X	Total Indirect Annual Costs	S+T+U+V+W	$43,690.63
Total Annualized Cost		L+R+X	**$120,295.76**
	Emission Reductions		
Y	Total PM10 Emissions (lb/year)	8760 hr/year x MMBtu/hrx 0.003	526
Z	Filterable PM10 (lb/year)	8760 hr/year x MMBtu/hr x 0.00075	131
AB	PM10 Captured by Baghouse (lb/year)	99% control of filterable	130
	PM10 Captured (tons/year)	AB/2000	**0.065**
	Cost Effectiveness ($/ton)	**$1,850,704.00**	

62.5 MMBtu/hr NG-Fired Boiler Controlled by a Fabric Filter Baghouse

Boiler Size	**62.5**	**MMBtu/hr**	
Exhaust Temp < 400 Deg F			
	Item	**Method of Calculation**	**Cost**
	Direct Capital Costs		
A	Total Purchased Equip Cost	Western Pneumatics (17,400 acfm)	$180,000.00
B	Freight	5% Purchased Equip Cost (PEC)	$9,000.00
C	Sales Tax	8.25% PEC	$14,850.00
D	Direct Installation Costs	25% PEC	$45,000.00
E	Total Direct Capital Costs	A+B+C+D	$248,850.00
	Indirect Capital Costs		
F	Facilities	5% PEC	$9,000.00
G	Engineering	10% PEC	$18,000.00
H	Process Contingency	5% PEC	$9,000.00
I	Total Indirect Capital Costs	F+G+H	$36,000.00
J	Project Contingency	20% PEC	$36,000.00
K	Total Capital Costs	E+I+J	$320,850.00
L	**Annualized Capital Costs (10 Years @ 4%)**	0.123*K	$39,464.55
	Direct Annual Costs		
	Operating Costs		
M	Operator	0.5 hr/shift, $25/hr, 3 shifts/day	$13,687.50
N	Supervisor	15% of operator	$3,421.88
	Maintenance Costs		
O	Labor	0.5 hr/shift, $25/hr, 3 shifts/day	$13,687.50
P	Material	100% of Labor Cost	$13,687.50
	Utility Costs		
Q	Electricity Costs	0.1694/kw-hr EPA Cost Manual (452/B-02-001), Section 6, Chapter 1, Formula 1.14	$24,302.00
R	Total Direct Annual Costs	M+N+O+P+Q	$68,786.38
	Indirect Annual Costs		
S	Overhead	60% of O&M (M+N+O+P)	$26,690.63
T	Administrative	0.02 x PEC	$3,600.00
U	Insurance	0.01 x PEC	$1,800.00
V	Property Tax	0.01 x PEC	$1,800.00
W	Capital Recovery	0.13 x PEC	$23,400.00
X	Total Indirect Annual Costs	S+T+U+V+W	$57,290.63
Total Annualized Cost		L+R+X	**$165,541.56**
	Emission Reductions		
Y	Total PM10 Emissions (lb/year)	8760 hr/year x MMBtu/hrx 0.003	1,643
Z	Filterable PM10 (lb/year)	8760 hr/year x MMBtu/hr x 0.00075	411
AB	PM10 Captured by Baghouse (lb/year)	99% control of filterable	407
	PM10 Captured (tons/year)	AB/2000	**0.204**
	Cost Effectiveness ($/ton)	**$811,478.24**	

20 MMBtu/hr NG-Fired Boiler Controlled by a Ceramic Filter Baghouse

Boiler Size	**20**	**MMBtu/hr**	
Exhaust Temp < 400 Deg F			
	Item	**Method of Calculation**	**Cost**
	Direct Capital Costs		
A	Total Purchased Equip Cost	Western Pneumatics (7,300 acfm)	$100,000.00
B	Freight	5% Purchased Equip Cost (PEC)	$5,000.00
C	Sales Tax	8.25% PEC	$8,250.00
D	Direct Installation Costs	25% PEC	$25,000.00
E	Total Direct Capital Costs	A+B+C+D	$138,250.00
	Indirect Capital Costs		
F	Facilities	5% PEC	$5,000.00
G	Engineering	10% PEC	$10,000.00
H	Process Contingency	5% PEC	$5,000.00
I	Total Indirect Capital Costs	F+G+H	$20,000.00
J	Project Contingency	20% PEC	$20,000.00
K	Total Capital Costs	E+I+J	$178,250.00
L	**Annualized Capital Costs (10 Years @ 4%)**	0.123*K	$21,924.75
	Direct Annual Costs		
	Operating Costs		
M	Operator	0.5 hr/shift, $25/hr, 3 shifts/day	$13,687.50
N	Supervisor	15% of operator	$3,421.88
	Maintenance Costs		
O	Labor	0.5 hr/shift, $25/hr, 3 shifts/day	$13,687.50
P	Material	100% of Labor Cost	$13,687.50
	Utility Costs		
Q	Electricity Costs	0.1694/kw-hr EPA Cost Manual (452/B-02-001), Section 6, Chapter 1, Formula 1.14	$10,196.00
R	Total Direct Annual Costs	M+N+O+P+Q	$54,680.38
	Indirect Annual Costs		
S	Overhead	60% of O&M (M+N+O+P)	$26,690.63
T	Administrative	0.02 x PEC	$2,000.00
U	Insurance	0.01 x PEC	$1,000.00
V	Property Tax	0.01 x PEC	$1,000.00
W	Capital Recovery	0.13 x PEC	$13,000.00
X	Total Indirect Annual Costs	S+T+U+V+W	$43,690.63
Total Annualized Cost		L+R+X	**$120,295.76**

	Emission Reductions		
Y	Total PM10 Emissions (lb/year)	8760 hr/year x MMBtu/hrx 0.003	526
Z	Filterable PM10 (lb/year)	8760 hr/year x MMBtu/hr x 0.00075	131
AA	Condensable PM10 (lb/year)	Y-Z	395
AB	PM10 Captured by Baghouse (lb/year)	0.99*Z+0.2*AA	209
	PM10 Captured (tons/year)	AB/2000	**0.105**
	Cost Effectiveness ($/ton)	**$1,145,673.90**	

62.5 MMBtu/hr NG-Fired Boiler Controlled by a Ceramic Filter Baghouse

Boiler Size	**62.5**	**MMBtu/hr**	
Exhaust Temp < 400 Deg F			
	Item	**Method of Calculation**	**Cost**
	Direct Capital Costs		
A	Total Purchased Equip Cost	Western Pneumatics (17,400 acfm)	$180,000.00
B	Freight	5% Purchased Equip Cost (PEC)	$9,000.00
C	Sales Tax	8.25% PEC	$14,850.00
D	Direct Installation Costs	25% PEC	$45,000.00
E	Total Direct Capital Costs	A+B+C+D	$248,850.00
	Indirect Capital Costs		
F	Facilities	5% PEC	$9,000.00
G	Engineering	10% PEC	$18,000.00
H	Process Contingency	5% PEC	$9,000.00
I	Total Indirect Capital Costs	F+G+H	$36,000.00
J	Project Contingency	20% PEC	$36,000.00
K	Total Capital Costs	E+I+J	$320,850.00
L	**Annualized Capital Costs (10 Years @ 4%)**	0.123*K	$39,464.55
	Direct Annual Costs		
	Operating Costs		
M	Operator	0.5 hr/shift, $25/hr, 3 shifts/day	$13,687.50
N	Supervisor	15% of operator	$3,421.88
	Maintenance Costs		
O	Labor	0.5 hr/shift, $25/hr, 3 shifts/day	$13,687.50
P	Material	100% of Labor Cost	$13,687.50
	Utility Costs		
Q	Electricity Costs	0.1694/kw-hr EPA Cost Manual (452/B-02-001), Section 6, Chapter 1, Formula 1.14	$24,302.00
R	Total Direct Annual Costs	M+N+O+P+Q	$68,786.38
	Indirect Annual Costs		
S	Overhead	60% of O&M (M+N+O+P)	$26,690.63
T	Administrative	0.02 x PEC	$3,600.00
U	Insurance	0.01 x PEC	$1,800.00
V	Property Tax	0.01 x PEC	$1,800.00
W	Capital Recovery	0.13 x PEC	$23,400.00
X	Total Indirect Annual Costs	S+T+U+V+W	$57,290.63
Total Annualized Cost		L+R+X	**$165,541.56**
	Emission Reductions		
Y	Total PM10 Emissions (lb/year)	8760 hr/year x MMBtu/hrx 0.003	1,643
Z	Filterable PM10 (lb/year)	8760 hr/year x MMBtu/hr x 0.00075	411
AA	Condensable PM10 (lb/year)	Y-Z	1,232
AB	PM10 Captured by Baghouse (lb/year)	0.99*Z+0.2*AA	653
	PM10 Captured (tons/year)	AB/2000	**0.327**
	Cost Effectiveness ($/ton)	**$506,243.30**	

20 MMBtu/hr NG-Fired Boiler Controlled by a Wet ESP

Boiler Size	**20**	**MMBtu/hr**	
Exhaust Temp < 400 Deg F			

	Item	**Method of Calculation**	**Cost**
	Direct Capital Costs		
A	Total Purchased Equip Cost	Envitech (7,000 acfm quencher & ESP)	$900,000.00
B	Freight	5% Purchased Equip Cost (PEC)	$45,000.00
C	Sales Tax	8.25% PEC	$74,250.00
D	Direct Installation Costs	25% PEC	$225,000.00
E	Total Direct Capital Costs	A+B+C+D	$1,244,250.00
	Indirect Capital Costs		
F	Facilities	5% PEC	$45,000.00
G	Engineering	10% PEC	$90,000.00
H	Process Contingency	5% PEC	$45,000.00
I	Total Indirect Capital Costs	F+G+H	$180,000.00
J	Project Contingency	20% PEC	$180,000.00
K	Total Capital Costs	E+I+J	$1,604,250.00
L	**Annualized Capital Costs (10 Years @ 4%)**	0.123*K	$197,322.75
	Direct Annual Costs		
	Operating Costs		
M	Operator	0.5 hr/shift, $25/hr, 3 shifts/day	$13,687.50
N	Supervisor	15% of operator	$3,421.88
	Maintenance Costs		
O	Labor	0.5 hr/shift, $25/hr, 3 shifts/day	$13,687.50
P	Material	100% of Labor Cost	$13,687.50
	Utility Costs		
Q	Electricity Costs	Envitech 25kW; 0.1694/kw-hr	$37,098.60
R	Total Direct Annual Costs	M+N+O+P+Q	$81,582.98
	Indirect Annual Costs		
S	Overhead	60% of O&M (M+N+O+P)	$26,690.63
T	Administrative	0.02 x PEC	$18,000.00
U	Insurance	0.01 x PEC	$9,000.00
V	Property Tax	0.01 x PEC	$9,000.00
W	Capital Recovery	0.13 x PEC	$117,000.00
X	Total Indirect Annual Costs	S+T+U+V+W	$179,690.63
Total Annualized Cost		L+R+X	**$458,596.36**

	Emission Reductions		
Y	Total PM10 Emissions (lb/year)	8760 hr/year x MMBtu/hrx 0.003	526
AB	PM10 Captured by ESP (lb/year)	98% control efficiency, Z*0.98	515
	PM10 Captured (tons/year)	AB/2000	**0.258**
	Cost Effectiveness ($/ton)	**$1,777,505.27**	

62.5 MMBtu/hr NG-Fired Boiler Controlled by a Wet ESP

Boiler Size	**62.5**	**MMBtu/hr**	
Exhaust Temp < 400 Deg F			
	Item	**Method of Calculation**	**Cost**
	Direct Capital Costs		
A	Total Purchased Equip Cost	Envitech (17,000 acfm quencher & ESP)	$1,125,000.00
B	Freight	5% Purchased Equip Cost (PEC)	$56,250.00
C	Sales Tax	8.25% PEC	$92,812.50
D	Direct Installation Costs	25% PEC	$281,250.00
E	Total Direct Capital Costs	A+B+C+D	$1,555,312.50
	Indirect Capital Costs		
F	Facilities	5% PEC	$56,250.00
G	Engineering	10% PEC	$112,500.00
H	Process Contingency	5% PEC	$56,250.00
I	Total Indirect Capital Costs	F+G+H	$225,000.00
J	Project Contingency	20% PEC	$225,000.00
K	Total Capital Costs	E+I+J	$2,005,312.50
L	**Annualized Capital Costs (10 Years @ 4%)**	0.123*K	$246,653.44
	Direct Annual Costs		
	Operating Costs		
M	Operator	0.5 hr/shift, $25/hr, 3 shifts/day	$13,687.50
N	Supervisor	15% of operator	$3,421.88
	Maintenance Costs		
O	Labor	0.5 hr/shift, $25/hr, 3 shifts/day	$13,687.50
P	Material	100% of Labor Cost	$13,687.50
	Utility Costs		
Q	Electricity Costs	Envitech 50kW; 0.1694/kw-hr	$74,197.20
R	Total Direct Annual Costs	M+N+O+P+Q	$118,681.58
	Indirect Annual Costs		
S	Overhead	60% of O&M (M+N+O+P)	$26,690.63
T	Administrative	0.02 x PEC	$22,500.00
U	Insurance	0.01 x PEC	$11,250.00
V	Property Tax	0.01 x PEC	$11,250.00
W	Capital Recovery	0.13 x PEC	$146,250.00
X	Total Indirect Annual Costs	S+T+U+V+W	$217,940.63
Total Annualized Cost		L+R+X	**$583,275.65**
	Emission Reductions		
Y	Total PM10 Emissions (lb/year)	8760 hr/year x MMBtu/hrx 0.003	1,643
AB	PM10 Captured by ESP (lb/year)	98% control efficiency, Z*0.98	1,610
	PM10 Captured (tons/year)	AB/2000	**0.805**
	Cost Effectiveness ($/ton)	**$724,566.02**	

20 MMBtu/hr NG-Fired Boiler Controlled by a Dry ESP

Boiler Size	**20**	**MMBtu/hr**	
Exhaust Temp < 400 Deg F			
	Item	**Method of Calculation**	**Cost**
	Direct Capital Costs		
A	Total Purchased Equip Cost	Envitech (7,000 acfm ESP)	$750,000.00
B	Freight	5% Purchased Equip Cost (PEC)	$37,500.00
C	Sales Tax	8.25% PEC	$61,875.00
D	Direct Installation Costs	25% PEC	$187,500.00
E	Total Direct Capital Costs	A+B+C+D	$1,036,875.00
	Indirect Capital Costs		
F	Facilities	5% PEC	$37,500.00
G	Engineering	10% PEC	$75,000.00
H	Process Contingency	5% PEC	$37,500.00
I	Total Indirect Capital Costs	F+G+H	$150,000.00
J	Project Contingency	20% PEC	$150,000.00
K	Total Capital Costs	E+I+J	$1,336,875.00
L	**Annualized Capital Costs (10 Years @ 4%)**	0.123*K	$164,435.63
	Direct Annual Costs		
	Operating Costs		
M	Operator	0.5 hr/shift, $25/hr, 3 shifts/day	$13,687.50
N	Supervisor	15% of operator	$3,421.88
	Maintenance Costs		
O	Labor	0.5 hr/shift, $25/hr, 3 shifts/day	$13,687.50
P	Material	100% of Labor Cost	$13,687.50
	Utility Costs		
Q	Electricity Costs	Envitech 25kW; 0.1694/kw-hr	$37,098.60
R	Total Direct Annual Costs	M+N+O+P+Q	$81,582.98
	Indirect Annual Costs		
S	Overhead	60% of O&M (M+N+O+P)	$26,690.63
T	Administrative	0.02 x PEC	$15,000.00
U	Insurance	0.01 x PEC	$7,500.00
V	Property Tax	0.01 x PEC	$7,500.00
W	Capital Recovery	0.13 x PEC	$97,500.00
X	Total Indirect Annual Costs	S+T+U+V+W	$154,190.63
Total Annualized Cost		L+R+X	**$400,209.24**
	Emission Reductions		
Y	Total PM10 Emissions (lb/year)	8760 hr/year x MMBtu/hrx 0.003	526
Z	Filterable PM10 (lb/year)	8760 hr/year x MMBtu/hr x 0.00075	131
AB	PM10 Captured by ESP (lb/year)	90% control of filterable	118
	PM10 Captured (tons/year)	AB/2000	**0.059**
	Cost Effectiveness ($/ton)	**$6,783,207.46**	

62.5 MMBtu/hr NG-Fired Boiler Controlled by a Dry ESP

Boiler Size	**62.5**	**MMBtu/hr**	
Exhaust Temp < 400 Deg F			
	Item	**Method of Calculation**	**Cost**
	Direct Capital Costs		
A	Total Purchased Equip Cost	Envitech (17,000 acfm ESP)	$750,000.00
B	Freight	5% Purchased Equip Cost (PEC)	$37,500.00
C	Sales Tax	8.25% PEC	$61,875.00
D	Direct Installation Costs	25% PEC	$187,500.00
E	Total Direct Capital Costs	A+B+C+D	$1,036,875.00
	Indirect Capital Costs		
F	Facilities	5% PEC	$37,500.00
G	Engineering	10% PEC	$75,000.00
H	Process Contingency	5% PEC	$37,500.00
I	Total Indirect Capital Costs	F+G+H	$150,000.00
J	Project Contingency	20% PEC	$150,000.00
K	Total Capital Costs	E+I+J	$1,336,875.00
L	**Annualized Capital Costs (10 Years @ 4%)**	0.123*K	$164,435.63
	Direct Annual Costs		
	Operating Costs		
M	Operator	0.5 hr/shift, $25/hr, 3 shifts/day	$13,687.50
N	Supervisor	15% of operator	$3,421.88
	Maintenance Costs		
O	Labor	0.5 hr/shift, $25/hr, 3 shifts/day	$13,687.50
P	Material	100% of Labor Cost	$13,687.50
	Utility Costs		
Q	Electricity Costs	Envitech 50kW; 0.1694/kw-hr	$74,197.20
R	Total Direct Annual Costs	M+N+O+P+Q	$118,681.58
	Indirect Annual Costs		
S	Overhead	60% of O&M (M+N+O+P)	$26,690.63
T	Administrative	0.02 x PEC	$15,000.00
U	Insurance	0.01 x PEC	$7,500.00
V	Property Tax	0.01 x PEC	$7,500.00
W	Capital Recovery	0.13 x PEC	$97,500.00
X	Total Indirect Annual Costs	S+T+U+V+W	$154,190.63
Total Annualized Cost		L+R+X	**$437,307.84**
	Emission Reductions		
Y	Total PM10 Emissions (lb/year)	8760 hr/year x MMBtu/hrx 0.003	4,161
Z	Filterable PM10 (lb/year)	8760 hr/year x MMBtu/hr x 0.00075	411
AB	PM10 Captured by ESP (lb/year)	90% control of filterable	370
	PM10 Captured (tons/year)	AB/2000	**0.185**
	Cost Effectiveness ($/ton)	**$2,363,826.16**	

20 MMBtu/hr NG-Fired Boiler Controlled by a Venturi Scrubber

Boiler Size	**20**	**MMBtu/hr**	
Exhaust Temp < 400 Deg F			
	Item	**Method of Calculation**	**Cost**
	Direct Capital Costs		
A	Total Purchased Equip Cost	EnviroCare Micromist (7,000 acfm)	$400,000.00
B	Freight	5% Purchased Equip Cost (PEC)	$20,000.00
C	Sales Tax	8.25% PEC	$33,000.00
D	Direct Installation Costs	25% PEC	$100,000.00
E	Total Direct Capital Costs	A+B+C+D	$553,000.00
	Indirect Capital Costs		
F	Facilities	5% PEC	$20,000.00
G	Engineering	10% PEC	$40,000.00
H	Process Contingency	5% PEC	$20,000.00
I	Total Indirect Capital Costs	F+G+H	$80,000.00
J	Project Contingency	20% PEC	$80,000.00
K	Total Capital Costs	E+I+J	$713,000.00
L	**Annualized Capital Costs (10 Years @ 4%)**	0.123*K	$87,699.00
	Direct Annual Costs		
	Operating Costs		
M	Operator	0.5 hr/shift, $25/hr, 3 shifts/day	$13,687.50
N	Supervisor	15% of operator	$3,421.88
	Maintenance Costs		
O	Labor	0.5 hr/shift, $25/hr, 3 shifts/day	$13,687.50
P	Material	100% of Labor Cost	$13,687.50
	Utility Costs		
Q	Electricity Costs	0.1694/kw-hr EPA Cost Manual (452/B-02-001), Section 6, Chapter 1, Formula 1.14	$45,124.00
R	Total Direct Annual Costs	M+N+O+P+Q	$89,608.38
	Indirect Annual Costs		
S	Overhead	60% of O&M (M+N+O+P)	$26,690.63
T	Administrative	0.02 x PEC	$8,000.00
U	Insurance	0.01 x PEC	$4,000.00
V	Property Tax	0.01 x PEC	$4,000.00
W	Capital Recovery	0.13 x PEC	$52,000.00
X	Total Indirect Annual Costs	S+T+U+V+W	$94,690.63
Total Annualized Cost		L+R+X	**$271,998.01**
	Emission Reductions		
Y	Total PM10 Emissions (lb/year)	8760 hr/year x MMBtu/hrx 0.003	526
AB	PM10 Captured by Baghouse (lb/year)	99% efficiency	521
	PM10 Captured (tons/year)	AB/2000	**0.261**
	Cost Effectiveness ($/ton)	**$1,042,137.97**	

62.5 MMBtu/hr NG-Fired Boiler Controlled by a Venturi Scrubber

Boiler Size	**62.5**	**MMBtu/hr**	
Exhaust Temp < 400 Deg F			

	Item	**Method of Calculation**	**Cost**
	Direct Capital Costs		
A	Total Purchased Equip Cost	EnviroCare Micromist (20,000 acfm)	$520,000.00
B	Freight	5% Purchased Equip Cost (PEC)	$26,000.00
C	Sales Tax	8.25% PEC	$42,900.00
D	Direct Installation Costs	25% PEC	$130,000.00
E	Total Direct Capital Costs	A+B+C+D	$718,900.00
	Indirect Capital Costs		
F	Facilities	5% PEC	$26,000.00
G	Engineering	10% PEC	$52,000.00
H	Process Contingency	5% PEC	$26,000.00
I	Total Indirect Capital Costs	F+G+H	$104,000.00
J	Project Contingency	20% PEC	$104,000.00
K	Total Capital Costs	E+I+J	$926,900.00
L	**Annualized Capital Costs (10 Years @ 4%)**	0.123*K	$114,008.70
	Direct Annual Costs		
	Operating Costs		
M	Operator	0.5 hr/shift, $25/hr, 3 shifts/day	$13,687.50
N	Supervisor	15% of operator	$3,421.88
	Maintenance Costs		
O	Labor	0.5 hr/shift, $25/hr, 3 shifts/day	$13,687.50
P	Material	100% of Labor Cost	$13,687.50
	Utility Costs		
Q	Electricity Costs	0.1694/kw-hr EPA Cost Manual (452/B-02-001), Section 6, Chapter 1, Formula 1.14	$128,925.00
R	Total Direct Annual Costs	M+N+O+P+Q	$173,409.38
	Indirect Annual Costs		
S	Overhead	60% of O&M (M+N+O+P)	$26,690.63
T	Administrative	0.02 x PEC	$10,400.00
U	Insurance	0.01 x PEC	$5,200.00
V	Property Tax	0.01 x PEC	$5,200.00
W	Capital Recovery	0.13 x PEC	$67,600.00
X	Total Indirect Annual Costs	S+T+U+V+W	$115,090.63
Total Annualized Cost		L+R+X	**$402,508.71**

	Emission Reductions		
Y	Total PM10 Emissions (lb/year)	8760 hr/year x MMBtu/hrx 0.003	1,643
AB	PM10 Captured by Baghouse (lb/year)	99% efficiency	1,627
	PM10 Captured (tons/year)	AB/2000	**0.814**

	Cost Effectiveness ($/ton)	**$494,482.44**	

Appendix B
References

References

[1] EPA-452/F-03-025 https://www3.epa.gov/ttnchie1/mkb/documents/ff-pulse.pdf
[2] EPA-452/F-03-026 https://www.epa.gov/sites/default/files/2020-10/documents/ff-revar.pdf
[3] Correspondence from Clean Air Systems
[4] EPA-452/F-03-029 https://www3.epa.gov/ttn/chief/mkb/documents/fwespwpi.pdf#:~:text=An%20ESP%20is%20a%20particulate%20control%20device%20that,effluent%20is%20collected%2C%20andoften%20treated%20on-site%20%28EPA%2C%201998%29.
[5] EPA-452/F-03-027https://www3.epa.gov/ttn/catc/dir1/fdespwpi.pdf
[6] EPA-452/F-03-017https://www3.epa.gov/ttnchie1/mkb/documents/fventuri.pdf#:~:text=EPA-452%2FF-03-017%20Air%20Pollution%20Control%20Technology%20Fact%20Sheet%20Name,venturi%20jet%20scrubbers%2C%20gas-atomizing%20spray%20scrubbers%2C%20and%20ejector-venturiscrubbers

This page intentionally blank.

APPENDIX J

Comments and Responses

This page intentionally blank.

SUMMARY OF SIGNIFICANT COMMENTS FOR CONTINGENCY MEASURE STATE IMPLEMENTATION PLAN REVISION AND PROPOSED AMENDMENTS TO RULE 4901

The San Joaquin Valley Air Pollution Control District (District) hosted public workshops on March 22, 2023 and April 14, 2023, and posted the proposed Contingency Measure State Implementation Plan Revision and proposed amendments to Rule 4901 for public review and comment on April 18, 2023. Summaries of significant comments received are summarized below.

Comments were received from the following organizations:
Central California Environmental Justice Network (CCEJN)
Central Valley Air Quality (CVAQ)
Dietzkamei, Janet (Deitzkamei)
Garbarino, Wendy (Garbarino)
Menz, Thomas (Menz)
Stratham, Clare (Statham)

1. **COMMENT**: How robust is the District's enforcement program? Wood burning often occurs at night when the District cannot respond to complaints. (Dietzkamei, Statham)

   RESPONSE: The District implements a strong compliance program that works to address complaints submitted by the public as quickly as possible. Enforcement of our rules is a key part of our control strategy, including night time and weekend enforcement, and the District's compliance staff issue hundreds of residential wood burning violations each year. Furthermore, the District conducts additional focused enforcement efforts in communities with wood burning concerns.

2. **COMMENT**: The District and CARB should continue looking for additional contingency measures. (CVAQ)

   RESPONSE: The District appreciates your comment and is fully committed to pursuing any available opportunities for contingency measures, including reviewing any specific suggestions that may be provided. District analysis has shown that the District implements one of the most stringent regulatory programs in the nation with numerous generations of rules that have been approved by EPA as meeting Most Stringent Measures requirements. The analysis concluded that the majority of emission sources under the District's jurisdiction are either technologically or economically incompatible with contingency measure requirements, and limited opportunities for contingency measures exist. Pursuant to this evaluation, the District is proposing a contingency measure for Rule 4901, and will consider evaluation of a potential contingency measure for rural open areas.

3. **COMMENT**: The use of solid fuel contributes to the Valley's PM2.5 levels; we suggest that the District implement even more stringent residential wood burning curtailments beyond the current requirements. (Dietzkamei, Statham, CCEJN, Menz)

   RESPONSE: The District already has the most stringent wood burning curtailment program in the nation. The District has limited opportunities for contingency measures, and, based on recent court rulings and recent federal guidance, the Clean Air Act requires that the District seek to identify and adopt contingency measures that are held in reserve to be triggered upon EPA issuance that the Valley has failed to meet one of the contingency elements. The District will consider additional wood burning curtailments as part of control measure analyses for upcoming State Implementation Plans.

4. **COMMENT**: Dust suppressants needed to comply with potential amendments to District Rule 8051 (Open Areas) will require increased water use and require purchase of additional equipment, and may have adverse impacts to the environment. (Garbarino)

   RESPONSE: The District appreciates your comment and is not proposing any amendments to Rule 8051 at this time. If the District determines that amendments are needed to Rule 8051 to meet contingency measure requirements, the District will consider potential economic and environmental impacts, among other considerations, in developing proposed requirements.