San Joaquin Valley
AIR POLLUTION CONTROL DISTRICT

Summary of Rule 4694 Analyses under the 2016 Ozone Plan

November 2019

Prepared by the San Joaquin Valley APCD

Introduction

On June 16, 2016, the District adopted its *2016 Plan for the 2008 8-Hour Ozone Standard (2016 Ozone Plan)* to address federal mandates related to the 2008 8-hour ozone national ambient air quality standards (NAAQS, or standards).[1] Building on decades of developing and implementing effective air pollution control strategies, the *2016 Ozone Plan* demonstrates that the District's regulatory measures meet and exceed federal Clean Air Act requirements, includes additional commitments for potential further reductions in emissions, and ensures expeditious attainment of the standard. The federal deadline for the Valley to meet the 2008 8-hour ozone standard of 75 ppb is 2031. Modeling performed during the development of the 2016 Ozone Plan demonstrated that the Valley is a NOx-limited regime, especially in projections of future years. As such, VOC reductions are not as effective in reducing Valley ozone concentrations as NOx reductions. In addition, due to the continuing reductions in NOx emissions in the Valley over the coming years, brought about by the District's and the state's aggressive strategies to control NOx from stationary and mobile sources, VOC reductions will become even less effective at reducing ozone concentrations as we move into the future.

However, given the enormity of the overall reductions needed to attain the latest federal ozone standards, the District, in the *2016 Ozone Plan,* committed 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. Upon completion of this review, the District also committed to amend Rule 4694 (Wine Fermentation and Storage Tanks), if appropriate, to include additional requirements to further reduce emissions from wine fermentation processes.

As a first step in addressing this commitment, the District proceeded with a modeling analysis to understand the potential ozone improvements that may be brought about by requiring further VOC controls for wine fermentation.

Existing District Rule 4694 Winery Emissions Controls

Fermentation of red and white wine and, to a lesser extent, storage of the resulting wines, generate VOC emissions in the form of ethanol. Wine fermentation in the Valley is projected to emit 4.64 tons per day (tpd) of VOC in 2031, which is the year the Valley must meet the 2008 8-hour ozone standard. The current District rule regulating wine storage and fermentation, Rule 4694, was the first, and still only rule we're aware of, to require control of winery ethanol emissions. It requires fermentation emissions be reduced or mitigated by 35%, and requires wine to be stored in tanks that are temperature-controlled and equipped with pressure-vacuum valves. Through ongoing review of wine fermentation permitting applications, the District has also closely tracked

[1] San Joaquin Valley Air Pollution Control District. *2016 Plan for the 2008 8-Hour Ozone Standard*. (2016, June 16) retrieved from http://valleyair.org/Air_Quality_Plans/Ozone-Plan-2016.htm

the development of newer emission control technologies that have demonstrated capabilities of reducing more than 65% of ethanol emissions from wine fermentation processes.

Modeling Evaluation

The following discusses the modeling analysis that was conducted to provide an initial assessment of the ozone-reducing effectiveness of requiring additional VOC reductions from this source category through amending Rule 4694.

EPA has not published guidance on such region-wide impact analyses, but has provided guidance (most recently in 2017[2]) on evaluating the impact of permitting new or modified major sources of pollution under the prevention of significant deterioration (PSD) program. As called for under EPA's PSD modeling guidance, the analysis conducted for this report consisted of two (2) phases. As explained in more detail below, the Phase 1 analysis focused on an initial screening process, wherein the emissions from the wine storage/fermentation source category were compared against EPA-recommended thresholds. Phase 2 of this analysis then focused on a more intensive photochemical modeling analysis to determine the maximum ozone concentration change based on additional VOC reductions from this source category. Throughout this process, a conservative approach was taken to build a high level of confidence in the results.

Phase 1: Screening Analysis

EPA has also published guidance establishing an emissions threshold level known as Modeled Emission Rates for Precursors (MERP)[3] for determining if emissions of PM2.5 or ozone precursors from a single source would contribute to, or cause an exceedance of, an ambient air quality standard. These thresholds are used as a means of screening major sources of pollution seeking permits, in order to determine if more complex dispersion or photochemical modeling would be required.

To be conservative, the District compared these single-source MERP thresholds to the sum of all VOC emissions from all permitted winery fermentation operations in the Valley. In related guidance[4], EPA established several VOC MERPs depending on the location in the Valley and source parameters used in their modeling runs. The 8-hour ozone MERP threshold for VOCs across the Valley ranges from 1,095 to 1,724 tons per year (tpy). To provide another level of conservativeness, the District utilized the

[2] EPA 2017 - Revisions to the Guideline on Air Quality Models: Enhancements to the AERMOD Dispersion Modeling System and Incorporation of Approaches To Address Ozone and Fine Particulate Matter
[3] EPA 2016 - Guidance on the Development of Modeled Emission Rates for Precursors (MERPs) as a Tier 1 Demonstration Tool for Ozone and PM2.5 under the PSD Permitting Program
[4] https://www3.epa.gov/ttn/scram/guidance/guide/illustrative_merps_epa_modeling_2018dec28version.xlsx

minimum MERP level of 1,095 tpy when evaluating VOC emissions from wine fermentation.

Table 1 below provides the projected 2025/2030 emissions inventory from the California Air Resources Board (CARB) California Emission Projections and Analysis Model (CEPAM) inventory system. As noted in Table 1, the emissions from the wine storage/fermentation category for the Valley is 1,507 tons per year in 2025 and 1,580 in 2030, which represents a total of all emissions from permitted wine storage/fermentation facilities across the region.

Table 1 – 2025/2030 CEPAM VOC Emissions for Wine Storage/Fermentation

Counties	2025 Total (TPD)	2025 Total (TPY)	2030 Total (TPD)	2030 Total (TPY)
Fresno	0.86	313.9	0.92	335.8
Kern	0.19	69.4	0.2	73.0
Kings	0.01	3.7	0.0	0.0
Madera	0.28	102.2	0.28	102.2
Merced	0.82	299.3	0.85	310.3
San Joaquin	1.03	376.0	1.1	401.5
Stanislaus	0.83	303.0	0.87	317.6
Tulare	0.11	40.2	0.11	40.2
Valley Total*	***4.13***	***1,507.5***	***4.33***	***1,580.5***

*Note: 21% of emissions are from wine storage and not wine fermentation

Since the minimum single-source Valley VOC MERP threshold of 1095 tpy was exceeded by the industry's valley-wide emissions inventory, the District proceeded with a more refined modeling evaluation. Although this additional level of analysis is not technically required because the emissions from any single source did not exceed any MERP threshold, the District wanted to ensure that a thorough evaluation was conducted, and therefore proceeded with the Phase 2 analysis.

Phase 2: Refined Sensitivity Analysis

To conduct the refined sensitivity analysis in this assessment, the District used the most recent modeling that was used in the recent *2018 PM2.5 Plan*. Since the modeling analysis for the *2018 PM2.5 Plan* projected out to 2025 as its latest year, no modeling files are currently available for the 2030 inventory year, which would have been the closest to the 75 ppb 8-hour ozone attainment deadline of 2031. Due to this, the District used the 2025 modeling files as a conservative surrogate for the 2030/2031 period. As detailed previously, since NOx reductions are expected to sharply reduce in future years, and since the Valley is NOx-limited for ozone formation, if reductions from wine fermentation are shown to be ineffective in 2025, these same reductions would be even

less effective in 2031 when the Valley is required to attain the 75 ppb 8-hour ozone standard.

The District performed the refined sensitivity analysis using the Community Multiscale Air Quality (CMAQ) photochemical modeling system to determine the magnitude of the change in Valley ozone concentration if all VOC emissions from the wine storage/fermentation category were controlled, meaning the VOC emissions from this category were reduced to zero for this exercise. Although reducing the VOC emissions from this category to zero is unrealistic, this approach would conservatively provide the total potential ozone change if the emissions from wine storage/fermentation were controlled by 100%.

As noted in Table 1, the difference between the 2025 and 2030 inventories is approximately 5%. It should also be noted that 21% of the VOC emissions inventory for this category does not come from wine fermentation, but from wine storage. In this analysis, removing all the emissions from the wine category, including the 21% from wine storage, will ensure that the difference in emissions between 2025 and the 2030 inventory years are considered. This approach will also provide a conservative estimate of the impacts from controlling emissions from just the wine fermentation portion of the category.

The District conducted modeling runs for 1) Unadjusted Future Year 2025 and 2) Adjusted Future Year 2025. The Unadjusted Future Year 2025 model run represented the uncontrolled ozone run based strictly on the projected inventory for the year 2025. The Adjusted Future Year 2025 run used the same emissions file as the Unadjusted, but with the emissions from the wine storage/fermentation category removed from the projected inventory for the year 2025. A comparison of the projected Valley ozone concentrations was then made between the Unadjusted Future Year 2025 and the Adjusted Future Year 2025 model runs to determine the potential decrease in ozone concentrations across the Valley.

Model Results

As previously noted, the modeling results below represent the complete removal of all the VOC emissions from the wine storage/fermentation category, which in turn would require the 100 % control of all VOC emissions from wineries. There are no known VOC control technologies that could achieve this level of control. The VOC emissions reductions that could be achieved from controls on wine fermentation would of course be significantly less than the removal of emissions from the entire category, and so the potential ozone improvements from this much smaller achievable emissions reduction would be significantly less than what is detailed below.

The District conducted two post-processing sensitivity analyses to derive the annual average max 8-hour and daily max 8-hour concentrations. Each of these results from the sensitivity analysis were compared to EPA's draft Significant Impact Level (SIL) for

ozone of 1 ppb to determine the importance of controlling VOC emissions from wine fermentation. As noted in Figures 1 and 2, below, the annual average maximum 8-hour change in ozone concentration from removing all VOC emissions from the entire winery industry is 0.02 ppb and the daily maximum 8-hour change in ozone concentration is 0.18 ppb.

Figure 1 – Annual Average Maximum 8-Hr Change in Ozone Concentration

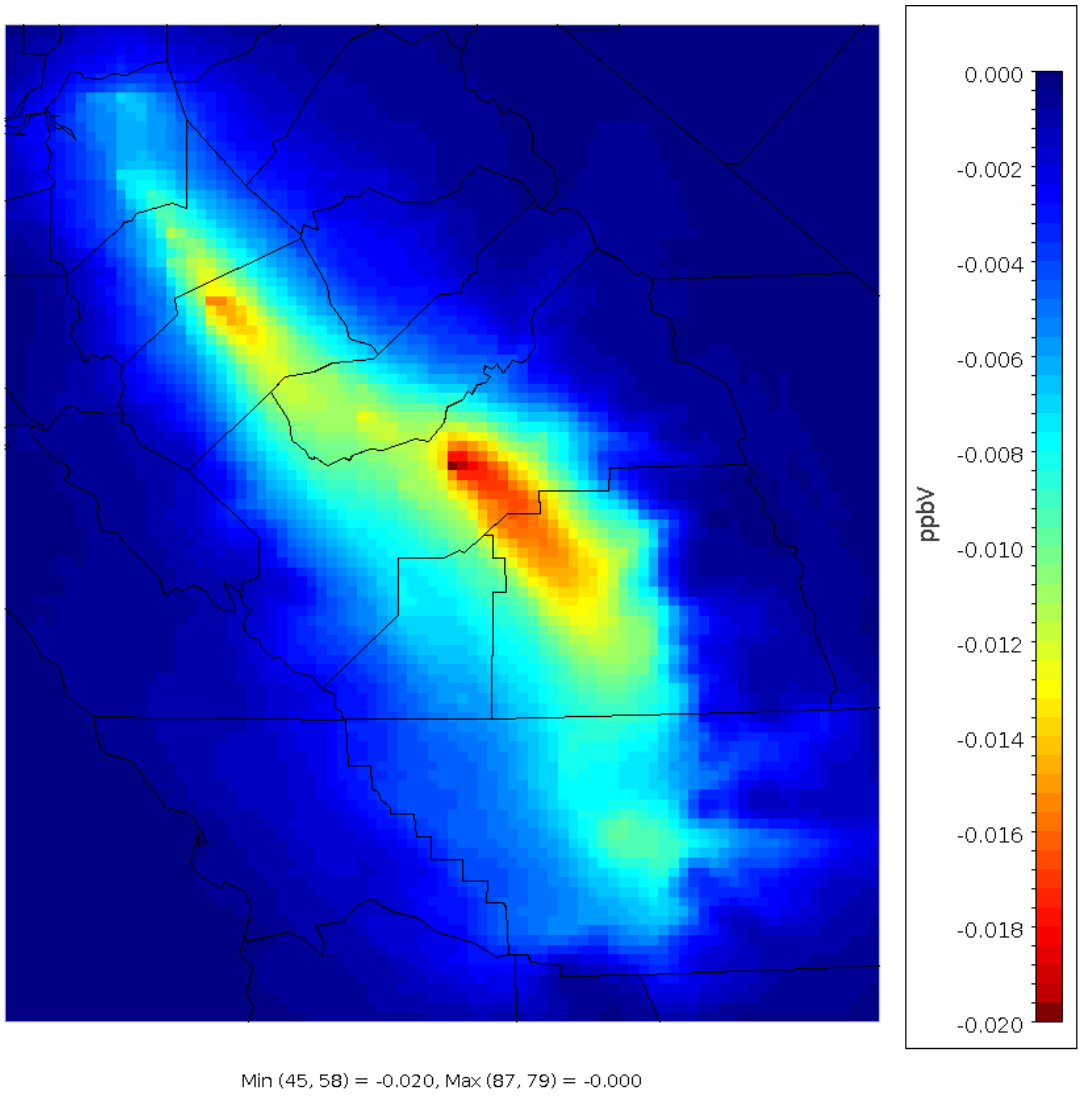
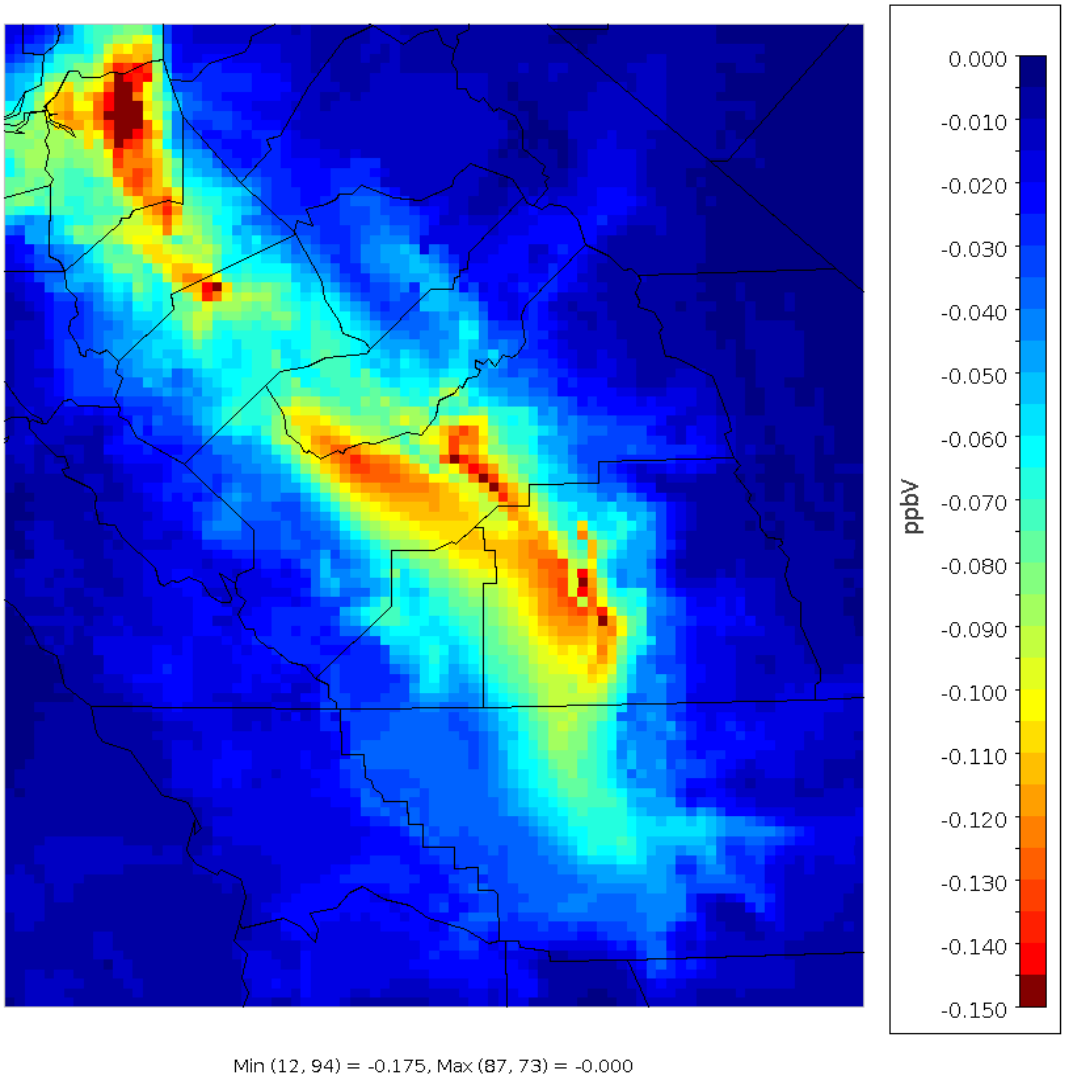


Figure 2 - Daily Maximum 8-Hr Change in Ozone Concentration



When these results are compared to EPA's draft SIL of 1 ppb, the change in concentration would be considered less than significant. In other words, the removal of all of the emissions from the wine storage/fermentation source category would not significantly alter the Valley's future ozone concentrations as estimated in the *2016 Ozone Plan*.

In addition, and as described above, since the actual amount of VOCs that would be reduced from further controls on wine fermentation, only, would be much less than that modeled in this analysis (fermentation plus storage), the ozone reduction from further controls on this portion of the category would be even less significant than the annual average and peak values of 0.02 ppb and 0.18 ppb, respectively.

Conclusion

In the absence of established guidance on determining the significance of emission reductions from categories of sources on regional attainment efforts, the District conservatively applied closely-related EPA guidance on significance in PSD permit modeling. As demonstrated above, even when assuming control of 100% of the ethanol from all winery operations in the San Joaquin Valley, the resulting modeled decrease in ozone is considered less than significant under this guidance.

Additionally on April 24, 2019, the District's 2016 Ozone Plan received EPA's final approval or conditional approval of all portions of the plan. EPA has therefore found that sufficient quantified emissions reductions are identified in the plan without including unquantified emissions reductions such as those related to the "further study" of Rule 4694. EPA also found that Rule 4694 met Reasonably Available Control Technology (RACT) requirements. This approval effectively ends the District's obligation to review Rule 4694 under the 2016 Ozone Plan.

However, given the quickly-developing technology situation, with multiple demonstrated installations of VOC controls on fermentation tanks, it is possible that further analyses of technological feasibility and cost effectiveness of such controls, such as required to take place in the near future under both federal RACT and state Best Available Retrofit Control Technology (BARCT) standards, may result in a need to propose a public process to consider modifications to Rule 4694:

1. The District's review of Rule 4694 as a part of a new State Implementation Plan (RACT SIP) is calendared to be completed by August of 2020.

2. Under the District's Best Available Retrofit Control Technology (BARCT) review commitment adopted in December 2018 by the District Governing Board[5], Rule 4694 is slated to be reviewed as to whether it meets BARCT requirements in calendar year 2020, and if amendments are necessary, to be modified in the calendar year 2021.

It should also be noted that this determination does not impact the District's obligation to require the Best Available Control Technology (BACT) to reduce VOC emissions at wineries installing new fermentation tanks or otherwise expanding operations. Such BACT determinations are required by the federal Clean Air Act, and state and local regulations, and will continue to be undertaken at the time permit applications for such projects are filed with the District.

[5] Full report and schedule available at :
http://www.valleyair.org/Board_meetings/GB/agenda_minutes/Agenda/2018/December/final/13.pdf