

**Bay Area Air Quality Management District**  
375 Beale Street  
San Francisco, CA 94105

**Refinery Rules**  
**Proposed Rule Amendments to:**

**Rule 6-5: Particulate Emissions from Refinery Fluidized Catalytic Cracking Units**

**Rule 11-10: Hexavalent Chromium Emissions from All Cooling Towers and Total Hydrocarbon Emissions from Petroleum Refinery Cooling Towers**

**Rule 12-15: Petroleum Refining Emissions Tracking**



**FINAL STAFF REPORT**  
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## **ACKNOWLEDGEMENTS**

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**APPENDIX B:** Settlement, Enforcement, and Release Agreement, March 1, 2018, re: WSPA, et al. v. Bay Area Air Quality Management District, case number N16-0963 (WSPA Case Agreement)

**APPENDIX C:** Cooling Tower Hydrocarbon Emissions Estimates

**APPENDIX D:** Summary of Comments and Responses on Proposed Amendments to Rules 6-5, 11-10, and 12-15 and Staff Report

## I. EXECUTIVE SUMMARY

The Bay Area Air Quality Management District (Air District) is proposing amendments to two of three rules that were adopted by the Air District Board of Directors on December 16, 2015. These rules were challenged by three of the five Bay Area refineries in a lawsuit that was filed on January 22, 2016, *Valero, et al. v. Bay Area Air Quality Management District*, case number N16-0095, and amended on February 16, 2016. On March 24, 2017 the parties to the lawsuit entered an enforcement agreement and agreement to stay litigation for all three of these regulations (referred to in this Report as the “Valero Case Agreement”). Terms of the Agreement affect implementation of Regulation 6, Rule 5: Particulate Emissions from Refinery Fluidized Catalytic Cracking Units (Rule 6-5); Regulation 8, Rule 18: Equipment Leaks (Rule 8-18); and Regulation 11, Rule 10: Hexavalent Chromium Emissions from All Cooling Towers and Total Hydrocarbon Emissions from Petroleum Refinery Cooling Towers (Rule 11-10). This Report will sometimes use the phrase “2016 Refinery Rules” when referring to these three rules collectively. Specifically, the Air District staff committed in the Agreement to implement the three rules that were challenged for a limited period of time in a manner consistent with how the rules are being proposed to change. The intent of this provision is that the refineries should not have to implement in the near-term provisions that are different than those contemplated in the Agreement. If the rules are not changed as contemplated in the Valero Case Agreement, the refineries will have to implement the rules as originally adopted in 2016. In that scenario, the refineries could reactivate their lawsuit and move forward with their legal challenge to the rules.

The Agreement states the Air District will propose amendments to the 2016 Refinery Rules for adoption by the Air District Board of Directors by November 1, 2018. This Staff Report describes the draft amendments to Rule 6-5 and to Rule 11-10 and provides the background information and rationale for the proposed amendments. Draft amendments to Rule 8-18 are not being presented at this time and will be delayed until a Refinery Heavy Liquids Fugitive Leaks study can be completed at all five Bay Area refineries. This study is underway, and findings are expected to be finalized in late 2018. Information from the study will be used to determine appropriate amendments for Rule 8-18, expected in Spring 2019.

In addition, the Air District is proposing amendments to Regulation 12, Rule 15: Petroleum Refining Emissions Tracking (Rule 12-15), adopted by the Air District Board of Directors on April 20, 2016. Rule 12-15 was challenged in a lawsuit that was filed by the Western States Petroleum Association (“WSPA”) and three of the refineries on May 25, 2016, *WSPA, et al. v. Bay Area Air Quality Management District*, case number N16-0963. Like the Valero Case Agreement, parties to the lawsuit have entered an agreement to stay the WSPA case litigation contingent on the Air District proposing specified amendments to Rule 12-15 (but not Rule 9-14). This agreement, entered into as of March 1, 2018, will be referred to in this Report as the “WSPA Case Agreement.” Similar to the Valero Case Agreement, in the WSPA Case Agreement the Air District committed to implement Rule 12-15 for a limited period of time in a manner consistent with how Rule 12-15 is being proposed as contemplated in the Agreement. The intent of this provision is that the refineries should not have to implement in the near-term provisions that are different than those contemplated in the Agreement. If Rule 12-15 is not changed as contemplated in the Agreement, the refineries will have to implement Rule 12-15 as originally adopted. In that

scenario, the refineries could reactivate their lawsuit and move forward with their legal challenge to Rule 12-15. This staff report describes the proposed amendments to Rule 12-15 and provides the background information and rationale for the proposal.

The proposed amendments to Rule 6-5 include revisions to:

- Clarify exemptions and rule provisions.

The proposed amendments to Rule 11-10 include revisions to:

- Modify and clarify limited exemptions for smaller cooling towers;
- Clarify a limited exemption for cooling towers not in petroleum refining service;
- Modify and clarify leak monitoring, action, and reporting requirements; and
- Remove Best Modern Practices requirements and associated reporting requirements.

The proposed amendments to Rule 12-15 include revisions to:

- Modify and clarify rule definitions and applicability;
- Clarify the annual Emissions Inventory review and approval process;
- Modify and clarify fence-line monitoring plan requirements, and review and approval process;
- Modify the process for updating Emissions Inventory Guidelines and Air Monitoring Guidelines;
- Modify the monthly crude slate report requirements; and
- Modify provisions for designating confidential information.

The Air District is publishing the full mark-up text of proposed amendments for Rule 6-5, Rule 11-10, and Rule 12-15 along with this Staff Report.

The proposed amendments to Rule 6-5 would apply to the four Bay Area refineries with fluidized catalytic cracking units. The proposed amendments to Rule 11-10 and Rule 12-15 would apply to all five Bay Area refineries.

Proposed amendments to Rule 6-5 would have no impact on emissions, as the amendments are clarifications of the original intent of Rule 6-5. Similarly, proposed amendments to Rule 12-15 have no impact on emissions. Rule 12-15 is an emissions reporting rule, therefore affect only emissions reporting and no controls are required.

Cooling tower hydrocarbon emission estimates are shown in Appendix C. Baseline emissions are prior to December 2015. Rule 11-10, as adopted in December 2015, was never implemented. Instead, Rule 11-10 has been implemented under the terms of the Valero Case Agreement. Proposed amendments to Rule 11-10 have been developed to formalize the terms of the Valero Case Agreement. It should be noted, however, that the proposed amendments could theoretically impact emissions relative to the rule, as adopted. This possible difference is due to reduced frequency in monitoring and thus potential delay in identifying and repairing a leak. As shown in Appendix C, staff estimates that foregone emissions reductions could be between 1 to 16 tons of hydrocarbons per year from monitoring weekly rather than daily. These potential emission impacts are described in Section VI. Emission Reduction Benefits & Compliance Costs. Furthermore, a Draft Environmental Impact Report (DEIR) was developed to analyze the potential environmental impacts. In addition, refinery fence-line monitoring (required under Rule

12-15) will be in place to detect and minimize any impacts of significant hydrocarbon leaks.

No costs would be incurred from any of the proposed amendments to these three rules. The proposed amendments to Rule 11-10 will result in cost savings from reduced frequency of cooling water monitoring.

This Staff Report describes the proposed amendments to Rule 6-5, Rule 11-10, and Rule 12-15. Following this introduction and summary, Section II, Background; Section III, Regulatory Framework; and Section IV, Technical Review each reference the relevant material available in the original Staff Reports for each rule development project in 2015 and 2016. These previous Staff Reports are attached to this staff report as Attachments 1, and 2. Section V, Proposed Rule Amendments comprehensively discusses each of the proposed rule amendments. Section VI, Emission Reductions & Compliance Costs discusses of the expected air quality impacts and compliance costs. Section VII, Rule Development and Public Consultation Process outlines the public outreach and involvement process that the Air District takes in developing the proposed amendments and provides further information on how interested members of the public can get involved.

In the process of negotiating the Valero Case Agreement and the WSPA Case Agreement, the Air District agreed to propose changes it believed were justified as a matter of policy. Notwithstanding the commitment made in these agreements to propose certain specified rule changes, the Air District is still at this point able to decide which of these changes should be adopted. Public input will be considered in making this decision. As noted above, the Valero and WSPA case agreements give the refineries the right to reactivate their lawsuits if rule changes consistent with those specified in the agreements are not adopted. Notwithstanding these legal consequences, the Air District's intent in seeking comment on these proposed amendments is to follow through with adoption after considering all comments received.

An analysis of the potential environmental impacts of the proposed amendments to the Rules 6-5, 11-10, and 12-15 was conducted pursuant to the California Environmental Quality Act (CEQA). The Environmental Impact Report concluded that the proposed amendments to Rule 11-10 could result in foregone ROG emission reductions compared to the existing Rule 11-10 (as previously adopted, but not implemented) that could exceed the operational ROG significance thresholds. Therefore, air quality impacts from the proposed amendments to Rule 11-10 were found to be potentially significant.

Air District staff recommends adoption of proposed amendments Rule 6-5, Rule 11-10, and Rule 12-15 and certification of the CEQA Final Environmental Impact Report.

## **II. BACKGROUND**

Background information for each of the rule development projects for Rule 6-5, Rule 11-10, and Rule 12-15 are available in the Background sections of each staff report, attached as Attachment 1 (Rule 6-5 and Rule 11-10 Staff Report) and Attachment 2 (Rule 12-15 Staff Report).

### **III. REGULATORY FRAMEWORK**

Information on the regulatory context and framework pertinent to sources and facilities subject to Rule 6-5, Rule 11-10, and Rule 12-15 can be found in the attached staff reports for these rules.

### **IV. TECHNICAL REVIEW**

Technical information on the facilities, sources, and emissions subject to Rule 6-5, Rule 11-10, and Rule 12-15 can be found in the attached staff reports for these rules.

### **V. PROPOSED RULE AMENDMENTS**

This section discusses the proposed amendments to Rule 6-5, Rule 11-10, and Rule 12-15 in detail.

#### **A. Proposed Amendments to Rule 6-5**

The proposed amendments to Rule 6-5 include revisions to provide more clarity and conciseness to portions of the Rule, as described below.

##### **Clarification of Rule Provisions**

Section 6-5-111: Exemption, Emissions Abated by Wet Scrubber: This exemption is clarified by stating more clearly that the requirements of the rule do not apply to sources abated with a wet scrubber that constitutes best available control technology (BACT). Because a wet scrubber is the most stringent control available for controlling particulate from a fluidized catalytic cracking unit, this rule would have no potential impact on a refinery using a wet scrubber. The change in rule language is consistent with the intent of the rule as adopted and does not represent a substantive change.

Section 6-5-301: Fluidized Catalytic Cracking Unit (FCCU) Emission Limits: This section is made more succinct by deleting placeholders for future limits on condensable particulate matter and sulfur dioxide (SO<sub>2</sub>). Limits on these emissions may be developed at a future date, but are not being proposed now. This is not a substantive change. The placeholder limits are informational only, and were included in the rule to alert readers to the intended two-part nature of Rule 6-5, in which the 2015 rule adoption, focusing on ammonia injection optimization, was to be followed by examination and possible adoption of further control measures. The Air District believes that interested parties are sufficiently aware of the two-part plan that the placeholder is no longer needed to serve the informational purpose for which it was intended, and can be deleted from the rule. Deleting the placeholders will have no effect on the Air District's authority to adopt further measures to control particulate from refinery FCCUs.

#### **B. Proposed Amendments to Rule 11-10**

The proposed amendments to Rule 11-10 include revisions to modify limited exemption requirements; modify and clarify leak monitoring, action, and reporting requirements; and remove modern practice requirements and reporting, as described below.

### **Limited Exemptions for Smaller Cooling Towers**

**Section 11-10-105: Limited Exemption, Recirculation Rates Less Than 500 Gallons Per Minute:** This limited exemption is amended to require cooling towers with a water recirculation rate of less than 500 gpm to be monitored once every week (rather than every 14 days). The proposed amendments also allow operators to elect to move to a monthly monitoring schedule if monitoring results at the cooling tower are below the Leak Action Level for four consecutive weeks. If the Leak Action Level is exceeded, the operator must revert to the weekly monitoring schedule, but may be eligible to again move to the monthly monitoring schedule after demonstrating four consecutive weeks below the Leak Action Level.

**Section 11-10-106: Limited Exemption, Recirculation Rates Less Than 2,500 Gallons Per Minute:** This limited exemption is amended to require cooling towers with a water recirculation rate of less than 2,500 gpm to be monitored once every week (rather than every seven days). The amendments also allow operators to elect to move to a monthly monitoring schedule if monitoring results at the cooling tower are below the Leak Action Level for four consecutive weeks. If the Leak Action Level is exceeded, the operator must revert to the weekly monitoring schedule, but may be eligible to again move to the monthly monitoring schedule after demonstrating four consecutive weeks below the Leak Action Level.

The proposed amendments to Sections 11-10-105 and 11-10-106 standardize the monitoring requirements for cooling towers under these limited exemptions, providing identical requirements for all cooling towers with water recirculation rates in both of these size ranges. The amended weekly monitoring schedule is more frequent than the existing rule requirement for cooling towers with rates less than 500 gpm (once every 14 days) and is of similar frequency to the existing requirement for cooling towers with rates less than 2,500 gpm (once every seven days). The Air District believes the provision under both sections to allow operators to move to monthly sampling is a more rational approach that tailors monitoring frequency to be more or less intensive depending on the past monitoring results. This will reduce monitoring burden for well-performing units while maintain a stricter monitoring regime for units with heat exchangers showing a tendency to leak.

### **Limited Exemption for Cooling Towers Not in Petroleum Refining Service**

**Section 11-10-107: Limited Exemption, Cooling Towers Servicing Hydrogen Production, Carbon Dioxide Recovery and Power Generation Facilities:** This exemption is amended to clarify that cooling towers that are not in petroleum refining services are exempt from the total hydrocarbon requirements of this rule. Specific examples of cooling towers not in petroleum refining service are cited. Provisions are made to clarify that cooling towers serving refinery sulfur plants, lube oil streams, and amine streams will be evaluated on a case-by-case basis to determine if the cooling tower is subject to the total hydrocarbon requirements of the Rule. This is a clarification of original intent and not a substantive change.

### **Leak Monitoring, Action, and Reporting Requirements**

**Section 11-10-304: Total Hydrocarbon Leak Monitoring Requirement:** Subsection 304.1 is amended to require cooling towers to be sampled once every week (rather than once

every day). The proposed amendments also allow operators to elect to move to a twice-monthly (two samples per month) sampling schedule if sampling results at the cooling tower are below the Leak Action Level for six consecutive months (26 consecutive weekly samples). If the Leak Action Level is exceeded, the operator must revert to the weekly sampling schedule, but may be eligible to again move to the twice-monthly sampling schedule after demonstrating six consecutive months below the Leak Action Level. Section 11-10-304.3 is also amended to require operators using an alternative Air District approved monitoring method to follow these same monitoring frequency requirements described in Section 11-10-304.1.

The amended weekly monitoring schedule is less frequent than the existing requirement (once every day) and is identical to the weekly frequency required of smaller cooling towers under the amended Sections 11-10-105 and 11-10-106. After further examination and consultation with the refineries following adoption of Rule 11-10, the Air District concluded that daily monitoring is more burdensome than necessary. Cooling tower leaks have the potential to emit a large amount of emissions, but they are a rare occurrence. The Air District believes weekly rather than daily monitoring better balances the burden of monitoring with the potential for excess emissions and is still a substantial improvement over pre-existing practices. The provision to allow operators to move to twice-monthly sampling is a more rational approach that tailors monitoring frequency to be more or less intensive depending on the past monitoring results. Again, this will reduce monitoring burden for well-performing units while maintain a stricter monitoring regime for units with heat exchangers showing a tendency to leak.

The proposed amendments to monitoring frequency may potentially delay the detection of a leak relative to Rule 11-10 as adopted. It is theoretically possible that this change in monitoring frequency would allow a cooling tower leak to go undetected for a few more days than would be allowed under the adopted version of the rule. Estimates of foregone leak emissions reductions from potential delays in detection shown in Appendix C may be speculative due to the variable nature of leaks; nevertheless, potential emissions scenarios are evaluated further in Section VI of this report. In addition, refinery fence-line monitoring will be in place to detect and help to minimize any impacts of significant hydrocarbon leaks.

Section 11-10-305: Leak Action Requirement: This section is amended to require cooling tower hydrocarbon leaks to be minimized as soon as practicable or within seven calendar days (rather than five calendar days) to provide time for necessary leak minimization delays associated with potential technical and/or safety constraints. The proposed amendment adds a provision that any delays in leak repair beyond 21 days must meet the criteria cited in 40 CFR 63.654(f)-(g) of the United States Environmental Protection Agency (EPA) National Emission Standards for Hazardous Air Pollutants (NESHAP) Subpart CC for Petroleum Refineries and be approved by the Air District. This proposed amendment is intended to better align leak repair requirements with applicable NESHAP conditions and provide time to identify the source of the leak, and for repair delays associated with potential technical and/or safety constraints. These proposed amendments to provide additional time for leak identification, minimization and repair may potentially allow increased emissions from leaks relative to Rule 11-10 as adopted; however, the Rule still requires that remedial actions be taken as soon as practicable, and any foregone leak emissions reductions from potential delays in minimization and/or repair would be highly

speculative and are not likely to be substantial.

The section is also amended to require operators to speciate and quantify toxic air contaminants (TACs) from water sampling within 72 hours of leak discovery (rather than within one calendar day of leak discovery) to provide adequate time and flexibility for potential sampling and analysis constraints (e.g. analytical lab closed over a holiday weekend).

Section 11-10-401: Petroleum Refinery Cooling Tower Reporting Requirements: This proposed amendment clarifies that sampling of the cooling tower water must occur as soon as feasible, and no later than 24 hours from the discovery of the leak. This section is amended to require notification of the Air District of total hydrocarbon concentration and chlorine concentration within 72 hours (rather than one calendar day) of discovering the leak. The proposed amendment also removes the requirements to report lists of all heat exchangers served by the cooling tower, as well as the pH level and iron concentration of the cooling water, as this reporting is unlikely to provide additional substantive information regarding the hydrocarbon emissions from the cooling tower. Notification requirements are also being added for delays in repair that meet the criteria cited in 40 CFR 63.654(f)-(g), as referenced in amended Section 11-10-305.

#### **Best Modern Practices Requirements and Reporting**

Section 11-10-402: Best Modern Practices: This section is being deleted to avoid potential duplication and conflicts with process safety management requirements. These requirements were intended to backup hydrocarbon sampling, but facility monitoring of chlorine residual is a better backup method. In addition, maintaining these requirements in Rule 11-10 would require revisions to the rule as “best modern practices” changed, without any clear benefit since these best practices are largely drawn from other regulatory requirements such as those implemented by California Occupational Safety and Health Administration. Moreover, several practices listed relate to cooling tower water chemistry and do not relate directly to hydrocarbon emissions; practices relevant to hydrocarbon emission monitoring and leak minimization and repair are more appropriately addressed through the leak monitoring requirements, monitoring chlorine residual and leak action requirements contained in other sections of the Rule.

Section 11-10-504: Operating Records: This section is being amended to remove recordkeeping requirements associated with the deleted Section 11-10-402, as these recordkeeping requirements are no longer applicable.

### **C. Proposed Amendments to Rule 12-15**

The proposed amendments to Rule 12-15 include revisions to modify and clarify definitions and rule applicability, emission calculation methodologies, emission inventory review and approval requirements and procedures, fence-line monitoring plan requirements, procedures for updating guidelines, crude slate reporting requirements, and confidential information designation procedures, as described below.

## **Rule Definitions and Applicability**

**Section 12-15-205: Crude Oil:** This definition is being amended to provide clarity, and language is also being added to define Crude Oil Blends for the purposes of the Rule. This does not represent a change from the intent of adopted Rule 12-15.

**Section 12-15-206: Emissions Inventory:** The proposed amendment removes the requirement to include emissions from cargo carriers (ships and trains) in the emissions inventory data; these cargo carriers are not under the control or authority of the refineries, and therefore the refineries are not able to validate or report cargo carrier emissions. The Air District will estimate cargo carrier emissions based on publicly-available information. Other proposed changes to this section are to clarify the original intent of the rule and do not represent substantive changes.

**Section 12-15-209: Monthly Crude Slate Report:** This definition is being amended to address concerns from the refineries regarding the burden of providing information on non-crude feedstocks. Non-crude feedstocks are introduced at refineries across a vast spectrum of uses and often in very small quantities. The refineries have asserted, and the Air District agrees, that there are rapidly diminishing returns in requiring the refineries to provide information on every non-crude feedstock introduced. The basic purpose of the Crude Slate Report is to investigate whether there is a relationship between varieties of processed crudes and emissions. The Air District's original intent in requiring information on non-crude feedstocks in Rule 12-15 was to address a situation in which these feedstocks are being used as a substitute for normal crude oil inputs for a substantial period of time. The proposed amendments implement this intent more effectively than the current rule by establishing a threshold below which non-crude feedstocks need not be addressed in the crude slate report.

The proposed amendments to Section 12-15-209 would establish threshold volumes for imported feedstocks with API Gravity greater than or equal to 15 degrees (°) and imported feedstocks with API Gravity less than 15° that are fed to a fluid catalytic cracking unit. For calendar months when imports exceed either of these threshold volumes, a summary report of API gravity and sulfur, iron, nickel, and vanadium content is required. Volumes of non-crude oil feedstocks below these levels are unlikely to have substantial impacts on emissions. The proposed amendments also contain a provision for the Air District to review the necessity for these reporting requirements for non-crude oil feedstock by March 1, 2023 based on information gathered. At that time, an affected refinery may also request that this non-crude oil feedstock reporting requirement for the facility be terminated based on the previous five years of reporting data. The Air District has sole discretion to grant or deny the request.

The proposed amendments would also define precautions and procedures for handling confidential data for inspection, audit, and review. The proposed amendments ensure that refinery crude slate and non-crude feedstock data are protected appropriately, remain on-site at the refinery and are prevented from inadvertent release. The Air District will audit the raw data and calculations summarizing the crude slate and non-crude feedstock data, but will take only summary information. The refineries have repeatedly asserted that keeping crude slate data confidential is essential to maintaining competitiveness in the industry. The Air District recognizes the plausibility of this assertion, and also notes that

the Crude Slate Report is part of an investigative process focused farther “upstream” from actual emissions than is typical for an air regulatory program. Given these circumstances, the Air District believes it is appropriate to build added protections into the rule to prevent the release of confidential information.

### **Emission Factors and Calculation Methodology**

**Section 12-15-401: Annual Emissions Inventory:** This section is being amended to clarify the calculation methodology to be used for calculating greenhouse gases using a “common pipe” method. The proposed amendment lists the steps required to properly account for GHG emissions using fuel gas from common refinery fuel gas systems.

Note that there is a stipulation in the WSPA Case Agreement to use emission factors for heavy liquid components, as provided in the California Air Pollution Control Officers Association (CAPCOA) California Implementation Guidelines for Estimating Mass Emissions of Fugitive Hydrocarbon Leaks at Petroleum Facilities,<sup>1</sup> on an interim basis. This section of the rule language is not being amended to include these emission factors for refinery heavy liquid fugitive leaks because this information fits best in the Air District Refinery Emissions Inventory Guidelines. These emission factors are considered interim and will be used until the Air District has completed the Refinery Heavy Liquids Study<sup>2</sup> and has developed new Bay Area refinery emission factors for these components.

### **Annual Emissions Inventory Review and Approval Process**

**Section 12-15-402: Review and Approval of Annual Emissions Inventory:** This section is being amended to clarify the process for communicating and issuing preliminary review determinations under Section 12-15-402.1. The proposed amendment also clarifies the notification process for Air District of the review period under Section 12-15-402.3 and sets a limit of 45 days for the extension of the review period.

### **Fence-line Monitoring Plan Requirements and Review Process**

**Section 12-15-403: Air Monitoring Plans:** This section is being amended to clarify that site-specific air monitoring plans will be allowed to have implementation schedules and dates that are tailored to the specific plan. The proposed amendments reflect that each refinery faces a unique set of circumstances in implementing a fence-line monitoring system. The intent of this proposed amendment is to allow facilities adequate time to properly complete design, permitting, sourcing, installation, testing, and start-up of monitoring systems, and to account for potential delays that are beyond the refinery’s control, provided that these timing considerations are explained and supported in the plan. This provision for a tailored implementation date will also be applicable to the updates of the site-specific plans that will be required after updated air monitoring guidelines are published by the Air District, as described in Section 12-15-406.

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<sup>1</sup> Emission Factors from TABLE IV-3a: CAPCOA-Revised 1995 EPA Correlation Equations and Factors for Refineries and Marketing Terminals, California Implementation Guidelines for Estimating Mass Emissions of Fugitive Hydrocarbon leaks at Petroleum Facilities, CAPCOA, February 1999.

<sup>2</sup> The Air District is currently conducting a study of fugitive leaks from heavy liquid components at the Bay Area refineries.

Section 12-15-404: Review and Approval of Air Monitoring Plans: This section is being amended to clarify the process for issuing preliminary review determinations under Section 12-15-404.1. The proposed amendment also clarifies notification process for extension of the Air District's review period under Section 12-15-404.4 and sets a limit of 45 days for the extension of the review period.

Section 12-15-501: Fence-line Monitoring System: These proposed amendments clarify that the requirements of this section are effective once the fence-line monitoring system is installed and operational, replacing the existing effective date of one year after approval of the air monitoring plan. This reflects the proposed amendment in Section 12-15-403 to allow tailored implementation dates for each site-specific air monitoring plan.

### **Update of Emissions Inventory Guidelines and Air Monitoring Guidelines**

Section 12-15-405: Emissions Inventory Guidelines: Proposed amendments to the guideline update process include a 60-day comment period for affected facilities to review and comment on changes to the Emissions Inventory Guidelines; and the Air District must respond to comments received. Affected facilities will be given at least 90 days to implement changes from the updated Emissions Inventory Guidelines in their respective annual emissions inventories. These proposed amendments are intended to provide affected facilities the opportunity to provide relevant feedback to proposed guideline changes and allow sufficient time for these changes to be promulgated.

Section 12-15-406: Air Monitoring Guidelines: Proposed amendments to the guideline update process include a 60-day comment period for affected facilities to review and comment on changes to the Air Monitoring Guidelines; and the Air District shall respond to comments received. This proposed amendment is intended to provide affected facilities the opportunity to provide relevant feedback to proposed guideline changes.

### **Monthly Crude Slate Report Requirements**

Section 12-15-408: Availability of Monthly Crude Slate Reports: Section 12-15-408.1 is being amended to validate that the historical monthly crude slate data required for years 2013, 2014, 2015, and 2016 will be based on records maintained by the refinery in the normal course of business, as historical data collected during these previous years may or may not align with the frequency, method, or scope of the ongoing monthly crude slate reports required under amended Section 12-15-408.2. The proposed amendments to this provision also define precautions and procedures for handling confidential data for inspection, audit, and review. The proposed amendments ensure that refinery confidential data are protected appropriately, remain on-site at the refinery, and are prevented from inadvertent release.

Subsection 12-15-408.2 is being amended to modify the summarized information required in the monthly crude slate report. These proposed amendments are made in Table 1 of the Rule and include added references to amended Section 12-15-209 regarding non-crude oil feedstock reporting requirements, deletion of vapor pressure reporting requirements for non-crude oil feedstocks, and deletion of BTEX (benzene, toluene, ethylbenzene, and xylene) reporting requirements for crude oil and non-crude oil feedstocks. A large majority of non-crude oil feedstocks are heavy gas oils, which have very low vapor pressure. BTEX is not typically analyzed for each shipment during the normal course of business, so this

information is generally not readily available. In addition, the concern about BTEX occurs primarily with light “oil-shale” and fracking based crudes where vapor pressure is adequate to flag any significant changes.

The proposed amendments to this subsection also define precautions and procedures for handling confidential data for inspection, audit, and review. The proposed amendments ensure that refinery confidential data is protected appropriately, remains on-site at the refinery and is prevented from inadvertent release.

### **Designation of Confidential Information**

Section 12-15-407: Designation of Confidential Information: This section is amended to defer to the amended Sections 12-15-209 and 408 for requirements regarding designation of confidential information under those sections, as those amended sections discuss treatment of confidential information explicitly. The requirements for an owner/operator to provide a redacted version of the document are removed because they are not relevant to Rule 12-15. Crude slate reports are not required to be submitted to the Air District. Emissions inventories are by definition “emissions data” and so cannot be claimed as confidential. Fence-line monitoring plans have already been submitted and contained no claims of confidentiality. It is likely that any revisions to those plans will likewise contain no confidentiality claims.

## **VI. EMISSION REDUCTION BENEFITS & COMPLIANCE COSTS**

This section of the Staff Report summarizes the emission impacts that would result from the proposed amendments to Rule 6-5, Rule 11-10, and Rule 12-15, and the costs involved with these amendments.

### **A. Amendments to Rule 6-5**

The proposed amendments to Rule 6-5 will have no impact on emissions. The proposed amendments are clarifications of the original intent of Rule 6-5. There are no costs associated with the amendments to Rule 6-5.

### **B. Amendments to Rule 11-10**

Rule 11-10 has been implemented under the terms of the Valero Case Agreement. Proposed amendments to Rule 11-10 have been developed to formalize how Rule 11-10 has been implemented. Baseline emissions, and emissions reductions from enhanced cooling tower monitoring are estimated as shown in Appendix C.

The proposed amendments to Rule 11-10 would require weekly monitoring, with potential adjustments to twice-monthly monitoring (i.e. two samples per month). These proposed amendments are estimated to reduce ROG emissions to as low as 64 tpy, as described in Appendix C. While less stringent than daily monitoring, weekly monitoring remains substantially more stringent than monthly monitoring. Changing monitoring frequency as proposed in amendments to Rule 11-10 would not result in an increase in actual emissions because the amendments are consistent with how the Rule has been implemented since adoption. However, the change in monitoring frequency, when compared to the rule language as adopted, can theoretically allow for an emissions impact since less frequent

monitoring may allow a potential future leak to go undetected for a longer period of time. The Air District can, through its enforcement program, take additional samples at random to increase the frequency of monitoring at facilities. This would reduce the amount of time between rule required monitoring where there is no data at facilities and mitigate some of the foregone emission reductions.

The Air District's position is that a theoretical impact of increased emissions relative to the rule language that was never implemented does not require analysis under CEQA. However, for the sake of transparency and thoroughness, the Air District is analyzing these theoretical impacts so that the public understands the difference between the rule as it was adopted (though not implemented) and the rule as proposed. Staff estimates the foregone emissions reductions that could theoretically occur when monitoring weekly rather than daily range from 1 tpy to 16 tpy, as shown in Appendix C. A Draft Environmental Impact Report has been developed to further analyze the environmental impacts. CEQA Guidelines indicate that cumulative impacts of a Project shall be discussed when the Project's incremental effect is cumulatively considerable, as defined in CEQA Guidelines §15065(c). The cumulative air quality impacts of the proposed Project have been evaluated in the Draft EIR.

No costs are incurred from proposed amendments to Rule 11-10. Estimated cost savings from the proposed amendments to Rule 11-10 that reduce frequency of cooling water monitoring are based on sampling and analysis of cooling water samples weekly, rather than daily. Staff assumes no continuous monitors are installed. Table C:4c in the Rule 11-10 staff report summarizes total sampling and analysis costs at \$2,187,350 per year. Staff estimates reducing sample frequency from daily to weekly, including times when sampling frequency may be extended to twice-monthly or monthly will reduce costs by \$1,678,750 per year. Cost effectiveness of reducing sample frequency and analysis is \$110,000 saved per ton of potentially foregone emission reductions. This savings indicates these amendments are reasonable, since \$110,000 per ton is well outside the range of normal cost effectiveness determinations.

#### **C. Amendments to Rule 12-15**

The proposed amendments to Rule 12-15 would have no impact on emissions. Rule 12-15 is an emissions reporting rule, so no controls are required, and the amendments affect only emissions reporting. There are no costs associated with the amendments to Rule 12-15.

### **VII. REGULATORY IMPACTS**

Regulatory impact information on the facilities, sources, and emissions subject to Rule 6-5, Rule 11-10, and Rule 12-15 can be found in the attached staff reports for these rules.

### **VIII. RULE DEVELOPMENT AND PUBLIC CONSULTATION PROCESS**

#### **A. Rule Development Process**

Staff anticipates that proposed amendments to Rule 6-5, Rule 11-10, and Rule 12-15 will be considered together at a Public Hearing. The Draft Environmental Impact Report (DEIR) will consider the cumulative impact of these three rule amendments. The Socioeconomic Analysis completed for Rule 6-5 and Rule 11-10 at the time of their

adoption, and the Socioeconomic Analysis completed for Rule 12-15 at the time of its adoption are attached to this staff report. Proposed amendments to Rule 6-5 and Rule 12-15 do not have any cost impacts. Proposed amendments to Rule 11-10 will result in cost savings. Since the cost impacts of these proposed amendments are no impacts or cost savings, no additional analysis beyond what has already been reported is needed.

## **B. Public Outreach and Consultation**

A Public Hearing is the next step in the rulemaking process. Air District staff posted the CEQA Notice of Preparation / Initial Study of environmental impacts on August 1, 2018. Air District staff conducted a CEQA Scoping Meeting on Monday, August 20, 2018 at the District office. Comments for the CEQA analysis were due by Friday, September 7, 2018. The CEQA Initial Study and comments are found in the Draft Environmental Impact Report, Appendix A. During this comment period, the Air District received a comment letter from Communities for a Better Environment (and several co-signatories) expressing concern that amendments to Rule 6-5 would preclude the Air District from requiring strict condensable PM controls on FCCUs. The Air District responded and clarified that the amendments to Rule 6-5 consists of formatting changes and a clarification of original intent, and would not preclude the Air District from considering further amendments to make the rule more stringent in the future.

Air District staff posted the draft amendments to Rule 6-5, Rule 11-10, and Rule 12-15 and initial staff report on August 20, 2018 to solicit input and identify any potential issues and concerns. Comments for the draft amendments and initial staff report were due by Friday, September 21, 2018. Air District staff considered input received and continued to conduct further analysis to prepare the proposed amendments and staff report. Staff published the staff report and proposed amendments to Rule 6-5, Rule 11-10, and Rule 12-15 on October 22, 2018 and accepted written comments through December 7, 2018. One comment letter was received during this comment period, and staff prepared a summary of comments received and responses for inclusion in the final proposal package. Staff will present final proposals to the Air District's Board of Directors for their consideration. At the Public Hearing, the Air District's Board of Directors will consider the final proposals and receive public input before taking any action on the proposed amendments.

## **C. Review of Potential Environmental Impacts Under CEQA**

The Air District contracts with an independent consultant to conduct a California Environmental Quality Act (CEQA) analysis of potential environmental impacts from any rule making projects. A Notice of Preparation/Initial Study (NOP/IS) regarding the impact of these proposed rule amendments were posted August 1, 2018 for review and comment. The CEQA Scoping Meeting was conducted on Monday, August 20, 2018.

The DEIR was conducted for all three proposed amended rules as individual CEQA projects. The consultant made an initial assessment of any environmental impacts based on the proposed amendments to Rule 6-5, Rule 11-10, and Rule 12-15, as well as this Staff Report. The DEIR includes a cumulative impacts analysis addressing, among other things, these three rules. The cumulative impacts analysis will be updated when Rule 8-18 is proposed for revisions as anticipated in the second half of 2019.

The DEIR was posted on October 22, 2018 for review and comment, and written comments

were accepted through December 7, 2018. No comment letters on the DEIR were received during the comment period. Prior to making a decision on the adoption of the proposed amendments, the Air District's Board of Directors must review and certify the Final EIR as providing adequate information on the potential adverse environmental impacts of implementing the projects. The EIR concluded that the proposed amendments to Rule 11-10 could result in foregone ROG emission reductions compared to the existing Rule 11-10 (as adopted, but not implemented), and that these theoretical foregone emission reductions could exceed the operational ROG significance thresholds. Therefore, air quality impacts from the proposed amendments to Rule 11-10 were found to be potentially significant. No feasible mitigation measures have been identified to avoid or reduce the impacts to less than significant.

The final proposals and staff report have been used to finalize the CEQA environmental analysis. At the Public Hearing, the Air District Board of Directors will consider the final proposal and public input before taking any action on the proposed amendments to Rule 6-5, Rule 11-10, and Rule 12-15.

#### **D. Review of Potential Socio-Economic Impacts**

The Air District contracts with an independent consultant to conduct a Socioeconomic Analysis of potential economic impacts from the proposed amendments to Rule 6-5, Rule 11-10, and Rule 12-15. The Socioeconomic Analysis completed for Rule 6-5 and Rule 11-10 at the time of their adoption, and the Socioeconomic Analysis completed for Rule 12-15 at the time of its adoption are attached to this workshop report. Proposed amendments to Rule 6-5 and Rule 12-15 do not have any cost impacts. Proposed amendments to Rule 11-10 will result in cost savings. Since the cost impacts of these proposed amendments are no impacts or cost savings, no additional analysis beyond what has already been reported is needed.

### **IX. CONCLUSION / RECOMMENDATIONS**

Pursuant to the California Health and Safety Code [section 40727](#), before adopting, amending, or repealing a rule the Board of Directors must make findings of necessity, authority, clarity, consistency, non-duplication and reference. This section addresses each of these findings.

#### **A. Necessity**

“‘Necessity’ means that a need exists for the regulation, or for its amendment or repeal, as demonstrated by the record of the rulemaking authority.” H&SC [section 40727\(b\)\(1\)](#).

Proposed amendments to Regulation 6, Rule 5: Particulate Emissions from Refinery Fluidized Catalytic Cracking Units (Rule 6-5); Regulation 11, Rule 10: Hexavalent Chromium Emissions from All Cooling Towers and Total Hydrocarbon Emissions from Petroleum Refinery Cooling Towers (Rule 11-10), and Regulation 12, Rule 15: Petroleum Refining Emissions Tracking (Rule 12-15) are needed to improve the clarity and efficiency of these rules as explained above in this Staff Report.

## B. Authority

“‘Authority’ means that a provision of law or of a state or federal regulation permits or requires the regional agency to adopt, amend, or repeal the regulation. H&SC [Section 40727\(b\)\(2\)](#).”

The Air District has the authority to adopt amendments to these rules under Sections 40000, 40001, 40702, and 40725 through 40728.5 of the California Health and Safety Code.

## C. Clarity

“‘Clarity’ means that the regulation is written or displayed so that its meaning can be easily understood by the persons directly affected by it.” H&SC [Section 40727\(b\)\(3\)](#)

Proposed amendments to Rule 6-5, Rule 11-10, and Rule 12-15 are written so that their meaning can be easily understood by the persons directly affected by them. Further details in the staff report clarify the proposals, affected emission sources, compliance options, and administrative requirements for the industries subject to this rule.

## D. Consistency

“‘Consistency’ means that the regulation is in harmony with, and not in conflict with or contradictory to, existing statutes, court decisions, or state or federal regulations.” H&SC [Section 40727\(b\)\(4\)](#)

The proposed amendments to the existing rule are consistent with other Air District rules, and not in conflict with state or federal law.

## E. Non-Duplication

“‘Nonduplication’ means that a regulation does not impose the same requirements as an existing state or federal regulation unless a district finds that the requirements are necessary or proper to execute the powers and duties granted to, and imposed upon, a district.” H&SC [Section 40727\(b\)\(5\)](#)

Proposed amendments to Rule 6-5, Rule 11-10, and Rule 12-15 are non-duplicative of other statutes, rules or regulations. To the extent duplication exists, such duplication is appropriate for execution of powers and duties granted to and imposed upon the Air District.

## F. Reference

“‘Reference’ means the statute, court decision, or other provision of law that the district implements, interprets, or makes specific by adopting, amending, or repealing a regulation.” H&SC [Section 40727\(b\)\(6\)](#)

Implementing, interpreting or making specific the provisions of the California Health and Safety Code Sections 40000, 40001, 40702 and 40727.

The proposed rules have met all legal noticing requirements, have been discussed with the regulated community and other interested parties, and reflect consideration of the input and comments of many affected and interested stakeholders.

#### G. Recommendations

Air District staff recommends adoption of proposed amendments Rule 6-5, Rule 11-10, and Rule 12-15 and certification of the CEQA Final Environmental Impact Report.

## IX. REFERENCES

1. California Air Pollution Control Officers Association (CAPCOA), 1999. California Implementation Guidelines for Estimating Mass Emissions of Fugitive Hydrocarbon leaks at Petroleum Facilities, February.

## Appendices

- A. Valero Case Agreement: Enforcement Agreement and Agreement to Stay Litigation, March 24, 2017, re: *Valero, et al. v. Bay Area Air Quality Management District*, case number N16-0095, January 22, 2016, amended on February 16, 2016.
- B. WSPA Case Agreement: Settlement, Enforcement, and Release Agreement, March 1, 2018, re: *WSPA, et al. v. Bay Area Air Quality Management District*, case number N16-0963, May 25, 2016.
- C. Cooling Tower Hydrocarbon Emissions Estimates
- D. Summary of Comments and Responses on Proposed Amendments to Rules 6-5, 11-10, and 12-15 and Staff Report

## Attachments

1. Final Staff Report – Rule 6-5: Particulate Emissions from Refinery Fluidized Catalytic Cracking Units; Amendments to Rule 8-18: Equipment Leaks; and Amendments to Rule 11-10: Hexavalent Chromium from All Cooling Towers and Total Hydrocarbon Emissions from Petroleum Refinery Cooling Towers, December 10, 2015
2. Final Staff Report – Rule 12-15: Petroleum Refining Emissions Tracking, April 20, 2016

## APPENDIX A

Enforcement Agreement and Agreement to Stay Litigation, March 24, 2017, re: Valero, et al. v. Bay Area Air Quality Management District, case number N16-0095 (Valero Case Agreement)

## ENFORCEMENT AGREEMENT AND AGREEMENT TO STAY LITIGATION

This Agreement, entered into as of March 24, 2017, is made by and between VALERO REFINING COMPANY—CALIFORNIA, TESORO REFINING & MARKETING COMPANY, LLC, and PHILLIPS 66 COMPANY (collectively, the “**Petitioners**”) and the BAY AREA AIR QUALITY MANAGEMENT DISTRICT (the “**District**”), each sometimes referred to herein as a “Party,” or collectively as the “Parties.”

### RECITALS

The District is the agency with primary responsibility for the control of air pollution from stationary sources in the San Francisco Bay Area Air Basin.

The San Francisco Bay Area Air Basin encompasses Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, and Santa Clara Counties, and the southern portions of Solano and Sonoma Counties.

Petitioners each operate petroleum refining facilities that are within the San Francisco Bay Area Air Basin and are regulated by the District.

On December 16, 2015, the District and its Board approved an Initial Study/Negative Declaration and the adoption or amendment of the three regulations to which Petitioners are subject. These three rules are entitled: Regulation 6, Rule 5: Particulate Emissions from Refinery Fluidized Catalytic Cracking Units (“**Rule 6-5**”); Regulation 8, Rule 18: Equipment Leaks (“**Rule 8-18**”); and Regulation 11, Rule 10: Hexavalent Chromium Emissions from All Cooling Towers and Total Hydrocarbon Emissions from Petroleum Refinery Cooling Towers (“**Rule 11-10**”). Collectively, these three rules are sometimes referred to herein as the “**Challenged Rules**.”

On January 22, 2016, Petitioners filed a Petition and Complaint in the Superior Court for the State of California for the County of Contra Costa and filed an Amended Petition and Complaint on February 16, 2016, which were docketed as *Valero, et al. v. Bay Area Air Quality Management District*, case number N16-0095 (the “**Lawsuit**”).

- a. In the Lawsuit, Petitioners alleged, among other things, that the District’s adoption of the Initial Study/Negative Declaration and the Challenged Rules violated the California Environmental Quality Act (“**CEQA**”) and its implementing regulations (Pub. Res. Code §21000 et seq.; Cal. Code Regs., title 14, § 15000 et seq.); certain provisions of the California Health & Safety Code, (H&SC §§ 40000-4608); and California common law.
- b. The District filed its Answer to the Lawsuit on August 2, 2016 and filed an Amended Answer on August 11, 2016. In its Answers, the District denied that it violated California Law when adopting the Initial Study/Negative Declaration and the Challenged Rules.
- c. Parties completed briefing in the Lawsuit on November 23, 2016.
- d. A hearing in the lawsuit was set by the court for January 27, 2017. By joint stipulation and the Court’s approval, the hearing has been rescheduled for April 14, 2017.

The purpose of this Agreement, which the Parties have negotiated in good faith, is to establish terms, conditions, and a framework for further analysis that will help facilitate full settlement of the Lawsuit. The Parties are engaged in continuing settlement discussions and are making progress towards a mutually satisfactory resolution of the Lawsuit. At the same time, the Parties acknowledge that additional study and analysis is required before full resolution of the Lawsuit is possible.

The Parties have agreed to work together to complete an ongoing heavy liquid component emissions study already being jointly conducted by the District and Petitioners, and hereby acknowledge that the results of that study and other ongoing analyses will inform future actions related to the Lawsuit and amendments to the Challenged Rules.

The Parties acknowledge that any amendments to the Challenged Rules contemplated by this Agreement are subject to the requirements of the District's rulemaking procedures and other applicable laws governing administrative or regulatory action in the State of California.

**NOW, THEREFORE**, based on the foregoing recitals and in consideration of the mutual promises, covenants, and obligations herein, the sufficiency of which consideration is hereby acknowledged, the Parties agree as follows:

#### **ARTICLE 1: STAY OF LITIGATION**

1.1. The Parties agree to seek and maintain a stay of litigation in the Lawsuit, up to and including the earlier of November 1, 2018 or the termination or expiration of this Agreement, including without limitation a delay, postponement, and stay of any further merits briefing and hearing (the "*Stay of Litigation*"). The Stay of Litigation shall not encompass any motions or status reports filed by the Parties to maintain or alter the duration of the Stay of Litigation or to enforce their rights under this Agreement.

1.2. The Parties shall jointly and immediately notify the court of the execution of this Agreement and request, through an appropriate filing with the court, the Stay of Litigation. The Parties further agree to seek leave of the court to allow for status reports to be filed by the Parties every six months during the Stay of Litigation.

1.3. The parties agree to jointly file any motions, status reports, and other papers necessary to obtain and maintain the Stay of Litigation, and no Party shall take any action to frustrate or remove the Stay of Litigation, except in the event of the termination or expiration of this Agreement for any reason.

1.4. In the event that the court lifts the Stay of Litigation prior to the Termination Date of this Agreement, each Party shall have the right, but not the obligation, to terminate this Agreement by providing written notice to all other Parties, in which case no Party shall have any continuing obligation hereunder.

1.5. Nothing in this Article 1 is intended to waive, abridge, abrogate, or limit any procedural or substantive right, claim, or defense that:

a. Petitioners or the District may have with respect to the Challenged Rules and the Lawsuit;

b. Petitioners or the District may have with respect to any other regulatory action undertaken by the District and any related litigation, including but not limited to Case Number N16-0963 pending in the Superior Court for the State of California for the County of Contra Costa.

1.6. Nothing in this Article 1 is intended to waive any right of any Party to prosecute or defend the Lawsuit, or to seek a trial in the Lawsuit, in the event that:

a. the Parties, despite taking all reasonable and appropriate actions, are unable to obtain or maintain the Stay of Litigation due to an action of the court;

b. the court lifts or removes the Stay of Litigation or otherwise sets a date for briefing or trial in the Lawsuit; or

c. this Agreement terminates or expires.

## **ARTICLE 2: HEAVY LIQUIDS STUDY**

2.1. The Parties agree to continue the ongoing heavy liquid component emissions study to assess air emissions that are directly related to refinery components in heavy liquid service (the “*Heavy Liquids Study*”).

2.2. The results of the Heavy Liquids Study will be evaluated in relation to amendment of the Challenged Rules and potential future settlement of the Lawsuit.

2.3. The parameters of the Heavy Liquids Study and each Party’s obligations related to the Heavy Liquids Study include, but are not limited to, the following:

a. The Heavy Liquids Study shall be conducted at five separate refineries that are subject to the District’s jurisdiction, including the three refineries owned or operated by the Petitioners.

(i) The five refineries to be included in the Heavy Liquids Study are: the Valero Benicia Refinery, the Tesoro Martinez Refinery, the Phillips 66 Rodeo Refinery, the Shell Oil Martinez Refinery, and the Chevron Richmond Refinery.

(ii) The Parties acknowledge that Shell Oil and Chevron are not parties to this Agreement or the Lawsuit and that neither the District nor the Petitioners can compel these entities, or their refinery operations, to participate in the Heavy Liquids Study as it is envisioned by this Agreement. To the extent that Shell Oil and/or Chevron do not agree to participate in the Heavy Liquids Study, or otherwise frustrate data collection and analysis with respect to their refinery operations, the Parties to this Agreement shall not be required to include Shell Oil and/or Chevron refinery facilities, as appropriate, in the Heavy Liquids Study.

b. On or before April 30, 2017, the District shall, in consultation with the Petitioners, produce a protocol describing:

(i) the data, parameters, and conditions to be included and evaluated in the Heavy Liquids Study; and

(ii) the format of the results of the Heavy Liquids Study.

The heavy liquids study protocol may be revised as appropriate to reflect lessons learned during the course of the study. Any such revision shall be made in consultation with the Petitioners.

c. The District shall meet with each of the five refineries included in the Heavy Liquids Study and coordinate data collection from each such refinery (subject to the limitations described in Section 2.3(a)(ii)).

d. Petitioners shall cooperate with the District and use commercially reasonable efforts to facilitate data collection and completion of the Heavy Liquids Study.

e. The Parties acknowledge that the data collection phase of the Heavy Liquids Study is estimated to take approximately two months each at the five separate refineries and is expected to conclude in November, 2017.

f. Following completion of the Heavy Liquids Study data collection phase at each refinery, the District shall meet with the refinery managers and/or other designees of the Petitioners at each refinery participating in the Heavy Liquids Study to discuss the data collection process, any issues encountered, exchange lessons learned and best practices related to data collection from equipment in heavy liquid service, and work to mutually resolve any issues in order to facilitate completion of the Heavy Liquids Study.

g. On or before March 31, 2018, the District shall analyze data and other findings of the Heavy Liquids Study and, in consultation with Petitioners, generate a written report documenting the results of the Heavy Liquids Study in accordance with the parameters of this Article 2.

### **ARTICLE 3: COMPLIANCE AND ENFORCEMENT**

3.1. During the Term of this Agreement, and for twelve (12) calendar months following the termination or expiration of this Agreement, the District agrees that, with respect to Petitioners, and notwithstanding the language contained in any of the Challenged Rules, the District shall enforce (or not enforce, as applicable) the following provisions in lieu of corresponding provisions of the Challenged Rules (and any corresponding provisions or requirements contained in an applicable Title V Operating Permit or SIP) as follows:

a. **Rule 6-5.**

(i) The requirements of Rule 6-5 shall not apply to any Fluidized Catalytic Cracking Unit controlled or abated by a Flue Gas Scrubber providing abatement efficiencies that constituted Best Available Control Technology when permitted or constructed.

(ii) Provision 6-5-301, such that it shall not include any emissions limitations related to condensable particulate matter or sulfur dioxide.

b. **Rule 8-18.**

(i) Provision 8-18-306.1: mass emissions determinations are not required for leaks less than 3,000 ppm.

(ii) Provision 8-18-309 shall not apply to lubrication systems and lube oil.

(iii) Provisions 8-18-400 and 8-18-500 shall not apply to a category of equipment that handles organic liquids having an initial boiling point greater than 302° Fahrenheit. This provision of the Agreement shall remain in effect (and shall survive the Term of this Agreement) until the later of:

(A) November 1, 2018; or

(B) one year after the District publishes on the District website a finding that the provisions of 8-18-400 and 8-18-500 are cost-effective when applied to a category of equipment that handles organic liquids having an initial boiling point greater than 302° Fahrenheit; such cost-effectiveness finding shall take into consideration the results of the ongoing Heavy Liquids Study, or whatever portion of the study is completed prior to November 1, 2017.

(iv) With regard to connectors in heavy liquid service, compliance with 8-18-402 shall be achieved as follows: Each facility subject to this Regulation must submit a plan for identifying connectors in heavy liquid service subject to the rule to the Air Pollution Control Officer (“APCO”) by not later than 3 months after the date on which cost-effectiveness findings, if any, are published pursuant to Section 3.1(b)(iii)(B) of this Agreement. Such plan shall provide details of the facility’s plans, procedures, and/or methods for identifying the connectors and documenting compliance with the requirements of Regulation 8-18-401.6. This plan must be approved by the APCO. The approved plan must be implemented within a year of the date on which APCO approves such plan. Provided the plan is timely submitted, the facility is deemed in compliance with this requirement until such time as the APCO acts to approve or disapprove its plan.

(v) Provisions 8-18-502.6 and 503.5 the piping and instrumentation diagrams (“P&IDs”) described in the initially-adopted Rule 8-18-502.6 are not required to be submitted to the District; rather, they shall be maintained at the facility and made available to District for review upon request, and updated as needed in the ordinary course of business and in accordance with other regulatory requirements.

(vi) Provision 8-18-503.2: the submittal date for annual inventory updates shall be February 1 of each year.

c. **Rule 11-10.**

(i) Provision 11-10-105 (“Limited Exemption, Recirculation Rates Less Than 500 Gallons Per Minute and 11-10-106 Limited Exemption, Recirculation Rates Less Than 2,500 Gallons Per Minute”): the sampling and monitoring requirements for cooling towers with recirculation rates less than 2,500 gallons per minute shall be required on a weekly basis, except that a refinery may move to monthly sampling and monitoring for a particular cooling tower after four (4) weeks of sampling or monitoring results below the applicable leak action level, and

(A) in the event that sampling or monitoring identifies a result above the applicable leak action level, the refinery must revert to a weekly sampling or monitoring schedule for the relevant cooling tower; and

(B) the relevant cooling tower shall be again eligible for monthly sampling after four (4) weeks of sampling or monitoring results below the applicable leak action level.

(ii) Provision 11-10-107 (“Limited Exemption Facilities not in Petroleum Refining Process Service”): cooling towers that are not in petroleum refining process service are excluded from the total hydrocarbon emission requirements of this provision. Lube oils and amine streams will be evaluated on a case-by case basis. Specific examples of cooling towers not in petroleum refining process service are those that serve power generation operations, hydrogen production facilities, and carbon dioxide recovery facilities located at petroleum refineries, provided their cooling systems are separate from those used in petroleum refining operations. Sulfur plants shall be evaluated on a case-by-case basis. Refining process service is limited to refinery process units that handle petroleum hydrocarbons.

(iii) Provision 11-10-304 (“Total Hydrocarbon Leak Monitoring Requirement”): the sampling and monitoring requirements contained in Sections 304.1 and 304.3 for cooling towers with recirculation rates greater than 2,500 gallons per minute shall be required on a weekly basis, except that a refinery may move to bi-monthly sampling and monitoring for a particular cooling tower after six (6) months of weekly sampling or monitoring results below the applicable leak action level, and

(A) in the event that sampling or monitoring identifies a result above the applicable leak action level, the refinery must revert to a weekly sampling or monitoring schedule for the relevant cooling tower; and

(B) the relevant cooling tower shall be again eligible for bi-monthly sampling after six (6) months of sampling or monitoring results below the applicable leak action level.

(iv) Provision 11-10-305 (“Leak Action Requirement”):

(A) the cooling tower owner/operator shall minimize leaks greater than the applicable leak action level as soon as practicable or within seven (7) calendar days;

(B) the delay of repair criteria contained in 40 C.F.R. 63.654(f)-(g) shall apply; and

(C) if applicable, the cooling tower owner/operator shall speciate Toxic Air Contaminants (TACs) within 72 hours.

(v) Provision 11-10-401 (“Petroleum Refinery Cooling Tower Reporting Requirements”):

(A) the time for notice pursuant to 401.1 shall be 72 hours and such notices are not required to include pH levels or iron concentrations. Notwithstanding the previous sentence, sampling for chlorine and hydrocarbons shall occur as soon as is feasible and in no event later than 24 hours following discovery of the leak;

(B) the delay of repair criteria contained in 40 C.F.R. 63.654(f)-(g) shall apply; and

(C) Petitioners are not obligated to provide a list of heat exchangers to the District.

(vi) Provision 11-10-402 (“Best Modern Practices”): this Provision shall not apply to Petitioners.

(vii) Provision 11-10-504 (“Operating Records”): Petitioners are not obligated to provide to the District any information, pursuant to this Provision, related to “best modern practices employed.”

3.2. The District agrees that, in addition to interpreting and enforcing the foregoing provisions during the Term of this Agreement consistent with the language and terms of this Article 3, the District shall not encourage or aid any other Person to enforce the provisions of the Challenged Rules addressed in this Article 3 against Petitioners, except as they are described herein.

3.3. During the Term of this Agreement, and for twelve (12) calendar months following the termination or expiration of this Agreement the District agrees that, with respect to each of the Petitioners, compliance with the terms and conditions of this Agreement and, in particular, the provisions of Sections 3.1(a)-(c), shall constitute compliance, or being on a schedule of compliance, with the requirements of the provisions of the Challenged Rules referenced herein, to the extent that each such requirement applies to each Petitioner.

3.4. For avoidance of doubt, the provisions of this Article 3 shall survive for a period of twelve (12) months the termination, cancellation, invalidation, or expiration of this Agreement for any reason including, without limitation, termination pursuant to a right of termination contained herein.

## ARTICLE 4: RULE MODIFICATIONS

4.1. Prior to the expiration of the Term of this Agreement, and subject to Section 2 of this Article, the District shall propose amendments to the Challenged Rules to its Board, and/or take other action as follows:

a. **Rule 6-5.**

(i) Propose an amendment to Rule 6-5 to clarify that Rule 6-5 does not apply to any Fluidized Catalytic Cracking Unit with an installed Wet Scrubber or Flue Gas Scrubber, or adopt implementation guidance to the same effect.

(ii) Either propose an amendment to Provision 6-5-301 to remove references to emissions limitations related to condensable particulate matter or sulfur dioxide, or propose emissions limitations related to these pollutants.

b. **Rule 8-18.**

(i) With respect to provisions 8-18-400 and 8-18-500, the District shall either:

(A) propose an amendment to Rule 8-18, or adopt implementation guidance, to clarify that Provisions 8-18-400 and 8-18-500 shall not apply to a category of equipment that handles organic liquids having an initial boiling point greater than 302° F or;

(B) make a finding on the record, based on the results of the Heavy Liquids Study, that the provisions of 8-18-400 and 8-18-500 are cost-effective when applied to a category of equipment that handles organic liquids having an initial boiling point greater than 302° Fahrenheit; the District's cost of effectiveness analysis shall differentiate between classes of equipment and service types and take into consideration the differences between heavy liquid components' varying physical and operational characteristics, emissions, and leak rates and, if necessary, make different findings for different classes of equipment and service types.

(ii) With respect to provisions 8-18-502.6 and 8-18-503.5, the District shall:

(A) Propose an amendment to Rule 8-18, or adopt implementation guidance to clarify that submissions of P&IDs to the District will not be required pursuant to 8-18-503.5 provided the information is maintained onsite by the facility and made available to the District upon request.

(iii) With respect to provision 8-18-309, the District shall, based on results of the Heavy Liquid Study, evaluate whether this provision should apply to lubrication systems and lube oil, and shall propose to exclude lubrication systems if appropriate.

(iv) With respect to provision 8-18-402, the District shall propose an amendment to Rule 8-18, or adopt implementation guidance to clarify that each facility subject to Rule 8-18 must submit a plan for identifying connectors in heavy liquid service subject to the rule to the Air Pollution Control Officer ("APCO") by not later than 3

months after the date on which cost-effectiveness findings, if any, are published pursuant to Section 3.1(b)(iii)(B) of this Agreement or another later date that is appropriate under the circumstances. Such plans shall provide details of the facility's plans, procedures, and/or methods for identifying the connectors and documenting compliance with the requirements of Regulation 8-18-401.6. This plan must be approved by the APCO. The approved plan must be implemented within a year of the date on which APCO approves such plan. Provided the plan is timely submitted, the facility is deemed in compliance with this requirement until such time as the APCO acts to approve or disapprove its plan.

(v) With respect to provisions 8-18-306 and 8-18-311, the District shall evaluate in a publicly available document (e.g., a staff report) and, if appropriate, propose an amendment to provision 8-18-306 (or a corresponding provision, if renumbered), or adopt implementation guidance, to clarify that mass emissions determinations are not required for leaks less than 3,000 ppm.

(vi) With respect to provision 8-18-503.2, the District shall either propose an amendment to Rule 8-18, or adopt implementation guidance, to clarify that the submittal date for annual inventory updates identified in 8-18-503.2 shall be February 1 of each year.

c. **Rule 11-10.**

(i) With respect to provision 11-10-105, the District shall propose an amendment such that the sampling and monitoring requirements for cooling towers with recirculation rates less than 2,500 gallons per minute shall be required on a weekly basis, except that a refinery may move to monthly sampling and monitoring for a particular cooling tower after four (4) weeks of sampling or monitoring results below the applicable leak action level, and:

(A) in the event that sampling or monitoring identifies a result above the applicable leak action level, the refinery must revert to a weekly sampling or monitoring schedule for the relevant cooling tower; and

(B) the relevant cooling tower shall be again eligible for monthly sampling after four (4) weeks of sampling or monitoring results below the applicable leak action level.

(ii) With respect to provision 11-10-107, the District shall propose an amendment to clarify that cooling towers that are not in petroleum refining process service are excluded from the total hydrocarbon emission requirements of this provision. Such amendment shall also provide specific examples of cooling towers not in petroleum refining process service, including those that serve power generation operations, hydrogen production facilities, and carbon dioxide recovery facilities located at petroleum refineries (provided their cooling systems are separate from those used in petroleum refining operations); refining process service is limited to refinery process units that handle petroleum hydrocarbons; and that sulfur plants shall be evaluated on a case-by-case basis. The District shall also consider, based on results of the Heavy

Liquids Study, whether lube oils and amine streams, or some subset thereof, should be determined not to be in refining process service for purposes of provision 11-10-107, and shall propose amendments to provision 11-10-107 reflecting any such determination. The review described in the preceding sentence is supplemental to, and not in lieu of, any case-by-case review of amine streams and lube oils pursuant to provision 11-10-107.

(iii) With respect to provision 11-10-304, the District shall propose an amendment such that the sampling and monitoring requirements contained in Sections 304.1 and 304.3 for cooling towers with recirculation rates greater than 2,500 gallons per minute shall be required on a weekly basis, except that a refinery may move to bi-monthly sampling and monitoring for a particular cooling tower after six (6) months of weekly sampling or monitoring results below the applicable leak action level, and

(A) in the event that sampling or monitoring identifies a result above the applicable leak action level, the refinery must revert to a weekly sampling or monitoring schedule for the relevant cooling tower; and

(B) the relevant cooling tower shall be again eligible for bi-monthly sampling after six (6) months of sampling or monitoring results below the applicable leak action level.

(iv) With respect to provision 11-10-305, the District shall propose an amendment such that 11-10-305 is modified as follows:

(A) the cooling tower owner/operator shall minimize leaks greater than the applicable leak action level as soon as practicable or within seven (7) calendar days;

(B) the delay of repair criteria contained in 40 C.F.R. 63.654(f)-(g) shall apply; and

(C) if applicable, the cooling tower owner/operator shall speciate Toxic Air Contaminants (TACs) within 72 hours.

(v) With respect to, provision 11-10-401, the District shall propose an amendment such that 11-10-401 is modified as follows:

(A) the time for notice pursuant to 401.1 shall be 72 hours and such notices are not required to include pH levels or iron concentrations. Notwithstanding the previous sentence, sampling shall occur as soon as is feasible and in no event later than 24 hours after discovery of the leak;

(B) the delay of repair criteria contained in 40 C.F.R. 63.654(f)-(g) shall apply; and

(C) Petitioners are not obligated to provide a list of heat exchangers to the District.

(vi) With respect to provision 11-10-402 (“Best Modern Practices”), the District shall propose an amendment such that 11-10-402 is eliminated from Rule 11-10 or does not apply to Petitioners.

(vii) With respect to provision 11-10-504, the District shall propose an amendment modifying 11-10-504 to clarify that Petitioners are not obligated to provide to the District any information, pursuant to this Provision, related to “best modern practices employed.”

4.2. Petitioners acknowledge that certain modifications to the Challenged Rules described in Section 1 of this Article may, in some instances, be addressed by the District through implementation guidance rather than a formal rule amendment. To facilitate that process, and notwithstanding any requirements imposed by Section 1 of this Article to propose rule amendments:

- a. During the Term of this Agreement, the District may propose draft guidance documents to Petitioners in lieu of individual rule amendments contemplated by Section 1 of this Article;
- b. Petitioners shall review draft guidance documents proposed by the District and provide the District with a written response within thirty (30) calendar days indicating whether the proposed guidance is acceptable as drafted; and
- c. in the event Petitioners deem, in writing, that a particular guidance document is acceptable, adoption of that same guidance by the District shall satisfy the corresponding obligation in Section 1 of this Agreement (such that the District shall not be required to propose a formal rule amendment with respect to the relevant rule provision or provisions).

4.3. The District shall make good-faith efforts to complete the various actions contemplated by Section 1 of this Article. Such efforts shall include, but are not limited to:

- a. Completing the Heavy Liquids Study and any other studies or analyses in a timely and workmanlike manner;
- b. Drafting and proposing any rule amendments or guidance documents in a timely manner;
- c. Complying with all applicable rulemaking procedures;
- d. Placing sufficient information in the administrative record to justify and support each rule amendment, regulatory action, or guidance document;
- e. Defending any rule amendments, regulatory actions, and guidance documents during the public notice-and-comment period, if required; and
- f. Defending any rule amendments, regulatory actions, and guidance documents from administrative or judicial challenge brought by any Person other than Petitioners, if required.

## ARTICLE 5: DEFINITIONS

The following capitalized terms used in this Agreement shall have the meanings respectively specified or referenced:

“**Adopt**” means the approval of a resolution by the Board adopting a new or modified rule or regulation, with the effect of making that rule or regulation final and effective as of the applicable effective date contained in the rule or regulation.

“**Board**” or “**The Board**” means the District’s Board of Directors.

“**Breach Notice**” is defined in Section 6.15(b).

“**Breaching Party**” is a Party that commits a Default Event.

“**CEQA**”, or the “**California Environmental Quality Act**”, is defined in the Recitals.

“**Challenged Rules**” is defined in the Recitals.

“**Default Event**” is defined in Section 6.14(a).

“**Effective Date**” is defined in Section 6.2(a).

“**Flue Gas Scrubber**” means a pollution control device employing wet, spray dry, or dry technology to reduce emissions of sulfur dioxide to the atmosphere through absorption and/or reaction processes, and which are sometimes referred to as a “flue gas desulfurization” unit or simply as a “scrubber”.

“**Heavy Liquids Study**” is defined in Section 2.1.

“**Lawsuit**” is defined in the Recitals.

“**Losses**” means any liability, claim, demand, damage, loss, fine, penalty, expense or cost, of any kind or description, including, but not limited to, judgments, liens, expenses (including, but not limited to, court costs and attorneys’ fees) and amounts agreed upon in settlement, but expressly excluding expectation losses or damages and punitive damages.

“**Person**” means any natural person, entity or governmental authority including, but not limited to, any corporation, firm, limited liability company, joint venture, partnership, trust, unincorporated organization or any department or agency of any governmental authority.

“**PPM**” or the lowercase “**ppm**” means parts per million.

“**Rule 6-5**” is defined in the Recitals.

“**Rule 8-18**” is defined in the Recitals.

“**Rule 11-10**” is defined in the Recitals.

“**SIP**” means a California State Implementation Plan that is adopted by the California Air Resources Board and approved by the United States Environmental Protection Agency in accordance with the federal Clean Air Act.

“*Stay of Litigation*” is defined in Section 1.1.

“*Term*” is defined in Section 6.2(c).

“*Termination Date*” is defined in Section 6.2(b).

“*Title V Operating Permit*” means a stationary source operating permit issued to the owner or operator of such facility pursuant to Title V of the federal Clean Air Act, including all matters incorporated into such permits by reference and any pending revision revisions to such permits.

## ARTICLE 6: MISCELLANEOUS PROVISIONS

### 6.1. Scope of Agreement.

- a. This Agreement is binding upon the Parties only with respect to the matters specifically addressed herein and does not otherwise bind Petitioners or the District.
- b. This Agreement does not alter, waive, or abrogate any right that any Party may have to prosecute or defend the Lawsuit in the event of termination or expiration of this Agreement or an applicable order of the court compelling a trial or other resolution of the Lawsuit.
- c. This Agreement does not alter, waive, or abrogate any right that any Party may have to prosecute or defend any currently pending litigation related to regulatory actions other than the Challenged Rules, including but not limited to Case Number N16-0963 in the Superior Court for the State of California for the County of Contra Costa.
- d. This Agreement does not alter, waive, or abrogate any right that Petitioners may have to bring an administrative or judicial challenge to any pending or future rule, regulation, or regulatory action taken by the District.

### 6.2. Effective Date, Term.

- a. This Agreement commences as of March 24, 2017 (the “*Effective Date*”).
- b. This Agreement terminates on November 1, 2018 (the “*Termination Date*”) unless terminated earlier pursuant to a right of termination herein, or extended by mutual written agreement by the Parties, subject to approval of the court.
- c. The term of this Agreement (the “*Term*”) will begin on the Effective Date and, unless this Agreement is earlier terminated by a Party pursuant a right of termination in this Agreement, will expire upon the Termination Date. The term may be extended by mutual written agreement by the Parties, subject to approval of the court.

6.3. Successors and Assigns. This Agreement may not be assigned by any Party without the express written consent of all of the other Parties, whose consent will not be unreasonably withheld. This Agreement is binding upon and shall inure to the benefit of the Parties, their respective successors, limited partners, agents, principals, and permitted assigns.

6.4. No Presumption Regarding Drafting Party. This Agreement is the result of negotiations between the Parties, and it is the product of all of the Parties. This Agreement shall not be construed against any Party because of the involvement of that Party or its counsel in the preparation or drafting of this Agreement.

6.5. Severability. If any term or provision of this Agreement is to any extent illegal, otherwise invalid, or incapable of being enforced, then such term or provision shall be excluded only to the extent of such invalidity or unenforceability and all other terms and provisions contained in this Agreement shall remain in full force and effect, subject to the following:

- a. if application of this severability provision should materially affect the substance of this Agreement and the actions contemplated herein, the Parties agree to negotiate in good faith to amend this Agreement to include a replacement provision suitable to all Parties to give effect to the original intent of the Parties;
- b. if the Parties are unable to reach agreement on a replacement provision within thirty (30) calendar days, the adversely impacted Party shall have the right but not obligation to terminate this Agreement, in which case neither Party shall have any further obligations hereunder; and
- c. in the event of such termination, the Parties agree to jointly seek to remove the Stay of Litigation described in Article 1.

6.6. Notices. All notices, requests, demands and other communications made under this Agreement shall be in writing and shall be deemed duly given if (i) hand delivered against a signed receipt therefor, (ii) sent by registered mail, return receipt requested, first class postage prepaid, or (iii) sent by internationally recognized overnight delivery service.

- a. Notices to Petitioners pursuant to this Agreement shall be sent to:

*Valero Refining Company—California:*

Name:	Megan Bluntzer
Email:	Megan.Bluntzer@valero.com
Telephone:	(210) 345-4009
Address:	1 Valero Way, San Antonio, TX 78249

*Tesoro Refining & Marketing Company, LLC:*

Name:	Stoney Vining
Email:	Stoney.K.Vining@tsocorp.com
Telephone:	(210) 626-4122
Address:	19100 Ridgewood Pkwy , San Antonio, TX 78259

*Phillips 66 Company:*

Name:	Manager, San Francisco Refinery at Rodeo
Email:	N/A
Telephone:	(510) 245-4415
Address:	1380 San Pablo Avenue, Rodeo, CA 94572

*With a copy to Beveridge & Diamond P.C.:*

Name:	David McCray
Email:	dmccray@bdlaw.com
Telephone:	(415) 262-4025
Address:	456 Montgomery Street, Suite 1800, San Francisco, CA 94104

b. Notices to the District pursuant to this Agreement shall be sent to:

Name:	Adan Schwartz
Email:	aschwartz@baaqmd.gov
Telephone:	(415) 749-4920
Address:	375 Beale St., San Francisco, 94105

*With a copy to:*

Name:	Eric Stevenson
Email:	estevenson@baaqmd.gov
Telephone:	(415) 749-4695
Address:	375 Beale St., San Francisco, 94105

c. Either Party may alter that Party's contact information for purposes of notices, at any time, by giving notice of such change in conformity with the provisions of this Section 6.6.

d. Notice shall be deemed to be effective: if hand delivered, when delivered; if mailed, at midnight on the third (3rd) business day after being sent by registered mail; and if sent by internationally recognized overnight delivery service, on the next business day following delivery to such delivery service.

e. The Parties acknowledge and agree that the foregoing provisions for the giving of notice are not intended to cover day-to-day communications between the Parties in the course of performing each such Party's duties and obligations hereunder, including, without limitation, communications related to conducting the Heavy Liquids Study.

f. The notice provisions contained in this Section 6.6 are not intended to alter in any way the procedures related to the District's regulatory and rulemaking processes, including but not limited to the provision of adequate public notice of regulatory actions,

submission of public comments on such actions, and other notifications and procedures required or customary with respect to District's regulatory actions.

6.7. Governing Law; Venue. This Agreement shall be governed by and construed in accordance with the laws of California, without giving effect to any choice or conflict of law provision or rule (whether of the State of California or any other jurisdiction). Any action, proceeding or suit arising out of or based upon this Agreement or shall be instituted in the Superior Court for the State of California for the County of Contra Costa.

6.8. Recitals. The Recitals set forth in this Agreement are a material part of this Agreement and are hereby expressly incorporated by reference as though expressly set forth herein.

6.9. Authority.

a. Petitioners and the District hereby represent and warrant that they each have full power and authority to enable execute and deliver this Agreement and to perform their obligations hereunder.

b. Each of the undersigned individuals represents and warrants that s/he has read and understands this Agreement and has full and complete lawful authority to bind the respective Party and any respective principals, successors, subsidiaries, partners, limited partners, agents and assigns to this Agreement.

6.10. Entire Agreement. This Agreement, including any Appendices hereto, constitutes the full, complete and final statement of Petitioners and the District on the matters addressed by this Agreement. The Parties acknowledge that this Agreement contains the entire understanding between the Parties with respect to the matters addressed by this Agreement.

6.11. Amendments in writing. This Agreement may be amended or modified only by a written instrument signed by authorized representatives of all Parties.

6.12. Waiver. Any waiver of any provision or term of this Agreement shall be effective only if in writing and signed by all Parties. The waiver of any provision or term of this Agreement shall not be deemed as a waiver of any other provision of this Agreement.

6.13. No Third Party Beneficiaries. There are no third-party beneficiaries to this Agreement and nothing expressed, implied, or referred to in this Agreement will be construed to give any Person, other than the Parties to this Agreement, any legal or equitable right, remedy, or claim under or with respect to this Agreement or any provision of this Agreement, except such rights as may inure to the predecessors, successors, subsidiaries partners, limited partners, agents, principals, and permitted assigns of each Party.

6.14. Breach, Termination.

a. Default Events. Any material breach of any provision of this Agreement shall constitute a "**Default Event**." In the event of a Default Event, the non-defaulting Party may take any remedies available to it under applicable law and this Section 6.14.

b. Notice of breach.

(i) In the event any Party commits a Default Event, and has knowledge of that Default Event, the Breaching Party shall give immediate notice to all other Parties describing the Default Event in reasonable detail and identifying which section(s) of this Agreement the Breaching Party has materially breached.

(ii) A Party may issue notice to any other Party upon gaining knowledge of a Default Event by the other Party, identifying which section(s) of this Agreement that Party has allegedly materially breached (each such notice, a “**Breach Notice**”).

c. Termination in Event of Default. Each Party shall have the right, but not the obligation, to terminate this Agreement upon written notice to all other Parties of a Default Event that is not remedied and cured in all material respects by the Breaching Party within thirty (30) calendar days after the date of a corresponding Breach Notice.

d. Remedies in event of termination following a default event. In the event of termination of this Agreement pursuant to Section 6.14(c):

(i) the non-Breaching Party shall have the right to lift the Stay of Litigation described in Article 1 and to take make any filings with the court necessary to facilitate such removal of the Stay of Litigation; and

(ii) the non-Breaching Party also shall have the right to any and all legal and equitable remedies available to it under applicable law.

6.15. Reasonable Cooperation. The Parties agree to provide reasonable cooperation to each other as may be necessary to give effect to this Agreement. The Parties agree to meet monthly to discuss the Heavy Liquid Study progress, related issues, and to foster communication. The Parties agree that at least one such meeting will be held in person each quarter. The remaining meetings may be held in person and/or by teleconference.

6.16. Time is of the Essence. Time is of the essence with respect to the completion of each Party’s obligations under this Agreement. This is a material provision of this Agreement.

6.17. Counterparts. This Agreement may be executed in one or more counterparts, each of which shall have the same force and effect as an original, but all of which together shall constitute one and the same instrument.

[Signature page(s) follow]

IN WITNESS WHEREOF, this Agreement has been executed by each of the Parties as of the date set forth beneath such Party's authorized representative's signature:

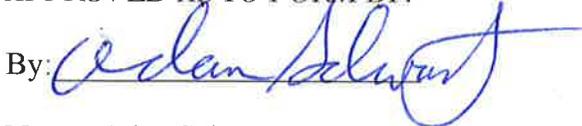
**BAY AREA AIR QUALITY  
MANAGEMENT DISTRICT**

By:   
Name: Jack P. Broadbent

Title: Executive Officer/APCO

Dated: 3/28/17

*APPROVED AS TO FORM BY:*

By:   
Name: Adan Schwartz

Title: Senior Assistant Counsel, Bay Area  
Air Quality Management District

Dated: March 24, 2017

**VALERO REFINING COMPANY—  
CALIFORNIA**

By: \_\_\_\_\_

Name: Don Wilson

Title: VP and General Manager

Dated: \_\_\_\_\_

**TESORO REFINING & MARKETING  
COMPANY, LLC**

By: \_\_\_\_\_

Name: Thomas A Lu

Title: Vice President, Martinez Refinery

Dated: \_\_\_\_\_

**PHILLIPS 66 COMPANY**

By: \_\_\_\_\_

Name: Mark Evans

Title: Refinery Manager

Dated: \_\_\_\_\_

IN WITNESS WHEREOF, this Agreement has been executed by each of the Parties as of the date set forth beneath such Party's authorized representative's signature:

**BAY AREA AIR QUALITY  
MANAGEMENT DISTRICT**

By: \_\_\_\_\_

Name: Jack P. Broadbent

Title: Executive Officer/APCO

Dated: \_\_\_\_\_

*APPROVED AS TO FORM BY:*

By: \_\_\_\_\_

Name: Adan Schwartz

Title: Senior Assistant Counsel, Bay Area  
Air Quality Management District

Dated: \_\_\_\_\_

**VALERO REFINING COMPANY—  
CALIFORNIA**

By: Don Wilson *MQB*

Name: Don Wilson

Title: VP and General Manager

Dated: 3/23/17

**TESORO REFINING & MARKETING  
COMPANY, LLC**

By: \_\_\_\_\_

Name: Thomas A Lu

Title: Vice President, Martinez Refinery

Dated: \_\_\_\_\_

**PHILLIPS 66 COMPANY**

By: \_\_\_\_\_

Name: Mark Evans

Title: Refinery Manager

Dated: \_\_\_\_\_

IN WITNESS WHEREOF, this Agreement has been executed by each of the Parties as of the date set forth beneath such Party's authorized representative's signature:

**BAY AREA AIR QUALITY  
MANAGEMENT DISTRICT**

By: \_\_\_\_\_

Name: Jack P. Broadbent

Title: Executive Officer/APCO

Dated: \_\_\_\_\_

*APPROVED AS TO FORM BY:*

By: \_\_\_\_\_

Name: Adan Schwartz

Title: Senior Assistant Counsel, Bay Area  
Air Quality Management District

Dated: \_\_\_\_\_

**VALERO REFINING COMPANY—  
CALIFORNIA**

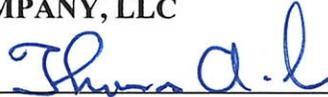
By: \_\_\_\_\_

Name: Don Wilson

Title: VP and General Manager

Dated: \_\_\_\_\_

**TESORO REFINING & MARKETING  
COMPANY, LLC**

By: 

<sup>MWA</sup>  
Name: Thomas A Lu

Title: Vice President, Martinez Refinery

Dated: 3/23/2017

**PHILLIPS 66 COMPANY**

By: \_\_\_\_\_

Name: Mark Evans

Title: Refinery Manager

Dated: \_\_\_\_\_

IN WITNESS WHEREOF, this Agreement has been executed by each of the Parties as of the date set forth beneath such Party's authorized representative's signature

**BAY AREA AIR QUALITY  
MANAGEMENT DISTRICT**

By: \_\_\_\_\_

Name Jack P Broadbent

Title: Executive Officer/APCO

Dated: \_\_\_\_\_

*APPROVED AS TO FORM BY*

By \_\_\_\_\_

Name. Adan Schwartz

Title. Senior Assistant Counsel, Bay Area  
Air Quality Management District

Dated. \_\_\_\_\_

**VALERO REFINING COMPANY—  
CALIFORNIA**

By: \_\_\_\_\_

Name: Don Wilson

Title. VP and General Manager

Dated \_\_\_\_\_

**TESORO REFINING & MARKETING  
COMPANY, LLC**

By \_\_\_\_\_

Name: Thomas A Lu

Title: Vice President, Martinez Refinery

Dated: \_\_\_\_\_

**PHILLIPS 66 COMPANY**

By:  \_\_\_\_\_

Name: Mark Evans

Title: Refinery Manager

Dated: 3/24/2017

## APPENDIX B

Settlement, Enforcement, and Release Agreement, March 1, 2018, re: WSPA, et al. v. Bay Area Air Quality Management District, case number N16-0963 (WSPA Case Agreement)

## SETTLEMENT, ENFORCEMENT, AND RELEASE AGREEMENT

This Settlement, Enforcement, and Release Agreement (“Agreement”) is entered into as of the last date of execution of the Agreement, by and between the WESTERN STATES PETROLEUM ASSOCIATION (“WSPA”), VALERO REFINING COMPANY—CALIFORNIA (“Valero”), TESORO REFINING & MARKETING COMPANY, LLC (“Tesoro”), and PHILLIPS 66 COMPANY (“Phillips 66”) (collectively, the “Petitioners”) and the BAY AREA AIR QUALITY MANAGEMENT DISTRICT (the “District”), each sometimes referred to herein as a “Party,” or collectively as the “Parties.”

### RECITALS

The District is the agency with primary responsibility for the control of air pollution from stationary sources in the San Francisco Bay Area Air Basin.

The San Francisco Bay Area Air Basin encompasses Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, and Santa Clara Counties, and the southern portions of Solano and Sonoma Counties.

Petitioner WSPA is a non-profit trade association representing twenty-six companies that explore for, produce, refine, transport, and market petroleum, petroleum products, natural gas, and other energy supplies in California, Arizona, Nevada, Oregon, and Washington. WSPA’s members include Chevron Products Company, Shell Martinez Refinery, Phillips 66, Tesoro, and Valero (collectively, “WSPA Members”), all of which have operations and facilities in the Bay Area that are regulated by the District.

Individually named Petitioners Valero, Tesoro, and Phillips 66 each operate petroleum refining facilities that are within the San Francisco Bay Area Air Basin and are regulated by the District.

On April 20, 2016, the District and its Board approved and adopted Regulation 12, Rule 15: Petroleum Refining Emissions Tracking (“Rule 12-15”); and Regulation 9, Rule 14: Petroleum Coke Calcining Operations (“Rule 9-14”). Collectively, these rules are sometimes referred to herein as the “*Challenged Rules*.”

On May 25, 2016, Petitioners filed a Petition and Complaint in the Superior Court for the State of California for the County of Contra Costa which was docketed as *WSPA, et al. v. Bay Area Air Quality Management District*, case number N16-0963 (the “Lawsuit”).

In the Lawsuit, Petitioners allege, among other things, that the District’s adoption of the Initial Study/Negative Declaration and the Challenged Rules violated the California Environmental Quality Act (“CEQA”) and its implementing regulations (Pub. Res. Code §21000 et seq.; Cal. Code Regs., title 14, § 15000 et seq.); certain provisions of the California Health & Safety Code, (H&SC §§ 40000-4608); and California common law.

The District filed its Answer to the Lawsuit on November 4, 2016. In its Answer, the District denies that it violated California law when adopting the Initial Study/Negative Declaration and the Challenged Rules.

The Parties have completed briefing the matter and a hearing date has been set for March 5, 2018.

On July 26, 2017, the Governor of California signed into law Assembly Bill No. 617 (“AB 617”) which amends Section 39607(b) of the Health and Safety Code to require the California Air Resources Board (“CARB”) to establish “a uniform statewide system of annual reporting of emissions of criteria pollutants and toxic air contaminants for a stationary source.” The Parties acknowledge that implementation of this Agreement may be affected by AB 617 or implementing regulations adopted by CARB.

**NOW, THEREFORE**, based on the foregoing recitals and in consideration of the mutual promises, covenants, and obligations herein, the sufficiency of which consideration is hereby acknowledged, the Parties agree to the following terms in settlement of this lawsuit:

### **SECTION 1: ENFORCEMENT**

1.1. The District agrees that, until Rule 12-15 is amended as provided for in Section 2 of this Agreement, it shall enforce Rule 12-15 against Petitioners only in accordance with the modified language and provisions contained in Appendix A of this Agreement, which is attached hereto and hereby fully incorporated into and made part of this Agreement (“Appendix A”).

1.2. Petitioners agree to comply with the modified language and provisions of Rule 12-15 contained in Appendix A until Rule 12-15 is amended by the District as provided for below in Section 2.

1.3. Petitioners’ compliance with the modified language and provisions of Rule 12-15 as it appears in Appendix A shall constitute compliance, or being on a schedule of compliance, with the requirements of Rule 12-15.

1.4. For avoidance of doubt, any provision of Rule 12-15 not identified in Appendix A is not modified or altered by this Agreement.

1.5. It is the understanding of the parties that, pursuant to Section 12-15-408.1, should the Refineries not have historical data kept in the ordinary course of business, the absence of such data will not, in and of itself, trigger New Source Review permitting requirements under Rules 2-1 or 2-2. Nothing herein is intended to restrict the District’s options in a future revision to Rules 2-1 or 2-2.

1.6. As of the Effective Date of this Agreement, the District and Petitioners are discussing whether Petitioners are required to report emissions from stationary sources that are temporarily located on site to perform tasks at refineries, but are permitted to other entities (“Temporary Sources”) for purposes of the Section 12-15-206 Emissions Inventory. The District agrees that, until a future rule adoption specifically and expressly requires the reporting of emissions data for Temporary Sources by Petitioners, the District will not seek to expand reporting under Rule 12-15 beyond what is currently practiced in the annual update. Notwithstanding the preceding sentence, the District may require that Petitioners continue to report emissions from Temporary Sources that have previously been included in the annual updates for refinery permit renewals.

This paragraph only addresses Petitioners' obligation to report. Nothing in the paragraph is intended to limit the District's ability to estimate emissions from Temporary Sources.

1.7. The Parties are currently undertaking a Heavy Liquids Study, pursuant to a separate agreement, to measure and assess emissions from certain components in heavy liquid service at Bay Area refineries ("Heavy Liquids Study"). The Parties agree that pending completion of the Heavy Liquid Study and the establishment of new emissions factors based upon the results of the Heavy Liquids Study, the interim Heavy Liquids Emissions Factors depicted in Appendix A, Section 12-15-401, below, will be utilized for purposes of complying with and enforcing Rule 12-15, as well as for all other District purposes, including but not limited to, emissions permit fees and rule-making.

## **SECTION 2: AMENDMENT OF RULE 12-15.**

2.1. The Parties agree and acknowledge that:

- a. the modified language, provisions, and comments appearing in Appendix A represent the intent of the Parties with respect to modifying Rule 12-15 and that;
- b. such language is the result of good faith, arms-length negotiations regarding the appropriate and legal scope of Rule 12-15.

2.2. Within nine (9) months of the Effective Date, the District shall propose for adoption amendments to Rule 12-15 in accordance with the modified language and comments set forth in in Appendix A.

## **SECTION 3: DISMISSAL OF LAWSUIT**

3.1. Within thirty (30) calendar days of the adoption of revisions to Rule 12-15 that are in accordance with Section 2 of this Agreement, or other revisions that are otherwise acceptable to Petitioners, Petitioners shall make an appropriate filing with the court seeking voluntary dismissal of the Lawsuit, inclusive of all causes of action therein, with prejudice.

3.2. Notwithstanding the forgoing, this Agreement does not alter, waive, or abrogate any right that any Party may have to (i) prosecute or defend the Lawsuit in the event that a Party commits a material breach of any provision herein, including but not limited to the District's failure to propose and/or adopt revisions to Rule 12-15 substantially similar to those contained in Appendix A or (ii) enforce the terms of this Agreement. Nor does this Agreement alter, waive, or abrogate any right that the Petitioners have to challenge future modifications or amendments to Rule 12-15, or to any other rule or regulation, that the District may propose and/or adopt.

3.3. Effective on the same day as dismissal of the lawsuit in accordance with this Section 3, should such dismissal be granted by the court, the Parties, through this agreement and subject to Section 3.2, shall release and forever discharge each other from any and all claims, debts, damages, liabilities, demands, obligations, costs, expenses, attorney fees, disputes, actions and causes of action of every nature, whether known or unknown, suspected or unsuspected, that each Party may hold or have against each other as a result of the subject of the Lawsuit,

including, but not limited to those claims set forth in the Lawsuit, all of which are incorporated herein fully by reference.

#### SECTION 4: MISCELLANEOUS PROVISIONS

##### 4.1. Scope of Agreement.

- a. This Agreement is binding upon the Parties only with respect to the matters specifically addressed herein and does not otherwise bind Petitioners or the District.
- b. This Agreement does not alter, waive, or abrogate any right that any Party may have to prosecute or defend any currently pending litigation related to regulatory actions other than the Challenged Rules, including but not limited to Case Number N16-0095 (*Valero et al. v. BAAQMD*) and Case Number N17-2300 (*WSPA et al. v BAAQMD*).
- c. This Agreement does not alter, waive, or abrogate any right that Petitioners may have to bring an administrative or judicial challenge to any pending or future rule, regulation, or regulatory action taken by the District.
- d. In entering into this Agreement, the Petitioners expressly reserve and do not waive any arguments they may have, either singularly or collectively, in part or all together, to allege and prosecute any and all claims that rules other than the Challenged Rules are part of the same CEQA “project” as the Challenged Rules and in violation of CEQA. Further, the District agrees that it will not oppose such claims by arguing that dismissal of the Lawsuit is evidence that illegal “piecemealing” did not occur.

4.2. No Presumption Regarding Drafting Party. This Agreement is the result of arms-length negotiations between the Parties, and it is the product of all of the Parties. This Agreement shall not be construed against any Party because of the involvement of that Party or its counsel in the preparation or drafting of this Agreement.

4.3. Severability. If any term or provision of this Agreement is to any extent illegal, otherwise invalid, or incapable of being enforced, then such term or provision shall be excluded only to the extent of such invalidity or unenforceability and all other terms and provisions contained in this Agreement shall remain in full force and effect, and the Parties shall work together in good faith to amend, modify, or replace the relevant term or provision in accordance with the intent of the Parties as expressed in this Agreement.

4.4. Notices. All notices, requests, demands and other communications made under this Agreement shall be in writing and shall be deemed duly given if (i) hand delivered against a signed receipt therefor, (ii) sent by registered mail, return receipt requested, first class postage prepaid, or (iii) sent by internationally recognized overnight delivery service.

a. Notices to Petitioners pursuant to this Agreement shall be sent to:

*Western States Petroleum Association:*

Name:	Oyango Snell
Email:	osnell@wspa.org
Telephone:	(916) 325-3115
Address:	1415 L Street, Suite 600, Sacramento, CA 95814

*Valero Refining Company—California:*

Name:	Megan Bluntzer
Email:	Megan.Bluntzer@valero.com
Telephone:	(210) 345-4009
Address:	1 Valero Way, San Antonio, TX 78249

*Tesoro Refining & Marketing Company, LLC:*

Name:	Stoney Vining
Email:	Stoney.K.Vining@tsocorp.com
Telephone:	(210) 626-4122
Address:	19100 Ridgewood Pkwy , San Antonio, TX 78259

*Phillips 66 Company:*

Name:	Manager, San Francisco Refinery at Rodeo
Email:	N/A
Telephone:	(510) 245-4415
Address:	1380 San Pablo Avenue, Rodeo, CA 94572

*With a copy to Beveridge & Diamond P.C.:*

Name:	David McCray
Email:	dmccray@bdlaw.com
Telephone:	415.262.4025
Address:	456 Montgomery Street, Suite 1800, San Francisco, CA 94104

b. Notices to the District pursuant to this Agreement shall be sent to:

Name:	Adan Schwartz
Email:	aschwartz@baaqmd.gov
Telephone:	(415) 749-4920
Address:	375 Beale St., San Francisco, 94105

*With a copy to:*

Name:	Eric Stevenson
Email:	estevenson@baaqmd.gov
Telephone:	(415) 749-4695
Address:	375 Beale St., San Francisco, 94105

c. Either Party may alter that Party's contact information for purposes of notices, at any time, by giving notice of such change in conformity with the provisions of this Agreement.

d. Notice shall be deemed to be effective: if hand delivered, when delivered; if mailed, at midnight on the third (3rd) business day after being sent by registered mail; and if sent by internationally recognized overnight delivery service, on the next business day following delivery to such delivery service.

4.5. Governing Law; Venue. This Agreement shall be governed by and construed in accordance with the laws of California, without giving effect to any choice or conflict of law provision or rule (whether of the State of California or any other jurisdiction). Any action, proceeding or suit arising out of or based upon this Agreement shall be instituted in the Superior Court for the State of California for the County of Contra Costa.

4.6. Recitals. The Recitals set forth in this Agreement are a material part of this Agreement and are hereby expressly incorporated by reference as though expressly set forth herein.

4.7. Authority. Each Party hereby represents and warrants that it has full power and authority to enable, execute and deliver this Agreement and to perform its obligations hereunder. Each of the undersigned individuals represents and warrants that s/he has read and understands this Agreement and has full and complete lawful authority to bind the respective Party and any respective principals, successors, subsidiaries, partners, limited partners, agents and assigns to this Agreement.

4.8. Benefit and Burden. This Agreement is binding upon and shall inure to the benefit of the Parties, their respective beneficiaries, predecessors, successors, assigns, partners, partnerships, parent companies, subsidiaries, affiliated and related entities, officers, directors, principals, agents, servants, employees, representatives, and all persons, firms, petitioners, and/or persons or entities connected with each of them, including, without limitation, their insurers, sureties, attorneys, consultants, and experts.

4.9. Entire Agreement. This Agreement, including any Appendices hereto, constitutes the full, complete and final statement of Petitioners and the District on the matters addressed by this Agreement. The Parties acknowledge that this Agreement contains the entire understanding between the Parties with respect to the matters addressed by this Agreement. This Agreement expressly supersedes, voids, and terminates the entirety of the Interim Enforcement Agreement executed by the Parties on April 21, 2017 and amended on June 30, 2017.

4.10. Amendments in writing. This Agreement may be amended or modified only by a written instrument signed by authorized representatives of all Parties.

4.11. Waiver. Any waiver of any provision or term of this Agreement shall be effective only if in writing and signed by all Parties. The waiver of any provision or term of this Agreement shall not be deemed as a waiver of any other provision of this Agreement.

4.12. No Third-Party Beneficiaries. There are no third-party beneficiaries to this Agreement and nothing expressed, implied, or referred to in this Agreement will be construed to give any Person, other than the Parties to this Agreement, any legal or equitable right, remedy, or claim under or with respect to this Agreement or any provision of this Agreement, except such rights as may inure to the Parties' predecessors, successors, subsidiaries, or other persons or entities, in accordance with Section 4.8.

4.13. Further Cooperation. The Parties shall cooperate and promptly execute any and all documents and perform any and all acts necessary to effectuate the provisions of this Agreement.

4.14. No Admission. This Agreement resulted from a compromise of disputed claims and is not to be construed as an admission by either Party nor as acknowledgement that any of the claims and responses were correct or incorrect.

4.15. Effective Date. The Effective Date of this Agreement shall be the last date of execution of the Agreement.

4.16. Counterparts. This Agreement may be executed in one or more counterparts, each of which shall have the same force and effect as an original, but all of which together shall constitute one and the same instrument.

*[Signature page(s) follow]*

IN WITNESS WHEREOF, this Agreement has been executed by each of the Parties as of the date set forth beneath such Party's authorized representative's signature:

**BAY AREA AIR QUALITY  
MANAGEMENT DISTRICT**

BY:   
NAME: \_\_\_\_\_

TITLE: \_\_\_\_\_

DATED: 2/27/18

**APPROVED AS TO LEGAL FORM**

  
**BRIAN C. BUNGER  
DISTRICT COUNSEL  
BAY AREA AQMD**

**WESTERN STATES PETROLEUM  
ASSOCIATION**

BY: \_\_\_\_\_

NAME: \_\_\_\_\_

TITLE: \_\_\_\_\_

DATED: \_\_\_\_\_

**VALERO REFINING COMPANY—  
CALIFORNIA**

BY: \_\_\_\_\_

NAME: \_\_\_\_\_

TITLE: \_\_\_\_\_

DATED: \_\_\_\_\_

**TESORO REFINING & MARKETING  
COMPANY, LLC**

BY: \_\_\_\_\_

NAME: \_\_\_\_\_

TITLE: \_\_\_\_\_

DATED: \_\_\_\_\_

**PHILLIPS 66 COMPANY**

BY: \_\_\_\_\_

NAME: \_\_\_\_\_

TITLE: \_\_\_\_\_

DATED: \_\_\_\_\_

IN WITNESS WHEREOF, this Agreement has been executed by each of the Parties as of the date set forth beneath such Party's authorized representative's signature:

**BAY AREA AIR QUALITY  
MANAGEMENT DISTRICT**

BY: \_\_\_\_\_

NAME: \_\_\_\_\_

TITLE: \_\_\_\_\_

DATED: \_\_\_\_\_

**WESTERN STATES PETROLEUM  
ASSOCIATION**

BY: Oyango A. Snell

NAME: Oyango A. Snell (802878)

TITLE: General Counsel (Registered In-house)

DATED: 2/28/2018

**VALERO REFINING COMPANY—  
CALIFORNIA**

BY: \_\_\_\_\_

NAME: \_\_\_\_\_

TITLE: \_\_\_\_\_

DATED: \_\_\_\_\_

**TESORO REFINING & MARKETING  
COMPANY, LLC**

BY: \_\_\_\_\_

NAME: \_\_\_\_\_

TITLE: \_\_\_\_\_

DATED: \_\_\_\_\_

**PHILLIPS 66 COMPANY**

BY: \_\_\_\_\_

NAME: \_\_\_\_\_

TITLE: \_\_\_\_\_

DATED: \_\_\_\_\_

IN WITNESS WHEREOF, this Agreement has been executed by each of the Parties as of the date set forth beneath such Party's authorized representative's signature:

**BAY AREA AIR QUALITY  
MANAGEMENT DISTRICT**

BY: \_\_\_\_\_

NAME: \_\_\_\_\_

TITLE: \_\_\_\_\_

DATED: \_\_\_\_\_

**WESTERN STATES PETROLEUM  
ASSOCIATION**

BY: \_\_\_\_\_

NAME: \_\_\_\_\_

TITLE: \_\_\_\_\_

DATED: \_\_\_\_\_

**VALERO REFINING COMPANY—  
CALIFORNIA**

BY: Donald C. Wilson *MDP*

NAME: DONALD C. WILSON

TITLE: VP & GM

DATED: 2-26-18

**TESORO REFINING & MARKETING  
COMPANY, LLC**

BY: \_\_\_\_\_

NAME: \_\_\_\_\_

TITLE: \_\_\_\_\_

DATED: \_\_\_\_\_

**PHILLIPS 66 COMPANY**

BY: \_\_\_\_\_

NAME: \_\_\_\_\_

TITLE: \_\_\_\_\_

DATED: \_\_\_\_\_

IN WITNESS WHEREOF, this Agreement has been executed by each of the Parties as of the date set forth beneath such Party's authorized representative's signature:

**BAY AREA AIR QUALITY  
MANAGEMENT DISTRICT**

BY: \_\_\_\_\_

NAME: \_\_\_\_\_

TITLE: \_\_\_\_\_

DATED: \_\_\_\_\_

**WESTERN STATES PETROLEUM  
ASSOCIATION**

BY: \_\_\_\_\_

NAME: \_\_\_\_\_

TITLE: \_\_\_\_\_

DATED: \_\_\_\_\_

**VALERO REFINING COMPANY—  
CALIFORNIA**

BY: \_\_\_\_\_

NAME: \_\_\_\_\_

TITLE: \_\_\_\_\_

DATED: \_\_\_\_\_

**TESORO REFINING & MARKETING  
COMPANY, LLC**

BY: Thomas A. Lu

NAME: Thomas A. Lu

TITLE: VP, Martinez Refinery

DATED: 2/26/2018

**PHILLIPS 66 COMPANY**

BY: \_\_\_\_\_

NAME: \_\_\_\_\_

TITLE: \_\_\_\_\_

DATED: \_\_\_\_\_

IN WITNESS WHEREOF, this Agreement has been executed by each of the Parties as of the date set forth beneath such Party's authorized representative's signature:

**BAY AREA AIR QUALITY  
MANAGEMENT DISTRICT**

BY: \_\_\_\_\_

NAME: \_\_\_\_\_

TITLE: \_\_\_\_\_

DATED: \_\_\_\_\_

**WESTERN STATES PETROLEUM  
ASSOCIATION**

BY: \_\_\_\_\_

NAME: \_\_\_\_\_

TITLE: \_\_\_\_\_

DATED: \_\_\_\_\_

**VALERO REFINING COMPANY—  
CALIFORNIA**

BY: \_\_\_\_\_

NAME: \_\_\_\_\_

TITLE: \_\_\_\_\_

DATED: \_\_\_\_\_

**TESORO REFINING & MARKETING  
COMPANY, LLC**

BY: \_\_\_\_\_

NAME: \_\_\_\_\_

TITLE: \_\_\_\_\_

DATED: \_\_\_\_\_

**PHILLIPS 66 COMPANY**

BY:  \_\_\_\_\_

NAME: MARK EVANS

TITLE: REFINERY MANAGER

DATED: 3/1/2018

**APPENDIX A**  
**Rule 12-15 Modifications**

The following provisions of Rule 12-15 shall be proposed to be modified in accordance with the redline version below, in which (1) red text indicates language that shall be added (**example of new text**) to the relevant provision for purpose of this Agreement and for purposes of enforcement against Petitioners and, (2) strikethrough text indicates language that shall be removed (~~example of removed text~~) from the relevant provision for purpose of this Agreement and for purposes of enforcement against Petitioners. Comments on the redline version, which are considered terms of this Agreement, are indicated in green text (**example of comment text**). The District may propose the textual changes in this Agreement or alternative textual changes with the equivalent effect:

- a. 12-15-205: Crude Oil/**Crude Oil Blends: Unblended crude oil or blended crude oil at the first stage of processing at a Petroleum Refinery (typically at a crude distillation unit).**  
~~Petroleum, as it occurs after being extracted from geologic formations by an oil well, and after extraneous substances may have been removed, and which may be subsequently processed at a Petroleum Refinery.~~
  
- b. 12-15-206: Emissions Inventory: **For purposes of this regulation, an emissions inventory is Aa comprehensive and accurate** accounting of the types and quantities of criteria pollutants, toxic air contaminants, and greenhouse gases that are released into the atmosphere based on **current** ~~state-of-the-art~~ measurement technologies and estimation methodologies. **It is intended to represent the actual emissions to the best precision possible based on those measurement technologies and estimation methodologies.** For the purposes of this rule, emissions inventory data **is data that is** ~~shall be~~ collected or calculated **by the Petroleum Refinery** for: ~~(1) all continuous, intermittent, predictable, and accidental air releases resulting from Petroleum Refinery processes at stationary sources at a Petroleum Refinery;~~ and ~~(2) air releases from cargo carriers (e.g., ships and trains), excluding motor vehicles, during loading or unloading operations at a Petroleum Refinery.~~

12-15-209: Monthly Crude Slate Report: Summaries of the volume and certain properties of crude oil ~~or~~ **crude oil blends at the first stage of processing at a Petroleum Refinery (typically at a crude distillation unit) and of the volume and certain properties of non-crude oil feedstock or feedstock blends which have been imported from outside a Petroleum Refinery, at the point it is first introduced into any refinery processing equipment other than storage, product blending, loading or unloading.** The ~~crude oil~~ summary shall consist of the total volume of crude oil/~~crude oil blends~~ processed in the calendar month, and single average value for each of the properties of the total volume of ~~crude oil/ crude oil blends~~ processed for the calendar month, as listed in Section 12-15-408, Table 1. **The non-crude oil feedstock summary shall consist of the total volume and certain properties of non-crude oil feedstock/non-crude oil feedstock blends that are non-gaseous at Standard Temperature and Pressure fed to a fluidized catalyst processing unit. On a calendar month basis, the Petroleum Refinery shall document the volume of all imported feedstocks to a fluidized catalyst process unit. The Petroleum Refinery will provide a single averaged representative value for the imported feedstock to a fluidized**

catalyst for API, sulfur, iron, nickel, and vanadium if total imported feedstocks exceed one of the following conditions in the calendar month:

1. The volume of all imported feedstocks with an API equal to or greater than 15 is greater than 20 percent of the annualized daily limit listed within a Title V permit multiplied by 30;  
or
2. The volume of all imported feedstocks with an API less than 15 is greater than 50,000 bbls.

Within 5 years after execution of this Agreement, the District will reconsider whether the requirement for the non-crude oil feedstock summary is justified based on the frequency of events that require sampling. The District will propose removing this requirement unless it finds that the frequency of sampled events justifies its continuation. The District will consult with Petitioners prior to reaching a decision. Additionally based upon the five year monitoring results, an owner or operator of a Petroleum Refinery may request that this provision terminate with respect to that Petroleum Refinery and, in the District's sole discretion, the provision will terminate as to the specific Petroleum Refinery. The owner or operator of the Petroleum Refinery must submit the request in writing. The District must grant or deny the request within 30 days of receipt of the request. If the District fails to deny the request within 30 days, such failure will be deemed approval and the provision will sunset immediately with respect to that Petroleum Refinery.

~~Supporting information for each crude oil and each non-crude oil feedstock~~ data maintained by a Petroleum Refinery shall be made available for inspection and audit by the APCO at the Petroleum Refinery ~~audit~~ upon request in order to verify the summary data required in Section 12-15-408, Table 1. To ensure the protection of Confidential Information and prevent its inadvertent release, the District agrees to not remove the data described in this paragraph from the Petroleum Refinery or copy any source information or supporting data as described above. The District further agrees to use the supporting data only to verify the monthly cumulative statistical analysis of the summarized information found in Table 1. If the District creates its own notes based on review of the supporting data, it will ensure that its notes will not depict the supporting data in any form or manner such that a third party could deduce or reconstruct the supporting data (sometimes colloquially referred to as "reverse-engineering"). If the District finds a discrepancy between the monthly reports and supporting data, the District shall allow the Petroleum Refinery a reasonable opportunity to correct the discrepancy. If the discrepancy is not corrected, the District may use its notes (which are and shall be treated as confidential) and previous notification to correct the discrepancy as needed to document non-compliance with this Rule. The District will treat its notes as Confidential Information unless and until the source of the information affirmatively and in writing indicates to the District that the information contained in the notes is no longer Confidential Information (or a court of competent jurisdiction issues a final judgment ordering release of the information).

- c. **12-15-401 Annual Emissions Inventory:** A Petroleum Refinery or Support Facility owner/operator shall obtain and maintain APCO approval of an Annual Emissions

Inventory. Timely submittal as described in the next sentence shall constitute compliance with this requirement unless and until there is a determination of disapproval by the APCO pursuant to Section 12-15-402. On or before June 30, 2017, and every subsequent June 30, a Petroleum Refinery or Support Facility owner/operator shall submit to the APCO an Annual Emissions Inventory covering the previous calendar year period in an APCO-approved format. As described in the foregoing Agreement, the Parties have agreed to conduct, and are currently conducting, the Heavy Liquids Study. Pending the Heavy Liquids Study results, the Parties agree to utilize the emission factors in the table below for the calculation of the emissions from Heavy Liquid components [for all District purposes, including but not limited to, emissions permit fees and rule-making] until the Heavy Liquids Study is completed and new Bay Area refinery emissions factors are developed. The emission factors below are taken from the California Air Pollution Control Officers Association (“CAPCOA”) correlation equations and shall be applied to the HL components whose emissions were estimated in the EPA 114 request.

Heavy Liquid Component type	Equation	Reg 8-18 Leak Threshold (ppm)	Emission Factor (kg/hr/comp)
Valves	$2.27E-06(SV)^{0.747}$	100	7.08E-05
Pumps (Other than Steam Quench Seal)	$5.07E-05(SV)^{0.622}$	500	2.42E-03
Pumps-Steam Quench Seal	N/A	N/A	2.10E-02
Others	$8.69E-06(SV)^{0.642}$	100	1.67E-04
Connectors	$1.53E-06(SV)^{0.736}$	100	4.54E-05
Flanges	$4.53E-06(SV)^{0.706}$	100	1.17E-04
Open Ended Lines	$1.90E-06(SV)^{0.724}$	100	5.33E-05
Others - Pressure Relief Device *	$8.69E-06(SV)^{0.642}$	500	4.70E-04

Source: TABLE IV-3a: CAPCOA-REVISED 1995 EPA CORRELATION EQUATIONS AND FACTORS FOR REFINERIES AND MARKETING TERMINALS  
California Implementation Guidelines for Estimating Mass Emissions of Fugitive Hydrocarbon leaks at Petroleum Facilities, CAPCOA, February 1999.

d. 12-15-401.2: A summary of the total quantity of each criteria pollutant, TAC, and GHG that was emitted from the Petroleum Refinery or Support Facility during the Annual Emission Inventory period, including a table for each source and each pollutant listing whether the pollutant was (a) continuously monitored, (b) monitored by direct measurement, (c) not monitored and estimated by some other method, or (d) not monitored and estimated to be zero. For those Petroleum Refineries using a “common pipe” calculation method for GHGs based on the fuel gas system configuration, the Parties have agreed to the following approach:

1. Identify the total GHG emissions associated with the common pipe sources.
2. Identify in the summary all common pipe sources.
3. Prorate the total GHG emissions to each source based on that source’s actual fuel consumed.

4. The calculation will conclude and be deemed sufficient when 95% or more of the total GHG emissions associated with the common pipe sources are allocated.
- e. **402.1 Preliminary Review:** Within 45 days of receipt of the report, the APCO will complete a preliminary review of the report to identify any deficiencies that need to be corrected. If the APCO determines that the submitted report ~~is deficient~~ **does not meet the requirements of Rule 12-15**, the APCO will notify the owner/operator in writing. The notification will specify the basis for this determination and the required corrective action. The APCO shall provide the owner/operator with the opportunity to meet and confer to discuss any objections to the APCO's preliminary determinations before they become final. If a notification containing specific deficiencies is not sent by the APCO to the owner/operator within 45 days after the APCO's receipt of the report, the Preliminary Review shall be deemed complete.
- f. **402.3 APCO Action:** Within 45 days of the completion of preliminary review, or of resubmittal of a corrected report, the APCO will approve the report if the APCO determines that the report meets the requirements of ~~this rule~~ **Rule 12-15**, and shall provide written notification to the owner/operator. This period may be extended **45 days** if necessary as determined by the APCO, **and such extension will be communicated to the applicable refinery prior to the completion of the 45-day period.** If the APCO determines that the report does not meet the requirements of ~~this rule~~ **Rule 12-15**, the APCO will notify the owner/operator in writing. The notification will specify the basis for this determination. Upon receipt of such notification, the owner/operator shall correct the identified deficiencies and resubmit the report within 45 days. If the APCO determines that the owner/operator failed to correct any deficiency identified in the notification, the APCO will determine that the owner/operator has failed to meet the requirements of this rule, and will disapprove the report, or the APCO may make the necessary corrections and approve the report with a designation that the report was approved with Air District revisions. **If a notification containing specific deficiencies is not sent by the APCO to the owner/operator within 45 days after the APCO's receipt of the corrected report, the Annual Emissions Inventory shall be deemed complete**
- g. **12-15-403:** The Parties agree with the language of this Section 12-15-403 as written, but agree to clarify the terms and application of Section 12-15-403 as follows: The Parties agree that the fence-line monitoring plan that is to be submitted on or before April 20, 2017, is a site-specific plan, and that the District will allow for a tailored implementation date for each Petroleum Refinery, both for initial plans and for any revisions to such plans that may be appropriate following revisions to the guidelines described in Section 12-15-406. The District will propose revisions to Rule 12-15 that incorporate this stated intent into the rule. The District acknowledges that the timing of implementation for a fence-line monitoring plan may be affected by factors beyond the refinery's control. The District's intent is to allow sufficient time to complete the design, permitting, sourcing, installation, testing, and start-up of fence-line monitoring systems, taking into account potential delays that are explained and supported in the related site-specific plan. An example would be a compliance date that accounts for the time expected to obtain a permit from a local agency, or time necessary to obtain the required monitoring equipment from a vendor.

- h. **12-15-404.1: Preliminary Review:** Within 45 days of receipt of the air monitoring plan, the APCO will complete a preliminary review of the plan to identify any deficiencies that need to be corrected. If the APCO determines that the submitted plan is deficient, the APCO will notify the owner/operator in writing. The notification will specify the basis for this determination and the required corrective action. **If a notification containing specific deficiencies is not sent by the APCO to the owner/operator within 45 days after the APCO's receipt of the air monitoring plan, the Preliminary Review shall be deemed complete.**
- i. **12-15-404.4: Final Action:** Within 45 days of the close of the public comment period under Section 12-15-404.3, the APCO will approve the air monitoring plan if the APCO determines that the plan meets the requirements of Section 12-15-403, and shall provide written notification to the owner/operator. This period may be extended **45 days** if necessary as determined by the APCO. If the APCO determines that the plan does not meet the requirements of Section 12-15-403, the APCO will notify the owner/operator in writing. The notification will specify the basis for this determination. Upon receipt of such notification, the owner/operator shall correct the identified deficiencies and resubmit the air monitoring plan within 45 days. If the APCO determines that the owner/operator failed to correct any deficiency identified in the notification, the APCO will determine that the owner/operator has failed to meet the requirements of Sections 12-15-403 and will disapprove the plan. **If a notification containing specific deficiencies is not sent by the APCO to the owner/operator within 45 days after the APCO's receipt of the corrected air monitoring plan, the air monitoring plan shall be deemed complete.**
- j. **12-15-405: Emissions Inventory Guidelines:** The APCO shall publish, and periodically update, emissions inventory guidelines describing best practices to be used when **calculating emissions required to be reported in accordance with Rule 12-15** ~~producing emissions inventories required under this rule~~. Emission factors and **emission** estimation methodologies included in these guidelines may include, but are not limited to, continuous monitoring to measure emissions, applying the results of emissions source tests to known activity levels, combining published emission factors with known activity levels, material balances, or empirical formulae. **The District shall request comments from affected facilities at least 60 days in advance of making changes to the Emissions Inventory Guidelines. The District shall respond to comments received. Affected facilities shall be allowed at least 90 days to implement the changes in the Emissions Inventory Guidelines. The District will use these guidelines as criteria to determine whether for a of Petroleum Refinery and Support Facility emissions inventory meets the requirements of submittals Rule 12-15.**
- k. **12-15-406: Air Monitoring Guidelines:** The APCO shall publish air monitoring guidelines for Petroleum Refineries that describe the factors that the District will apply in reviewing fence-line monitoring systems required under this rule. These guidelines may include, but are not limited to, specifications for pollutant coverage, siting, instrumentation, operation, maintenance, quality assurance, quality control, and data reporting. The guidelines shall be reviewed by the APCO within five years of initial issuance in consideration of advances in air monitoring technology, updated information regarding the health effects of air pollutants, and review of data collected by existing fence-line air monitoring systems established under

this rule. The District shall request comments from affected facilities at least 60 days in advance of making changes to the Air Monitoring Guidelines. The District shall respond to comments received.

l. 12-15-407: **Designation of Confidential Information:** Except as stated in 12-15-209 and 12-15-408, when ~~submitting~~ providing any documents or records required by this rule to the District, the Petroleum Refinery or Support Facility owner/operator shall designate as confidential any information claimed to be exempt from public disclosure under the California Public Records Act, Government Code Section 6250 et seq. ~~If a document is submitted that contains information designated confidential in accordance with this section, the owner/operator shall provide a justification for this designation and shall submit a separate copy of the document with the information designated confidential redacted.~~

m. 12-15-408.

408.1 Historical Monthly Crude Slate Reports: For each-month of the years 2013, 2014, 2015 and 2016, summarized information as described in Table 1 to the extent ~~such this~~ information is available ~~based on the records maintained in the normal course of business.~~ Detailed supporting data, ~~based on records maintained by the Petroleum Refinery in the normal course of business,~~ shall be made available at the Petroleum Refinery upon APCO request for verification of the monthly-summaries described in 12-15-209, effective April 20, 2017. ~~For the purposes of this Agreement, to ensure the protection of Confidential Information and prevent its inadvertent release, the District will not remove or make copies of the detailed supporting data. Further, the District agrees that it shall use the supporting data only to verify the monthly cumulative statistical analysis of the summarized information found in Table 1. If the District creates its own notes based on review of the supporting data, it will ensure that its notes will not depict the supporting data in any form or manner such that a third party could deduce or reconstruct the supporting data (sometimes colloquially referred to as “reverse-engineering”). If the District finds a discrepancy between the monthly reports and supporting data, the District shall allow the Petroleum Refinery a reasonable opportunity to correct the discrepancy. If the discrepancy is not corrected, the District may use its notes and previous notification to correct the discrepancy (which are and shall be treated as confidential) as needed to document non-compliance with this Rule. The District will treat its notes and information it generates as Confidential Information unless and until the source of the information affirmatively and in writing indicates to the District that the information contained in the notes is no longer Confidential Information (or a court of competent jurisdiction issues a final judgment ordering release of the information.~~

408.2 Ongoing Monthly Crude Slate Reports: Beginning with January 2017, summarized information as described in Table 1. Detailed supporting data, ~~based on records maintained by the Petroleum Refinery shall be made available at the Petroleum Refinery upon APCO request for verification of the monthly summaries, no later than 30 days after the end of each calendar month. For the purposes of this Agreement, to ensure the protection of Confidential Information, the District agrees to~~

not remove the data from the Refinery or make any type of copies of the source information. The District agrees that any information it generates and takes possession of during its review of this detailed supporting data will not reveal data capable of being “reversed-engineered.” The District agrees to treat any such information that it generates as Confidential Information unless and until the Petitioner for which the information is gathered indicates otherwise.

Table 1 shall be amended as follows:

<b>Table 1- Summarized Information Required in Monthly Crude Slate Report</b>
<p>Processed Volume (thousand barrels)</p> <p>a. Total volume of crude oils / crude oil blends as fed to all crude units.</p> <p>b. Total volume of non-crude oil feedstock/non-crude oil feedstock blends as defined in Section 12-15-209.</p>
<p>API gravity (degrees)</p> <p>a. Average API gravity of total volume of crude oils / crude oil blends as fed to all crude units.</p> <p>b. Average API gravity of total volume of non-crude oil feedstocks / feedstock blends fed to all other process units as defined in Section 12-15-209.</p>
<p>Sulfur content (weight percent)</p> <p>a. Average sulfur content of total volume of crude oils / crude oil blends as fed to all crude units.</p> <p>b. Average sulfur content of total volume of non-crude oil feedstocks / feedstock blends fed to all other process units as defined in Section 12-15-209.</p>
<p>Vapor pressure (psia)</p> <p>a. Average vapor pressure of total volume of crude oils / crude oil blends fed to all crude units.</p> <p>b. Average vapor pressure of total volume of non-crude oil feedstocks / feedstock blends fed to all other process units.</p>
<p><del>BTEX (benzene, toluene, ethylbenzene, and xylene content in volume percent)</del></p> <p>a. <del>Average BTEX of total volume of crude oils / crude oil blends fed to all crude units.</del></p> <p>b. <del>Average BTEX of total volume of non-crude oil feedstocks / feedstock blends fed to all other process units.</del></p>

Metals (iron, nickel and vanadium content in ppmw)

- a. Average metals content of total volume of crude oils / crude oil blends fed to all crude units.
- b. Average metals content of total volume of non-crude oil feedstocks / feedstock blends fed to all other process units **as defined in Section 12-15-209.**

- n. **12-15-501: Fence-line Monitoring System:** ~~Within one year of the approval of an air monitoring plan under Section 12-15-404,~~ **Once the fence-line monitoring system is installed and operational pursuant to Section 12-15-403,** the Petroleum Refinery owner/operator will ensure that ~~a~~ **the** fence-line monitoring system ~~is installed,~~ **and** is operated in accordance with the approved air monitoring plan. Fence-line monitoring system data shall also be reported as specified in the approved plan.

## Appendix C: Cooling Tower Hydrocarbon Emissions Estimates

### **Objective:**

Calculate potential impacts on ROG emissions and associated cost impacts (i.e. cost effectiveness) for the draft amendments to Rule 11-10.

- Estimated emissions and emissions impacts of draft amendments to Rule 11-10 require a probabilistic assessment of future heat exchange leaks into cooling water systems, as the occurrence of leaks is speculative due to their variable nature. In addition, draft amendments to Rule 11-10 include further monitoring period extensions if the cooling tower demonstrates consistently that it has no leaking heat exchangers. This provision complicates the probabilistic assessment, because the timing of a future leak can impact the number of weeks monitored at a normal frequency and the number of weeks monitored at an extended frequency.
- Estimate impacts on emissions for more frequent monitoring. Maximum Achievable Control Technology (EPA 40 CFR 63.654) study estimated emissions for no monitoring, annual, quarterly, and monthly monitoring.
- Three different approaches are used to estimate average annual emissions (via emission factors) for monthly, twice-monthly, weekly and daily monitoring.

In addition, the current Rule 11-10 requires quicker response to cooling tower leaks than the MACT required by limiting repair time to 21 days, rather than 45 days as provided in the MACT analysis. Estimated emissions are adjusted to include this difference in repair periods, as described below.

### **Basis for Estimated Emission Reductions – Current Rule 11-10 (as adopted):**

Estimated emission reductions included in the Staff Report for Rule 11-10 as adopted in December 2015 were based on MACT-defined Emission Factors (EF):

- No monitoring EF = 6.0 lb ROG/Million gallons water circulation
- Monthly monitoring EF = 0.7 lb ROG/Million gallons water circulation

During the Rule 11-10 rule development process, staff used the MACT emission factor of 6.0 lb ROG per million gallons of circulating water for the “no monitoring” base case, and the improved emission factor of 0.7 lb ROG per million gallons of circulating water for the “active monitoring” case to estimate emission reductions. This approach resulted in emission estimates as follows:

$$\begin{aligned} \text{Baseline emissions} &= 978 \text{ tpy} & \text{Final estimated emissions} &= 117 \text{ tpy} \\ \text{Emission reductions} &= 978 \times (6.0 - 0.7)/6.0 = 978 \times 0.88 = 861 \text{ tpy} \end{aligned}$$

Note that the MACT emission factor used for the “active monitoring” case represents a monthly monitoring schedule. Rule 11-10 (as adopted) requires daily monitoring, however, staff did not estimate any further reduction in emissions from monitoring more frequently than monthly. Rule

11-10 also requires that leaks be repaired within 21 days, which is a shorter repair period than that required by the MACT (45 days); staff also did not estimate any further reduction in emissions from this shorter repair period of 21 days.

**Updated Estimate of Emission Reductions – Current Rule 11-10 (as adopted):**

Staff has identified appropriate emission factors for weekly and daily monitoring to update the estimates of emission reductions associated with Rule 11-10 (as adopted).

These emission factors are based on information provided by EPA’s staff work during development of the MACT, as described above. Air District staff used three different methods to extrapolate emission factors from monthly to more frequent monitoring periods:

1. Method 1: Use the “no monitoring” EF (6.0 lb ROG/M gallons of cooling tower recirculating water) and “monthly monitoring” EF (0.7 lb ROG/M gallons) to back calculate the likely leak magnitude and frequency of a “typical” cooling tower.
2. Method 2: Extrapolate directly (linear extrapolation) from the “no monitoring” EF through “monthly monitoring” EF to derive EFs for twice-monthly, weekly, and daily monitoring.
3. Method 3: Extrapolate directly (linear extrapolation) from the EFs for annual, quarterly, and monthly monitoring periods. The staff report supporting the MACT development from RTI International to EPA provided leak rate and emission reduction estimates for annual, quarterly, and monthly monitoring periods. This information provided the basis for extrapolating estimated emission factors for twice-monthly, weekly, and daily monitoring.

Staff used all three of these methods to develop estimated emission factors for more frequent monitoring. These methods are documented at the end of this appendix. Staff also developed an EF adjustment to account for the reduced repair period from 45 days to 21 days, resulting in a consistent reduction in emission factor of 0.207 lb/M gallons for all three methods used to estimate emission factors. This adjustment is shown in the calculations for Method 1 Emission Factors at the end of this appendix.

Table 4-1 shows the summary of estimated emission factors:

Table 4-1: Estimated Emission Factors for other monitoring periods:

<b>Monitoring Period (days)</b>	<b>Repair Period (days)</b>	<b>MACT Emission Factors (lb/M gal)</b>	<b>Method 1 Emission Factors (lb/M gal)</b>	<b>Method 2 Emission Factors (lb/M gal)</b>	<b>Method 3 Emission Factors (lb/M gal)</b>
None	45	6.0			
30	45	0.7	0.7	0.7	0.7
15	45		0.577	0.655	0.692
7	45		0.511	0.631	0.688
1	45		0.462	0.613	0.684
30	21		0.493	0.493	0.493
15	21		0.370	0.448	0.485
7	21		0.304	0.424	0.481
1	21		0.255	0.406	0.477

Updated estimates of emissions and emission reductions from Rule 11-10 (as adopted) depend on the emission factors used for weekly and daily monitoring.

Current Rule 11-10 requires cooling tower monitoring as follows:

- < 500 gpm cooling towers: monitor every other week
- < 2,500 gpm cooling towers: monitor weekly
- > 2,500 gpm cooling towers: monitor continuously, or daily

Applying the emission factors shown in Table 4-1 to the population of cooling towers in the Bay Area, updated estimates of the emissions and emission reductions from Rule 11-10 (as adopted) were calculated and are shown in Table 4-2. As shown, estimates of emission reductions from current Rule 11-10 range from 861 tons per year to 930 tons per year.

Table 4-2: Updated Estimated Emissions and Emission Reductions – Current Rule 11-10 (as adopted):

<b>Estimated Emissions Impact</b>	<b>Baseline Emissions (tpy)</b>	<b>MACT Emission Factors (tpy)</b>	<b>Method 1 Emission Factors (tpy)</b>	<b>Method 2 Emission Factors (tpy)</b>	<b>Method 3 Emission Factors (tpy)</b>
Baseline Emissions	978	-	-	-	-
Controlled Emissions (Current Rule 11-10 – as adopted)		117	48	76	90
Emission Reductions		861	930	902	888

### **Estimated Emission Impacts Associated with Draft Amendments to Rule 11-10:**

Estimated emission impacts associated with the draft amendments to Rule 11-10 also depend on the emission factors used for twice-monthly, weekly, and daily monitoring.

Draft amendments to Rule 11-10 require cooling tower monitoring as follows:

- < 500 gpm cooling towers: monitor weekly, monthly after 4 successful weekly samples
- < 2,500 gpm cooling towers: monitor weekly, monthly after 4 successful weekly samples
- > 2,500 gpm cooling towers: monitor weekly, twice-monthly after 26 successful weekly samples

Estimated annual average emission factors are based on the following monitoring schedule assumptions for base monitoring and extended monitoring frequencies:

- < 500 gpm cooling towers:
  - 6 weeks of weekly monitoring
  - 46 weeks of monthly monitoring
- < 2,500 gpm cooling towers:
  - 6 weeks of weekly monitoring
  - 46 weeks of monthly monitoring
- > 2,500 gpm cooling towers:
  - 27 weeks of weekly monitoring
  - 25 weeks of twice-monthly monitoring

Applying the emission factors shown in Table 4-1 to the population of cooling towers in the Bay Area, estimates of the emissions and emission impacts from the draft amendments to Rule 11-10 were calculated and are shown in Table 4-3.

Table 4-3: Estimated Emissions and Emission Reductions – Draft Amendments to Rule 11-10:

<b>Estimated Emissions Impact</b>	<b>Baseline Emissions (tpy)</b>	<b>MACT Emission Factors (tpy)</b>	<b>Method 1 Emission Factors (tpy)</b>	<b>Method 2 Emission Factors (tpy)</b>	<b>Method 3 Emission Factors (tpy)</b>
<b>Baseline Emissions</b>					
Baseline Emissions	978	-	-	-	-
<b>Current Rule 11-10 (as adopted)</b>					
Controlled Emissions		117	48	76	90
Emission Reductions		861	930	902	888
Costs		\$2,187,350	\$2,187,350	\$2,187,350	\$2,187,350
<b>Draft Amendments to Rule 11-10</b>					
Controlled Emissions			64	82	91
Emission Reductions			-16	-6	-1
Costs			\$506,600	\$506,600	\$506,600
Cost Impacts <sup>1</sup>			-\$1,680,750	-\$1,680,750	-\$1,680,750
Cost Effectiveness			\$110,000	\$300,000	\$1,600,000

Notes:

<sup>1</sup> Cost impacts that are negative represent a cost savings due to reduced monitoring (as compared to monitoring required by current Rule 11-10).

Potential Foregone Emission Reductions:

Staff used three methods to define the range of sensitivity cases to estimate emissions impacts and costs impacts. Reduced frequency of monitoring cooling towers can theoretically allow an increase in ROG emissions (i.e. foregone emission reductions). Using the three methods, estimates of foregone emission reductions range from 1 ton per year to 16 tons per year, with the greatest impact on emissions estimated using Emission Factors from Method 1.

Staff also calculated the cost effectiveness of the draft amendments using the three methods. Using the foregone emission reduction estimates and the estimated cost savings of \$1,680,750 from reduced monitoring associated with the draft amendments, estimates of cost effectiveness ranged from \$110,000 to \$1.6 million dollars of savings per ton of theoretical foregone emission reductions. Since the range of cost effectiveness savings are significant and beyond normal cost effectiveness thresholds, the draft amendments to Rule 11-10 are supported by the cost-benefits analysis.

**Alternatives for draft amendments to Rule 11-10 – estimated impacts on emissions and costs:**

Alternatives:

1. Do not extend monitoring period from weekly to monthly after 4 weeks below the leak threshold for cooling towers smaller than 2,500 gpm
2. Do not extend monitoring period from weekly to twice-monthly after 26 weeks below the leak threshold for cooling towers larger than 2,500 gpm

Table 4-4: Estimated Emissions and Emission Reductions – Alternatives to Draft Amendments to Rule 11-10:

<b>Estimated Emissions Impact</b>	<b>Method 1 Emission Factors (tpy)</b>	<b>Method 2 Emission Factors (tpy)</b>	<b>Method 3 Emission Factors (tpy)</b>
<b>Draft Amendments to Rule 11-10</b>			
Controlled Emissions	64	82	91
Costs	\$506,600	\$506,600	\$506,600
<b>Alternate 1: No extension of monitoring period for CWT &lt; 2,500 gpm</b>			
Controlled Emissions	63.5	81.8	90.9
Emission Reductions	0.5	0.2	0.1
Costs	\$558,350	\$558,350	\$558,350
Cost Impacts	\$51,750	\$51,750	\$51,750
Cost Effectiveness	\$100,000	\$250,000	\$500,000+
<b>Alternate 2: No extension of monitoring period for CWT &gt; 2,500 gpm</b>			
Controlled Emissions	57.9	79.7	90.6
Emission Reductions	6.1	2.3	0.4
Costs	\$569,100	\$569,100	\$569,100
Cost Impacts	\$62,500	\$62,500	\$62,500
Cost Effectiveness	\$10,200	\$27,200	\$156,000

Alternatives to extending monitoring period:

Extending the monitoring period is appropriate for the small (< 2,500 gpm) cooling towers. Eliminating the extension of the monitoring period from weekly to monthly results in an emission reduction estimated to be 0.1 – 0.5 tons per year, but increases monitoring costs by \$51,750 annually. Cost effectiveness for eliminating the extension of the monitoring period ranges from \$100,000 - \$500,000 per ton of emission reductions, and it not justified.

Eliminating the extension of the monitoring period for large (> 2,500 gpm) cooling towers from weekly to twice monthly is less clear. Eliminating the extension of the monitoring period from weekly to twice-monthly for roughly half of each year results in an emission reduction estimated to be 0.4 – 6.1 tons per year but increases monitoring costs by \$62,500 annually. Cost effectiveness for eliminating the extension of the monitoring period ranges from:

- \$10,200 per ton of foregone emission reductions when using Estimated Emission Factors 1,
- \$27,200 per ton of foregone emission reductions when using Estimated Emission Factors 2, and
- \$156,000 per ton of foregone emission reductions when using Estimated Emission Factors 3.

Staff used three methods to define the range of sensitivity cases to estimate emissions impacts, and costs impacts. The greatest impact on costs is identified using Estimated Emission Factors 3. Based on the highest cost impact of \$156,000 per ton of emission reductions, eliminating the extension of the monitoring period is not justified.

**Method 1 Emission Factors:**

Assume no more than 1 leak into each cooling tower each year (reasonable assumption)

Use MACT basis (above) to extrapolate emission factors for more frequent monitoring:

- X days leaking each year before leak discovered by other factors
- 365-X days not leaking
- $(6.0 \times X \text{ days}) + ((365-X) \times 0) = 365 \times 0.7$
- X = 42.6 days leaking each year

Monitoring period = 30 days.

- On average, will detect leak on 15th day, confirm with sample on 16th day.
- 16 days to identify leak:  $42.6 - 16 = 26.6$  days to repair leak (59% of 45-day repair period provided in MACT requirements)

Method 1 Emission Factors:

Monitoring Period	Average time to ID leak	Time for lab analysis	Repair time	Total Leak period	Emission Factor
days	days	days	days	days	lb/M gal.
None					6.0
30	15	1	26.6	42.6	0.7
15	7.5	1	26.6	35.1	0.577
7	3.5	1	26.6	31.1	0.511
1	0.5	1	26.6	28.1	0.462

However, Rule 11-10 included a 21-day repair period, or must notify APCO

- Estimated average repair time = 14 days (67% of repair period provided, slightly more than 59% of the 45-day repair period in the MACT because the timeframe is shorter)

Method 1 Emission Factors with 21-day repair period:

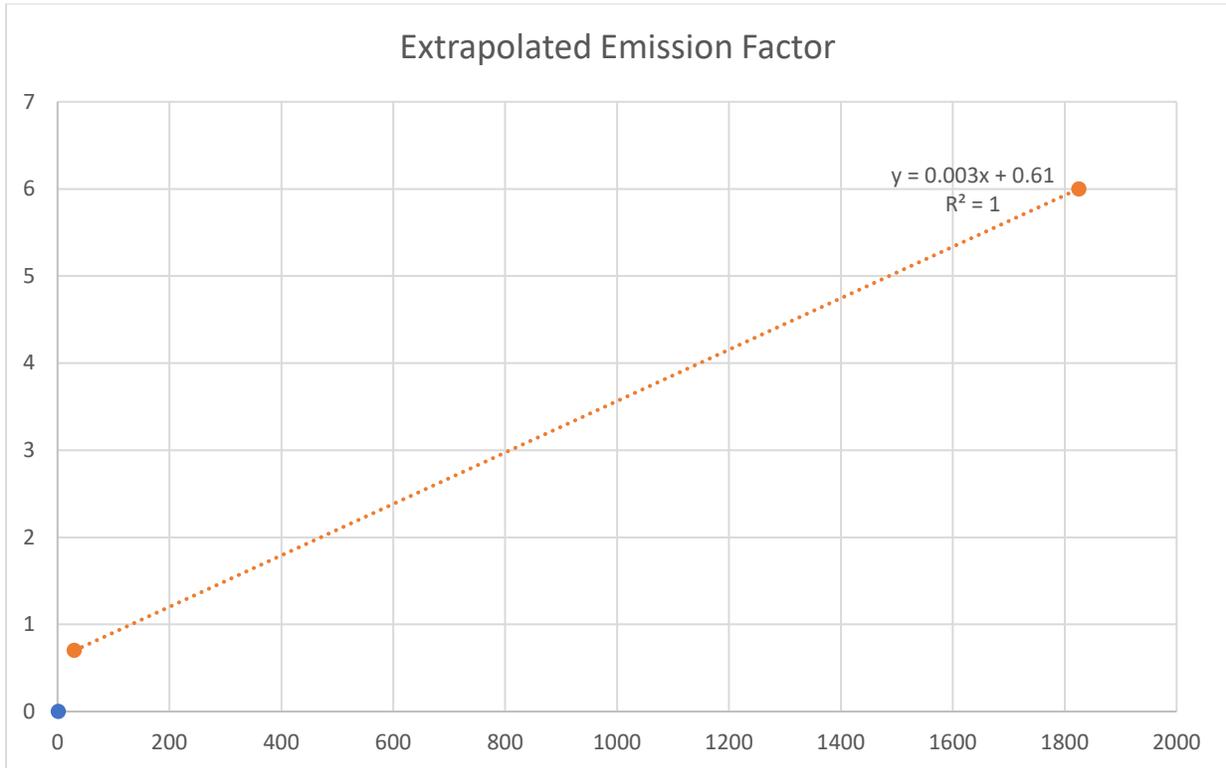
Monitoring Period	Average time to ID leak	Time for lab analysis	Repair time	Total Leak period	Emission Factor
days	days	days	days	days	lb/M gal.
30	15	1	14	30	0.493
15	7.5	1	14	22.5	0.370
7	3.5	1	14	18.5	0.304
1	0.5	1	14	15.5	0.255

Note – 21-day repair (14-day repair time) requirement reduces EF by 0.207 #/M gallons across all monitoring periods.

**Method 2 Emission Factors:**

Second Extrapolation of CWT emissions factors:

EF = 6.0 #/MM gallons with no monitoring, 0.7 #/MM gallons with monthly monitoring



Extrapolation		Monitoring Cycle - days	MACT	adj for 21-day repair EF2	
No Monitoring	6	1825 (~5 years)	6.0850		
Monthly	0.7	30	0.7000	0.207	0.493
Semi-monthly		15	0.6550	0.207	0.448
bi-weekly		14	0.6520	0.207	0.445
weekly		7	0.6310	0.207	0.424
daily		1	0.6130	0.207	0.406

**Method 3 Emission Factors:**

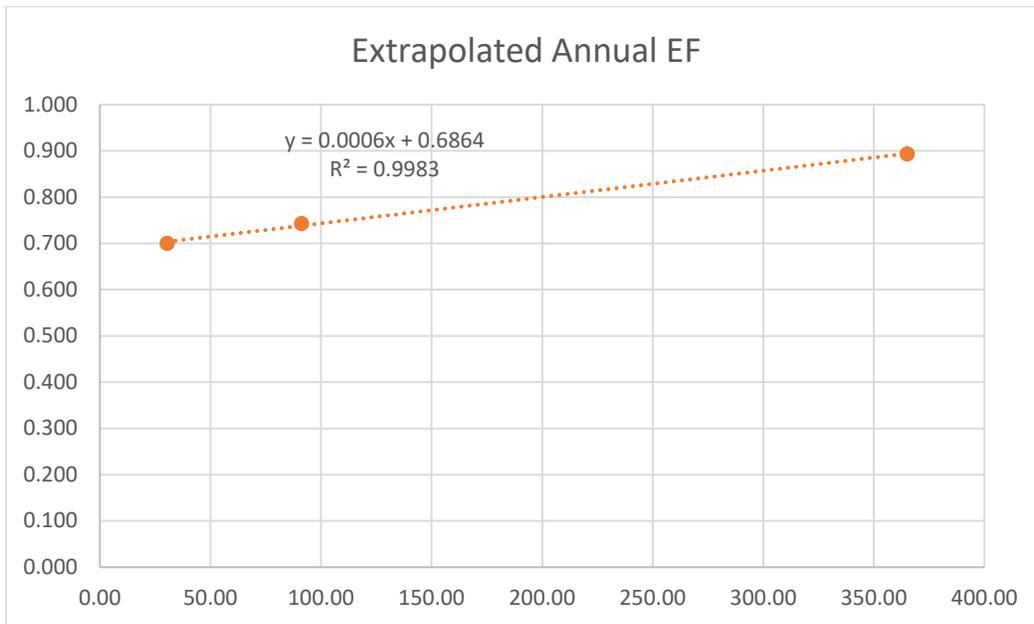
Third Extrapolation of CWT emissions factors:

MACT 40 CFR 63.654  
 Memorandum: RTI International  
 Jeff Coburn to Brenda Shine  
 EPA Docket No. EPA-HQ-OAR-2011-0002  
 July 12, 2011  
 Technology Review for Heat Exchange Systems

Table 10. Detailed Results from Option Cost-Effectiveness Evaluation

110,000 gpm cooling tower: 40-day repair / 800 ppm threshold

- Annual EF = 0.893
- Quarterly EF = 0.743
- Monthly EF = 0.700



		check	adj for 21-day repair	
monthly	30	0.700	0.207	0.493
twice monthly	15	0.692	0.207	0.485
weekly	7	0.688	0.207	0.481
daily	1	0.684	0.207	0.477

corrected by -.003 to 0.700

## APPENDIX D

### Summary of Comments and Responses on Proposed Amendments to Rules 6-5, 11-10, and 12-15 and Staff Report

#### List of Commenters

Abbreviation	Commenter / Reference
West Marin Standing Together and 350 Bay Area	W. Ellen Sweet, West Marin Standing Together, and Richard Gray, 350 Bay Area, Letter, December 7, 2018

*Comment 1.1:* The current proposed revision of Rule 6-5 removes condensable particulate matter and sulfur dioxide from the list of pollutants intended for future FCCU control under this rule. This retraction is what the District agreed to do in the Enforcement Agreement/Agreement to Stay Litigation signed with Bay Area refineries in March 2017 without public scrutiny or accountability. We request that the Board reject the portion of this settlement concerning the above described changes to adopted Rule 6-5 and prepare to defend it in court for the protection of public health in the Bay Area and in furtherance of your missions.

#### *West Marin Standing Together and 350 Bay Area*

*Response 1.1:* The comment misstates the significance of the rule language that is proposed to be changed. Rule 6-5 Section 6-5-301 includes a “placeholder” provision for future emissions limits that may be adopted, the purpose of which was to alert readers to the Air District’s intent to address particulate matter from FCCUs in two phases (first focusing on ammonia injection optimization, and followed by examination and possible adoption of further control measures). This “placeholder” provision does not make the adoption of subsequent emissions limits more or less likely from either a legal or policy standpoint. At this point, the Air District believes the community and interested parties are sufficiently aware of this two-phase plan that a placeholder provision is no longer needed. The proposed amendments to Rule 6-5 consist of formatting changes and a clarification of original intent, and would not preclude the Air District from considering further amendments to make the rule more stringent in the future. The Air District has conducted the rule development process for these amendments with the proper public outreach, noticing, and technical analysis required under the Health and Safety Code. Furthermore, the Air District describes anticipated future rule development for FCCU emissions in the proposed AB 617 Expedited Best Available Retrofit Control Technology (BARCT) Implementation Schedule, which would evaluate ways to further address condensable PM emissions from FCCUs.

11800 Shoreline Highway  
Point Reyes Station, CA 94956

December 7, 2018

**BY ELECTRONIC MAIL**

Board of Directors  
Bay Area Air Quality Management District  
c/o Marcy Hiratzka, Clerk of the Boards  
375 Beale Street  
San Francisco, CA 94105

RECEIVED

DEC 07 2018

CLERK OF  
THE BOARDS

RE: December 19<sup>th</sup> Public Hearings on Proposed Rule Amendment 6-5 and BARCT Implementation

As concerned members of the communities you serve, we would like to call your attention to an ongoing situation that requires action on your part as members of the BAAQMD Board of Directors. This is an urgent matter of public health and welfare - the stated mission of the BAAQMD. On December 19<sup>th</sup>, 2018 the Board has scheduled Public Hearings on (I) Proposed Amendments to District Rules 6-5; and (II) on AB 617 Best Available Retrofit Control Technology (BARCT) Implementation Schedule.

(I) Proposed Amendments to Rule 6-5

For several years, leading California health professionals, scores of community and environmental protection advocates have been regularly attending meetings and providing comments and letters to the Air District Board, Technical Advisory Council, Stationary Source and Refinery Oversight Committee urging the District to do their job by requiring standard Best Available Control Technology (BACT) on refinery Fluidized Catalytic Cracking Units (FCCUs). Uncontrolled fine particulates from Bay area refineries have long impacted the air quality and health of surrounding communities, and indeed the Bay area at large. By requiring the use of wet scrubbing equipment under adopted Rule 6-5 – a proven technology already in use at the Valero Benecia refinery and at refineries around the country – emissions of PM<sub>2.5</sub> (respirable) particulate could be reduced by greater than 95 percent. However, the current proposed revision of Rule 6-5 [Control Of Particulate Emissions from Refinery FCCUs] REMOVES condensable particulate matter (PM 2.5 and smaller) and sulfur dioxide (a precursor to particulate formation) from the list of pollutants intended for future FCCU control under this rule (Table 1). This retraction is what the District agreed to do in the "Enforcement Agreement/Agreement to Stay Litigation" signed with Bay area refineries in March 2017, without public scrutiny or accountability (see Article 3 on pages 4 and 5 of the Enforcement Agreement). We request that the Board reject the portion of this settlement concerning the above described changes to adopted Rule 6-5 and prepare to defend it in court for the protection of public health in the Bay Area and in furtherance of your mission.

(II) Proposed AB 617 BARCT Implementation Schedule

In the proposed BARCT Implementation Schedule refinery FCCUs are in one of the six categories to be evaluated for rule development, with a 2-year timeline (2019 to 2020). We believe that two more years of no control of FCCU PM<sub>2.5</sub> emission is unacceptable, in light of the ongoing critical community health impacts of refinery particulate emissions. We request that emissions reductions from FCCUs begin immediately under adopted Rule 6-5 and not be delayed for another two years under the AB 617 BARCT Implementation Schedule.

It is our hope that, as BAAQMD Board members, you will firmly stand on the side of protecting public health and welfare from uncontrolled fine particulate pollution impacts.

Thank you for your consideration of these critical issues, now more urgent than ever as California (and countries around the world) struggles to meet air pollution reduction targets that are drastically affecting the earth's climate.

Sincerely,

W. Ellen Sweet  
350Marin  
West Marin Standing Together

Richard Gray  
360 Bay Area



BAY AREA  
AIR QUALITY  
MANAGEMENT  
DISTRICT

**Petroleum Refinery Emissions Reduction  
Strategy:  
Staff Report**

Prepared by the staff of the  
Bay Area Air Quality Management District

December 2015

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# Petroleum Refinery Emissions Reduction Strategy: Staff Report

## I. EXECUTIVE SUMMARY

The Bay Area Air Quality Management District (Air District) has developed a strategy for addressing air pollution from Bay Area petroleum refineries. This strategy stems from a Board of Directors' resolution (2014-17) adopted in October 2014, in which the Board instructed staff to develop a regulatory strategy that would further reduce emissions from petroleum refineries, with a goal of an overall reduction of 20 percent (or as much as feasible) no later than 2020. The strategy targets a spectrum of criteria pollutants and/or their precursors, including reactive organic gases (ROG), particulate matter (PM), sulfur dioxide (SO<sub>2</sub>), and oxides of nitrogen (NO<sub>x</sub>).

The first set of these rules, designed to reduce harmful emissions, will be considered by the Board in December 2015 and is expected to reduce overall emissions from refineries by approximately 14 percent. This first set of rule actions would reduce smog-forming and toxic emissions from equipment leaks and cooling towers. These rules also would limit ammonia emissions from fluid catalytic cracking units (FCCUs), which will reduce associated formation and emission of fine particulate matter (PM<sub>2.5</sub>).<sup>1</sup> In mid-2016, the second set of regulations will be developed to further reduce PM<sub>2.5</sub> emissions from fluid catalytic cracking units (if needed) and SO<sub>2</sub>. The second set of regulations also would reduce SO<sub>2</sub> from other refinery sources including coke calcining and would reduce smog-forming emissions from turbines. The development of these sets of regulations is also known as the Petroleum Refinery Emission Reduction Strategy.

### Overview of Proposed Rules and Rule Amendments

In this first phase of the Petroleum Refinery Emission Reduction Strategy, staff has developed three regulatory proposals: one new rule, and amendments to two existing Air District rules.

- New rule, Rule 6-5: Fluidized Catalytic Cracking Unit (FCCU), to minimize PM<sub>2.5</sub> emissions from FCCUs at three refineries;
- Amendments to Rule 8-18: Equipment Leaks, to address fugitive emissions of reactive organic gases (ROG) and toxic compounds from refinery equipment; and
- Amendments to Rule 11-10: Toxic and ROG emissions from Cooling Towers, to address emissions of ROG and toxic compounds from cooling towers.

These emissions reductions will make substantial progress toward achievement and maintenance of the state and federal ambient air quality standards.

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<sup>1</sup> PM<sub>2.5</sub> is the portion of particulate matter with an aerodynamic diameter of less than 2.5 micrometers.

## II. BACKGROUND

The Petroleum Refinery Emissions Reduction Strategy is intended to reduce emissions of criteria pollutants and their precursors (SO<sub>2</sub>, NO<sub>x</sub>, PM<sub>2.5</sub>, reactive organic gases (ROG)) and toxic compounds from the five Bay Area refineries and associated facilities. The Air District plans to accomplish these refinery emissions reductions by amending several Air District rules affecting petroleum refineries and developing additional rules aimed at specific refinery processes.

The Air District is moving these individual actions through the rulemaking process as a package. This enables the Air District to use its staff resources more efficiently, streamline coordination and consultation with the public and the regulated community and respond to requests by the public. There should be no inference that this approach creates dependencies between these rule actions. Each rulemaking action is independent from the others and will be individually evaluated and considered for adoption according to the requirements of the California Health and Safety Code (H&SC).

This report and the proposed regulatory language reflect the input of stakeholders as a result of the Request for Comment on the Initial Report released in May 2015, open houses conducted in refinery communities in September 2015, and publishing of the public hearing package for these regulatory items, and internal staff deliberations. Staff considered the input received in drafting the proposed rules and the final staff report. The proposed rules and final staff report will be presented to the Air District Board of Directors for their consideration at a public hearing on December 16, 2015.

Goals: On December 17, 2014, the Air District's Board of Directors approved the following overall goals for the Petroleum Refinery Emission Reduction Strategy:

1. Strive to achieve a 20 percent reduction in emissions of criteria pollutants and precursors in the next five years.
2. Strive to achieve an additional 20 percent reduction in health risk from the emission of toxic pollutants.

Criteria pollutants are pollutants for which federal or state air quality standards have been established, such as SO<sub>2</sub>, ozone, and PM<sub>2.5</sub>. Precursors are pollutants that interact in the atmosphere to form criteria pollutants. For example, NO<sub>x</sub> and ROG when exposed to sunlight combine to form ozone, and SO<sub>2</sub> and NO<sub>x</sub> react with ammonia in the atmosphere to form PM<sub>2.5</sub>. Toxic pollutants (toxic air contaminants (TACs)) are compounds identified by the ARB as air pollutants that may cause or contribute to an increase in mortality or in serious illness or that may pose a present or potential hazard to human health.

### A. Air Quality Standards and Attainment Status

The Air District is a nonattainment area for the California ozone, PM<sub>10</sub> and PM<sub>2.5</sub> clean air standards and for the National ozone and PM<sub>2.5</sub> standards.

#### Ozone

Ozone is the chemical name for what is generally known as photochemical smog. Exposure to ozone can trigger a variety of health problems including chest pain, coughing, throat and eye irritation and congestion. It can worsen bronchitis emphysema and asthma and, after repeated exposure may

permanently scar lung tissue. Ozone forms when nitrogen oxides (NO<sub>x</sub>) and ROG react in the atmosphere, particularly when the weather is warm. Table 1 provides a summary of the number of times and locations the ozone standards have been exceeded in each of the last 5 years. This reflects the recent decision by the US Environmental Protection Agency (EPA) to strengthen the ozone standard to 0.070 part per million (ppm).

**Table 1: Ozone Standards, and Exceedances<sup>2</sup>**

Standard	Year	Exceedances	Locations
1 hour = 0.090 ppm	2010	26	13
	2011	6	3
	2012	5	4
	2013	3	1
	2014	3	1
8 hour = 0.070 ppm	2010	51	12
	2011	25	9
	2012	23	10
	2013	12	8
	2014	30	8

#### Particulate Matter

Particulate matter (particulates, PM) comes from natural sources (dust and sea salt), motor vehicles (mostly diesel soot), and industrial sources (catalyst emissions from refineries, black carbon from power plants). Particulates can also form in the air from reaction of ammonia with NO<sub>x</sub> and sulfur oxides (SO<sub>x</sub>). Particulates cause health impact because the smallest particles can penetrate deep into the lungs, causing damage to the lungs and creating breathing issues. The finest of these particles can penetrate through lung tissue into the bloodstream causing a variety of health issues, and are discussed below. Particulates are classified by size – the term Total Suspended Particulates (TSP) describes the entire range of particulate matter size. Particulates smaller than 10 microns are known as PM<sub>10</sub>, and very fine particulates smaller than 2.5 microns are known as PM<sub>2.5</sub> or fine particulate.

#### PM<sub>10</sub> Levels in the Bay Area

Table 2 provides a summary of the number of times and locations the PM<sub>10</sub> standards have been exceeded in each of the last 5 years.

**Table 2: PM<sub>10</sub> Standards, and Exceedances<sup>3</sup>**

Standard	Year	# of Times Exceeded	Locations
Annual = 20 µg/m <sup>3</sup>	2011	1	Napa
	2013	1	San Jose
24 hour = 50 µg/m <sup>3</sup>	2010	12	Bethel Island, San Rafael

<sup>2</sup> <http://www.arb.ca.gov/adam/select8/sc8display.php>

<sup>3</sup> <http://www.arb.ca.gov/adam/select8/sc8display.php>

	2011	24	Concord, Napa, San Pablo, San Rafael
	2012	15	Bethel Island, San Francisco, San Jose
	2013	21	San Jose, San Rafael
	2014	3	San Jose

### PM<sub>2.5</sub> Levels in the Bay Area

PM<sub>2.5</sub> can penetrate deeply into sensitive parts of the lungs and cause or worsen respiratory disease, such as emphysema and bronchitis, even for short exposure times. Fine particulates can also aggravate existing heart disease, leading to increased hospital admissions and premature death. The Air District continues to exceed the federal 24-hour standard of 35 µg/m<sup>3</sup> several times per year. On these high concentration days, people, especially vulnerable and susceptible parts of the population, can experience health problems that affect their ability to go about daily activities normally.

Table 3 provides a summary of the number of times and locations the PM<sub>2.5</sub> standards have been exceeded in each of the last 5 years.

**Table 3: PM<sub>2.5</sub> Standards, and Exceedances<sup>4</sup>**

Standard	Year	# of Times Exceeded	Locations or number of locations
Annual = 12 µg/m <sup>3</sup>	2013	1	Oakland
	2013	1	San Jose
Federal 24 hour standard* = 35 µg/m <sup>3</sup>	2010	11	6
	2011	15	8
	2012	3	2
	2013	21	9
	2014	7	6

\* The Federal PM<sub>2.5</sub> standard is included here because California does not have a 24-hour PM<sub>2.5</sub> standard. The federal PM<sub>2.5</sub> air quality standard is 35 micrograms per cubic meter (µg/m<sup>3</sup>) measured on a 24-hour basis. Ambient measurements are used to calculate a statistic that is compared to these standards called a design value. The Air District's most recent 24-hour design value was 32 µg/m<sup>3</sup>. While the design values have been below the federal standards since 2010, 35 µg/m<sup>3</sup> represents the daily limit beyond which significant health impacts may occur.

The Air District must continue to implement regulations to attain and maintain the California and/or federal clean air standards for ozone, PM<sub>10</sub> and PM<sub>2.5</sub>.

## **B. Regulatory Context**

The Air District is currently engaged in developing regulatory measures to reduce emissions of air pollutants from a wide variety of stationary and area sources. As part of the ongoing development of the Air District's 2016 Clean Air Plan, staff evaluated many of these sources and determined that due to

<sup>4</sup> <http://www.arb.ca.gov/adam/select8/sc8display.php>

their high relative contribution to emissions, refineries and associated facilities should be a high priority for additional pollution control.

The 2012 Bay Area Emissions Inventory indicates that refineries are the largest individual stationary source emitters of anthropogenic ROG, NO<sub>x</sub> and SO<sub>2</sub>. And they are the largest individual source category for PM<sub>2.5</sub> emissions. (See Table 4a) Their impact is even more significant in the counties where they are located. In Contra Costa and Solano counties, the refineries and their associated facilities emit 22 percent PM<sub>2.5</sub>, 26 percent of anthropogenic ROG and over 90 percent of SO<sub>2</sub> (See Table 4b).

**Table 4a: Bay Area Emissions of Relevant Pollutants by Source Category<sup>1</sup>**

Source Category	Emissions (tons/yr)							
	PM <sub>2.5</sub>	%	Anthropogenic ROG	%	NO <sub>x</sub>	%	SO <sub>2</sub>	%
Refineries	1,330	8%	5,178	5%	4,137	4%	3,009	42%
Coke Calcining	29	0.2%	0.2	0%	239	0.2%	1,242	17%
Cement Plant	23	0.1%	40	0.04%	2,170	2%	912	13%
Other Major Industrial	1,839	11%	17,640	18%	5,772	5%	581	8%
Residential/Commercial	5,519	34%	27,862	29%	5,531	5%	326	5%
Agricultural	471	3%	2,049	2%	0	0%	0	0%
Miscellaneous	986	6%	116	0.1%	10	0%	0	0%
Mobile Sources	5,945	37%	44,659	46%	91,473	83.7%	1,168	16%
<b>Total Emissions</b>	<b>16,142</b>	<b>100%</b>	<b>97,543</b>	<b>100%</b>	<b>109,332</b>	<b>100%</b>	<b>7,237</b>	<b>100%</b>

**Table 4b: Emissions of Relevant Pollutants by Source Category for Contra Costa and Solano Counties<sup>1</sup>**

Source Category	Emissions (tons/yr)							
	PM <sub>2.5</sub>	%	Anthropogenic ROG	%	NO <sub>x</sub>	%	SO <sub>2</sub>	%
Refineries	1,066	22%	6,439	26%	4,232	17%	2,889	63%
Coke Calcining	28	1%	0	0%	239	1%	1,242	27%
Cement Plant	0	0%	0	0%	0	0%	0	0%
Other Major Industrial	569	12%	3,383	14%	2,139	8%	85	2%
Residential/Commercial	1,548	32%	5,649	23%	1,122	4.4%	49	1.1%
Agricultural	97	2%	369	1%	0	0%	0	0%
Miscellaneous	294	6%	20	0%	2	0%	0	0.0%
Mobile Sources	1,212	25%	9,041	36%	17,703	69.6%	296	6%
<b>Total</b>	<b>4,814</b>	<b>100%</b>	<b>24,900</b>	<b>100%</b>	<b>25,437</b>	<b>100%</b>	<b>4,561</b>	<b>100%</b>

1. Emissions from biogenic sources and accidental fires are not included in this inventory. Mobile emissions include shipping emissions within 3 nautical miles of the Bay Area coastline.
2. PM<sub>2.5</sub> emissions for the Refineries category include condensable and filterable PM. Condensable PM data are not available for other source categories at this time.

Further, the five Bay Area refineries rank among the top ten facilities in the Bay Area for risk-weighted emissions of TACs, based on an evaluation of emissions from stationary sources in 2012 and using risk factors for cancer and chronic hazard indices.

Based on assessments of emissions of criteria pollutants and TACs from refineries, and to ensure the attainment and maintenance of the National Ambient Air Quality Standards (NAAQS) and California Ambient Air Quality Standard (CAAQS)<sup>5</sup> and ensure protection of the public from toxic air contaminants, the Air District has made emissions reductions from these facilities a high priority and intends to reduce refinery emissions by 20 percent by 2020, if feasible. To this end, staff has engaged in several rulemaking efforts to further reduce emissions of all air pollutants (including criteria and toxic pollutants) from the five Bay Area refineries, plus five associated facilities that either support refinery operation (two sulfuric acid plants and two hydrogen plants, and a coke calcining plant), which processes a refinery by-product. These emissions reduction efforts are part of an overall refinery strategy to address refineries and their impact on neighboring communities.

### **C. Air District Board Direction**

On October 15, 2014, the Air District Board of Directors adopted Resolution Number 2014-07, instructing staff to develop a strategy based on an evaluation of approaches that would further reduce emissions from petroleum refineries, including:

- The “community-worker” approach outlined in a September 26, 2014 letter;
- Approach(es) proposed by industry;
- Approach(es) to require each refinery to develop a refinery emissions improvement plan. The plan would implement a suite of measures to demonstrate compliance with all applicable requirements to reduce emissions from petroleum refineries and to identify any additional feasible measures to utilize best practices to minimize emission and to assure continuous emission reductions; and
- Other approaches deemed appropriate by Air District staff.

The resolution also instructed Air District staff to prepare and present to the Board of Directors by December 2014, a strategy to achieve further emissions reductions from petroleum refineries that would include as a target a 20 percent reduction in refinery emissions, or as much as feasible. The resolution also provided that the strategy must include a schedule to implement regulations or other enforceable mechanisms as expeditiously as possible.

On December 17, 2014, the Board of Directors approved the staff-proposed approach that would blend the best of the evaluated approaches. This approach has the following components:

- Identify specific source categories with opportunities for cost-effective controls (this is also known as a Best Available Retrofit Control Technology review, or BARCT review);
- Adopt requirements identified in the EPA Refinery Risk and Technology Review;
- Include the quantitative goals from the Community-Worker proposal;
- Include continuous improvement as a goal for regulations;
- Retain compliance with the Health and Safety Code and the process transparency advocated by industry.

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<sup>5</sup> The Bay Area is designated as a non-attainment area for the State 8-hour and 1-hour standards and the National 8-hour standard for ozone; the State annual and 24-hour standards for PM<sub>10</sub>; and the State annual standard and National 24-hour for fine particulate matter (PM<sub>2.5</sub>). [<http://www.baaqmd.gov/research-and-data/air-quality-standards-and-attainment-status>]

The Board of Directors also approved the following overall goals for the Petroleum Refinery Emissions Reduction Strategy:

1. Strive to achieve a 20 percent reduction in criteria pollutants and precursors within the next five years; and
2. Strive to achieve an additional 20 percent reduction in health risk from toxics.

#### **D. Targeted Pollutants**

The Petroleum Refinery Emission Reduction Strategy is intended to reduce emissions from the five Bay Area refineries and the five associated facilities of the following pollutants:

- Particulate matter (PM), including directly emitted filterable PM and condensable PM, as well as precursor compounds that form PM<sub>2.5</sub> as a result of chemical reactions in the atmosphere. Condensable PM is particulate matter that forms after the hot emissions from the stack cool to ambient temperatures. These emissions are not quantified by traditional particulate testing methodologies because the sampling system does not operate at atmospheric temperatures and the condensable PM is a vapor at higher temperatures.
- ROG, a precursor in the formation of ground-level ozone.<sup>6</sup>
- NO<sub>x</sub>, an ozone precursor and a contributor to fine PM formation.
- SO<sub>2</sub>, a precursor to PM<sub>2.5</sub> formation.
- Ammonia (NH<sub>3</sub>), also a precursor to PM<sub>2.5</sub> formation.

#### **E. Phased Approach**

Air District staff recommends a two-phase approach to complete the rulemaking for the Petroleum Refinery Emission Reduction Strategy:

1. Phase 1 is scheduled to be considered for adoption by the Air District Board of Directors at a public hearing on December 16, 2015; and
2. Phase 2 is scheduled to be completed in the third quarter 2016.

The first set of proposed regulations, Phase 1, is the culmination of over a year's effort developing information—such as emissions inventory, emissions reductions, control technology evaluation and cost estimates, cost effectiveness, and preliminary environmental impact review. Phase 1 includes the following three regulatory actions:

- New proposed rule, Rule 6-5: Fluidized Catalytic Cracking Unit (FCCU), to minimize condensable PM formation;
- Proposed amendments to Rule 8-18: Equipment Leaks, to address fugitive emissions of ROG and toxic compounds from refinery equipment; and
- Proposed amendments to Rule 11-10: Toxic and ROG emissions from Cooling Towers, to address ROG and toxic compounds from cooling towers.

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<sup>6</sup> Methane is not part of ROG because it has a low reactivity for ozone formation, although it is a potent greenhouse gas (GHG). The Air District expects some methane reductions as a co-benefit of ROG reductions. However, methane is not currently a targeted pollutant in this Petroleum Refinery Emission Reduction Strategy. It will be addressed through other measures in the Clean Air Plan.

The second set of regulatory actions, Phase 2, would focus on regulatory development for which staff has developed initial information, such as emissions inventory and cost estimates, but for which staff is currently in the process of gathering additional information needed for the regulatory development process, including environmental and socioeconomic information. Phase 2 would cover the following regulatory actions:

- New proposed rule, Rule 9-14: Petroleum Coke Calcining, to address emissions of SO<sub>2</sub> and the formation of PM<sub>2.5</sub>;
- Draft amendments to new Rule 6-5: FCCU to address emissions of SO<sub>2</sub> and condensable PM (if needed);
- Draft amendments to Regulation 9, Rule 1: Sulfur Dioxide, to further reduce emissions of SO<sub>2</sub> and the formation of PM<sub>2.5</sub> from refinery fuel gas combustion and from sulfuric acid plants, and to address emissions of SO<sub>2</sub> from sulfur plants; and
- Draft amendments to Rule 9-9: Stationary Gas Turbines, to address emissions of NO<sub>x</sub>.

## **F. Affected Facilities**

There are five petroleum refineries in the Bay Area that may be affected by the emission reduction strategy:

1. Chevron Products Company (Richmond);
2. Phillips 66 Company – San Francisco Refinery (Rodeo);
3. Shell Martinez Refinery (Martinez);
4. Tesoro Refining and Marketing Company (Martinez); and
5. Valero Refining Company – California (Benicia).

There are also five associated support facilities that may be affected:

1. Chemtrade West (sulfuric acid plant that supports Chevron);
2. Eco Services (formerly called Solvay; sulfuric acid plant that supports Shell and Valero regularly, and Tesoro as needed when its acid plant is down for maintenance);
3. Air Products (hydrogen plant that supports Tesoro);<sup>7</sup>
4. Phillips 66 Carbon Plant; and
5. Air Liquide (hydrogen plant that supports Phillips 66).

In addition, some other facilities will be impacted by the changes to Regulation 8, Rule 18: Equipment Leaks.

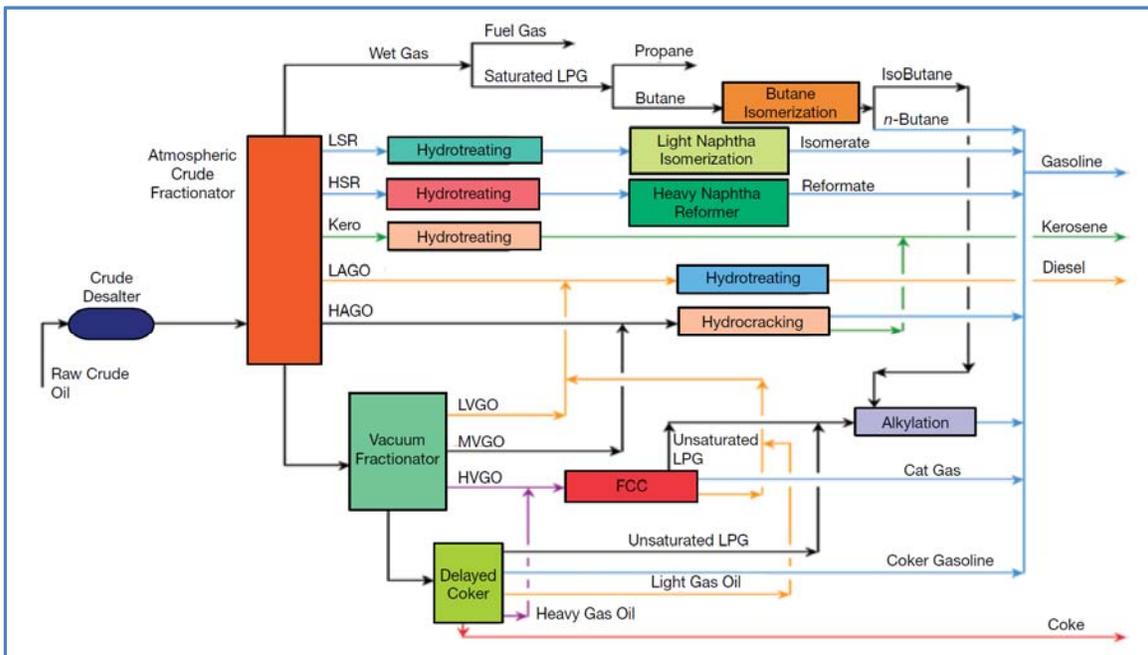
## **G. Petroleum Refining Processes**

These facilities process crude oil into a variety of products such as gasoline, aviation fuel, diesel and other fuel oils, lubricating oils, and feedstocks for the petrochemical industry. The diagram in Figure 1 illustrates how various process units at petroleum refineries convert raw crude oil (petroleum) into fuels and other products.

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<sup>7</sup> There is also an Air Products plant that supports only the Shell Refinery. The emissions from that plant were included in the baseline inventory.

Figure 1: Refinery Flow Diagram



Legend: LSR = light straight-run naphtha; HSR = heavy straight-run naphtha; Kero = kerosene; LAGO = light atmospheric gas oil; HAGO = heavy atmospheric gas oil; LVGO = light vacuum gas oil; MVGO = medium vacuum gas oil; HVGO = heavy vacuum gas oil.

The processing of crude oil occurs in various process units or plants; some of the primary process units include:

- **Crude Desalter:** Crude oil is mixed with water to separate the salt and sediments from the crude.
- **Crude Unit:** The incoming desalted crude oil is heated and distilled into various fractions for further processing in other units.
- **Gas Concentration Unit:** Light hydrocarbons from the top of the crude unit are separated and distributed in the refinery fuel gas (RFG) system for use as fuel for heaters and boilers.
- **Vacuum Distillation Unit:** The residue oil from the bottom of the crude oil distillation unit is further distilled under heavy vacuum.
- **Hydrotreater:** Naphtha, kerosene, and gas oil are desulfurized from the crude unit by using hydrogen and converting the organically bound sulfur into hydrogen sulfide (a toxic compound).
- **Fluidized Catalytic Cracker Unit:** Longer chain, higher boiling hydrocarbons such as heavy oils are broken (or “cracked”) into lighter, shorter molecules at high temperatures and moderate pressure in the presence of a catalyst. This process is so named because the catalyst is so fine that it behaves like a fluid.
- **Butane Isomerization Unit:** Isobutene (a lighter hydrocarbon) is combined with olefins (heavier hydrocarbons) to form larger molecules known as alkylates, which are used in blending gasoline to boost the octane rating. Alkylates are considered one of the highest quality refinery products.
- **Light Naphtha Isomerization Unit:** Benzene is saturated and short, straight-chain hydrocarbons are isomerized into branched-chain hydrocarbons.
- **Heavy Naphtha Reformer and Hydrotreater:** Low-octane linear hydrocarbons (paraffins) are converted into aromatics using a catalyst. The process also forms hydrogen - used in the refinery’s hydrocracking and hydrotreating units - and benzene, toluene, and xylene (BTX) feedstocks, used in other process units.

- Hydrocracker Unit: Hydrogen is used to upgrade heavier fractions into lighter, more valuable products, such as diesel and jet fuel, in a high pressure system.
- Alkylation Unit: Butene and propene are reacted with isobutane into alkylate, a high octane gasoline component.
- Delayed Coker: Very heavy residual oils are converted into end-product petroleum coke as well as naphtha and diesel oil byproducts.
- Claus Sulfur Plant: A two-step (thermal and catalytic) process for recovering sulfur from gaseous hydrogen sulfide (H<sub>2</sub>S) derived from refining crude oil. In the thermal step, H<sub>2</sub>S laden gas is combusted to form elemental sulfur and sulfur dioxide (SO<sub>2</sub>). In the catalytic step, a catalyst is used to boost the sulfur yield. In this step H<sub>2</sub>S reacts with SO<sub>2</sub> to form elemental sulfur.

These primary process units, minor process units, auxiliary equipment (boilers, turbines, heat exchangers, etc.), and other refinery activities (such as truck and loader traffic) emit a variety of criteria pollutants, toxic air contaminants, and greenhouse gases. Other sources of emissions include waste water treatment, tanks, leaking equipment, pressure release devices, flares, marine terminals, and product loading, which are collectively subject to at least ten different Air District regulations.

### III. PROPOSED RULES AND RULE AMENDMENTS

Air District staff is working on the following control measures that would comprise the Petroleum Refinery Emissions Reduction Strategy. The Phase 1 measures are covered in this staff report. Technical analysis has begun on the Phase 2 measures. Table 5 lists these individual control measures and rule development efforts.

**Table 5: Description of Rule Changes**

Title	Proposal Description
<b>PHASE 1</b>	
Rule 6-5: FCCU (Part 1)	Establish emission limits on fluid catalytic cracking units in oil refineries for ammonia, which expected to reduce emissions of condensable PM.
Rule 8-18: Equipment Leaks	Reduce fugitive emission of organic gases and toxic compounds through the following: <ul style="list-style-type: none"> <li>• Include identification and monitoring of heavy liquid service equipment;</li> <li>• Amend the non-repairable equipment standard to reduce the allowable amount of equipment placed on non-repairable list;</li> <li>• Require quantification of leaks for all equipment placed on the non-repairable list;</li> <li>• Add a maximum leak concentration (10,000 ppm) that would apply to all equipment placed on the non-repairable list; and</li> <li>• Add a maximum mass emissions rate (five pounds per day) that would apply to any individual piece of equipment subject to monitoring by Rule 8-18.</li> </ul> Administrative changes to rule language will be drafted to clarify and enhance enforceability of the rule.
Rule 11-10: Toxic and ROG Emissions from Cooling Towers	Reduce emissions of toxic organic gases and ROG from cooling towers by testing for and repairing heat exchanger leaks.
<b>PHASE 2</b>	
Rule 6-5: FCCU (Part 2)	Reduce SO <sub>2</sub> and condensable PM emissions (if needed).
Rule 9-1: Sulfur Dioxide (Part 1)	Reduce SO <sub>2</sub> emissions by the following: <ol style="list-style-type: none"> <li>1. Limit the sulfur content of refinery fuel gas to no more than 40 ppm;</li> <li>2. Limit SO<sub>2</sub> emissions from sulfuric acid plants to no more than 0.20 lb. SO<sub>2</sub> per</li> </ol>

Title	Proposal Description
	ton of acid produced; and 3. Reduce SO <sub>2</sub> emissions from refinery sulfur plants to the extent that it is feasible.
Rule 9-14: Petroleum Coke Calcining	Reduce SO <sub>2</sub> emissions and associated PM <sub>2.5</sub> formation from the coke calcining facility through improvements to the emission control system.
9-9: Stationary Gas Turbines	Require the installation of selective catalytic reduction control on turbines with heat input greater than 100 MM BTU/hr. (The scope of this change may be expanded to include smaller turbines, if staff finds that there may be cost-effective opportunities for emission reductions on these smaller turbines.)
<b>FURTHER STUDY MEASURES</b>	
Rule 8-8: Industrial Wastewater	Review industrial wastewater collection, separation, and treatment system operations to develop an overall strategy to reduce air toxics and TOCs.
8-44: Marine Vessel Operations	Reduce organic gas emissions from marine loading operations that are within the Air District's authority in consideration of overlapping authority of the Coast Guard and other agencies.
9-10: Refinery Boilers, Steam Generators and Process Heaters	The majority of NO <sub>x</sub> emissions at the refineries come from these sources. Recent updates to Rule 9-10 have tightened standards, but those reductions have not yet been reflected in the emissions inventory. Substantial work will be required to determine whether there are opportunities for additional controls.

Phase 1 items listed in the above table are the rules and amended rules that are being proposed for adoption at the December 16, 2015 Board of Directors meeting.

## A. Regulation 6, Rule 5: Particulate Emissions from Refinery Fluidized Catalytic Cracking Units

Staff proposes the major provisions in new proposed Rule 6-5 listed in Table 6.

**Table 6: Major Provisions in Proposed Rule 6-5**

Rule Section	Description
§ 6-5-301	Establish a new 10 ppmvd (at 3% oxygen concentration, daily average basis) ammonia emission limit from FCCUs effective January 1, 2018.
§ 6-5-401	Require submission of a control plan to comply with Section 6-5-301 and permit applications to perform required equipment modifications by January 1, 2017.
§ 6-5-402	Require submission of a monitoring plan to ensure compliance monitoring for Section 6-5-301 by January 1, 2017.
§ 6-5-403	As an alternative to compliance with Section 6-5-301, an FCCU operator may perform an optimization study leading to a new ammonia emission limit (presumably higher than the limit in Section 6-5-301) that is demonstrated to result in the greatest reduction in PM <sub>2.5</sub> emissions from the FCCU that is achievable given other existing requirements on the FCCU.

## B. Regulation 8, Rule 18, Equipment Leaks

Staff proposes the general changes to Rule 8-18 (Table 7), which would become effective January 1, 2018.

**Table 7: Major Amendments in Proposed Rule 8-18**

Rule Section	Description
§ 8-18-113	Require identification and monitoring of heavy liquid service equipment and subject heavy liquid service equipment to leak minimization and repair requirements.
§ 8-18-200	Additions to and clarification of definitions
§ 8-18-306	Reduce the allowable amount of equipment placed on non-repairable list.
§ 8-18-306.1	Add a maximum leak concentration (10,000 ppm) and require mass emission monitoring for all equipment placed on the non-repairable equipment list.
§§ 8-18-306.1 & 311	Establish a maximum mass emissions limit for fugitive equipment subject to the rule.
§ 8-18-401.11	Require the identification of the cause of any background reading greater than 50 ppmv.
8-18-502.6	Require submission of Piping and Instrumentation Diagrams (P&IDs) for equipment in heavy liquid service.

In addition, proposed administrative changes to rule language have been included to improve clarification and enforceability of the rule.

### C. Regulation 11, Rule 10: Cooling Towers

Staff proposes the general provisions in new Rule 11-10 listed in Table 9.

**Table 9: Major Provisions in Proposed Rule 11-10**

Rule Section	Description
§ 11-10-200	Addition of new definitions for the new THC leak monitoring and leak repair provisions.
§ 11-10-304	THC leak monitoring requirements provide refineries three options.
§ 11-10-305	Progressive steps for leak action repair requirements.
§ 11-10-400	Leak reporting requirements and “Best Modern Practices” requirements.

In addition, proposed administrative changes to rule language have been included to improve clarification and enforceability of the rule.

## IV. EMISSIONS AND EMISSION REDUCTIONS

The Air District has established a baseline emissions inventory for estimating emissions reductions from the new rules and proposed amendments to current rules in the Petroleum Refinery Emission Reduction Strategy. This inventory shows baseline emissions for pollutants targeted by the proposed regulations: PM (including directly-emitted filterable PM and condensable PM), TOG,<sup>8</sup> NO<sub>x</sub>, and SO<sub>2</sub>. It includes emissions from petroleum refinery processes (e.g., feedstock and product handling, petroleum separation, and conversion and treating processes) as well as from auxiliary facilities such as hydrogen production, sulfur recovery, and power plants. Reporting year 2013<sup>9</sup> was chosen as the baseline year because it is the most recent year for which the Air District has complete emissions data. However, equipment leak and cooling tower TOG emissions are based on reporting year 2014 because the calculation methodology for these source categories have been significantly improved in this reporting cycle.

<sup>8</sup> The Air District’s emissions reporting system does not consistently differentiate between TOG and ROG emissions. Because TOG is the more inclusive category, it is being used for the development of the baseline.

<sup>9</sup> The 2013 reporting year emissions correspond to emissions from calendar year 2012.

**Table 10: Baseline Emissions from the Refineries and Associated Facilities**

Facility Name	Average Annual Emissions (tons/year)				
	PM (filterable)	PM (cond.) <sup>10</sup>	TOG	NO <sub>x</sub>	SO <sub>2</sub>
Chevron	173	255	2,187	910	339
Phillips 66	53	—	337	266	409
Shell	409	98	1,749	971	1,084
Tesoro	80	91	1,200	763	572
Valero	123	—	494	1,205	111
Chemtrade West	4	—	55	3	127
Eco Services	18	—	1	13	362
Air Products	10	—	9	3	2
Phillips 66 (Carbon Plant)	29	—	0	239	1,242
Air Liquide	16	—	29	2	2
<b>Total Emissions</b>	<b>915</b>	<b>444</b>	<b>6,061</b>	<b>4,375</b>	<b>4,250</b>

The Air District has estimated the following emission reductions and costs for the regulatory actions under consideration (Table 11). More details may be found in the appendices to this document.

**Table 11: Estimated Emissions Reductions and Costs for Rule Changes in Phase One**

Title	PM (tons/year)	TOG (tons/year)	NO <sub>x</sub> (tons/year)	SO <sub>2</sub> (tons/year)	Costs (million \$/yr)
Rule 6-5: FCCU (Part 1) <sup>11</sup>	222	n/a	n/a	n/a	\$0.3
Rule 8-18: Equipment Leaks	n/a	1,227	n/a	n/a	\$6.8
Rule 11-10: Cooling Towers	n/a	861	n/a	n/a	\$2.2 <sup>12</sup>
<b>Totals for Phase 1</b>	<b>222</b>	<b>2,088</b>	<b>0</b>	<b>0</b>	<b>\$9.3</b>

Table 11 shows that the Air District has identified significant opportunities for TOG reductions in this first phase of regulatory actions. As sources of filterable PM at the refineries are already cost-effectively controlled, the key opportunity for emissions reductions is from condensable PM. The Air District plans to address condensable PM by regulating emissions from FCCUs.

The total combined baseline emissions from the refineries are 16,045 tons per year. The emissions reductions from Phase 1 of the Petroleum Refinery Emission Reduction Strategy are estimated to be 2,310 tons per year, which means this initial phase is projected to reduce emissions from these sources

<sup>10</sup> Condensable PM emissions are estimated based on a very small number of non-standard tests on FCCUs. These numbers will change as more testing is completed at the refineries.

<sup>11</sup> Air District staff is estimating a 50 percent reduction in condensable PM emissions from the FCCUs. But, since the baseline emissions are uncertain and the impact of the ammonia optimization is uncertain, the actual reductions are likely to be different. If insufficient condensable PM reductions are realized, more expensive add-on controls may be proposed in future rulemaking.

<sup>12</sup> Estimated costs range from \$1.1 million/yr to \$2.2 million/yr depending on the method selected by the refineries. The highest cost is shown here for consistency with the socioeconomic report.

by 14 percent.<sup>13</sup> Air District staff is still developing emissions reductions estimates for Phase 2, but expects the combined emission reductions to meet or exceed the 20 percent goal set by the Board.

### **Twenty Percent Reduction in Risk from Toxic Emissions**

Another of the goal of the Petroleum Refinery Emission Reduction Strategy is to reduce the risk from emissions of toxic compounds by at least 20 percent. Several of the rule development efforts undertaken in the strategy would reduce toxic emissions and risk. Specifically, amendments to Rule 8-18 would reduce VOCs, including toxic compounds, from leaking components, and amendments to Rule 11-10 would expand the scope of this airborne toxic control measure to included toxic organic gases from refinery cooling towers.

The key to addressing the impact of toxic pollutants from refineries is to determine which sources and pollutants are most responsible for increased health risk. To this end, staff will either develop a refinery-specific rule or general rule that would revise the requirements for the development and execution of Health Risk Assessments (HRAs) and the AB 2588 Air Toxics “Hot Spots” Act Action Levels for risk management that would significantly reduce the health impacts the from toxic emissions. Staff is considering proposing a reduction of the risk management action level from 100 in a million (100/M) cancer risk to 25 in a million (25/M). Further, the Office of Environmental Health Hazard Assessment (OEHHA) has updated the risk assessment guidelines and risk factors for TACs. The overall effect of the OEHHA Guideline revisions is an increase in cancer risk estimates. Although concentrations of pollutants may be the same for a given source, estimating cancer risk using the revised OEHHA guidelines will result in higher risk numbers. For most toxic air contaminants, the cancer risk will increase by about 40 percent for the same emission level compared to the cancer risk calculated using the previous HRA Guidelines. For a dozen TACs, the cancer risk could increase by up to a factor of five. These changes may result in many facilities, including refineries, triggering the public notification requirements under AB 2588. Once the impact of these changes are fully understood, Air District staff will determine the degree to which sources of toxic emissions would be impacted by the HRA guideline changes and a reduction in the risk management trigger level.

## **V. ECONOMIC IMPACTS**

Pursuant to the California Health & Safety Code (H&SC), the Air District is required to perform two different types of economic analysis for rule development activities. The two required analyses are (1) a socioeconomic analysis under Health and Safety Code section 40728.5, and (2) an incremental cost analysis under H&SC section 40920.6. The California Health & Safety Code states, in part, that air districts shall endeavor to achieve and maintain state ambient air quality standards for ozone, carbon monoxide, sulfur dioxide, and nitrogen dioxide by the earliest practicable date. In developing regulations to achieve these objectives, air districts shall consider the cost effectiveness of their air quality programs, rules, regulations, and enforcement practices in addition to other relevant factors, and shall strive to achieve the most efficient methods of air pollution control. However, priority shall be placed upon expeditious progress toward the goal of healthful air.

Since these economic analyses are specific to the particular rules, they are not addressed in the main body of this document. They may be found in the appendices specific to those rules.

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<sup>13</sup> Including, the reductions of condensable PM projected from rule 6-5, which are uncertain at this time.

## **VI. SOCIOECONOMIC IMPACTS**

Section 40728.5 of the California Health and Safety Code requires an air district to assess the socioeconomic impacts of the adoption, amendment or repeal of a rule if the rule is one that “will significantly affect air quality or emissions limitations.” Applied Development Economics of Walnut Creek, California has prepared a socioeconomic analysis of proposed new Regulation 6, Rule 5 and amendments to Regulation 8, Rule 18 and Regulation 11, Rule 10. This analysis is based on the costs of compliance with the proposed regulations, and is attached to this report as Appendix E. The analysis concludes that the socio-economic impacts of compliance with the requirements of these rules are less than significant. Moreover, because affected sources are not small businesses, small businesses are not disproportionately impacted by the proposed rule changes.

## **VII. ENVIRONMENTAL IMPACTS**

Pursuant to the California Environmental Quality Act, the District has had an initial study prepared by Environmental Audit, Inc. of Placentia, California for the proposed new Regulation 6, Rule 5, and amendments to Regulation 8, Rule 18 and Regulation 11, Rule 10. The initial study concludes that there are no potential significant adverse environmental impacts associated with these proposed amendments and proposed rule. A negative declaration is proposed for approval by the District Board of Directors. The negative declaration and initial study are provided in Appendix D.

## **VIII. REGULATORY IMPACTS**

Section 40727.2 of the California Health and Safety Code requires an air district, in adopting, amending, or repealing an air district regulation, to identify existing federal and air district air pollution control requirements for the equipment or source type affected by the proposed change in air district rules. The air district must then note any differences between these existing requirements and the requirements imposed by the proposed change. The regulatory impacts analysis may be found in the appendices specific to those rules.

## **IX. RULE DEVELOPMENT AND PUBLIC CONSULTATION PROCESS**

During this multi-phased rule development effort staff endeavored to engage all interested stakeholders, including affected industry, nearby community members, environmental organizations, other governmental agencies, the media, and other interested parties. There are several aspects to this public engagement, including:

- Development of conceptual versions of draft rules with discussions of those concepts;
- An advanced Call for Comments, released May 26, 2015, which included:
  - Petroleum Refinery Emissions Reduction Strategy: Initial Report
  - Concept Papers addressing each of the draft rules and rule amendments
  - Draft rule and rule amendment language
- Hosting a series of Refinery Rules Open House Workshops to solicit public input / comment on the Petroleum Refinery Emissions Reduction Strategy: Workshop Report, and revised concept papers for each of the draft new rules and draft rule and rule amendments. The Open Houses were held in the following locations:

- Martinez on September 15, 2015,
- Benicia on September 17, 2015, and
- Richmond on September 28, 2015;
- Meetings and consultations (community meetings, phone conversations, emails, letters) with interested stakeholders in less formal settings to discuss concerns and issues;
- Preparation of a regulatory package for the consideration of the Air District Board of Directors, including:
  - Proposed regulatory language;
  - A Staff Report presenting the staff’s findings, such as descriptions of the refining industry, regulatory history, summary and explanation of the proposal, emissions and emission reductions estimates, costs, cost effectiveness and incremental cost effectiveness, environmental and socioeconomic impacts, a schedule of implementation (when the provisions of the rule become effective if adopted), and staff recommendations to the Board of Directors;
  - An environmental analysis report;
  - A socioeconomic analysis report;
  - A discussion of and responses to comments received on the proposed rule, staff report, and environmental and socioeconomic analyses; and
- An informational Board meeting held on November 30, 2015 where presentations were made by Communities for a Better Environment and the Western States Petroleum Association and public testimony was provided by 43 individuals.
- Public Hearing, where the staff’s presentation is made and stakeholders may provide testimony to the Board of Directors on the staff proposal and at which the Board would consider the adoption of the proposal.

## **X. PRELIMINARY SCHEDULE OF THE PETROLEUM REFINERY EMISSION REDUCTION STRATEGY REGULATORY DEVELOPMENT**

Table 12 provides a preliminary schedule for the development of each of the two phases of the regulatory effort. It should be noted that these are only rough estimates of the schedule and the dates may change as the effort proceeds.

**Table 12:  
Schedule of the Petroleum Refinery Emission Reduction Strategy Regulatory Development**

Milestone	Phase 1	Phase 2
Concepts	April 2015	April 2015
Workshops	3 <sup>rd</sup> Quarter 2015	2 <sup>ND</sup> Quarter 2016
Public Hearing	4 <sup>th</sup> Quarter 2015	3 <sup>RD</sup> Quarter 2016

## **XI. COST RECOVERY**

The Air District has the authority to assess fees to regulated entities for the purpose of recovering the reasonable costs of implementing and enforcing applicable regulatory requirements. On March 7, 2012, the Air District's Board of Directors adopted a Cost Recovery Policy that specifies that newly adopted regulatory measures should include fees that are designed to recover increased regulatory program activity costs associated with the measure (unless the Board of Directors determines that a portion of those costs should be covered by tax revenue).

In accordance with the adopted Cost Recovery Policy, Air District staff is developing a new fee schedule to be included in Regulation 3, Fees.

## **XII. CONCLUSION**

Pursuant to Section 40727 of the California Health and Safety Code, the proposed new rules must meet findings of necessity, authority, clarity, consistency, non-duplication, and reference. Proposed new Regulation 6, Rule 5 and amendments to Regulation 8, Rule 18 and Regulation 11, Rule 10 are:

- Necessary to ensure the attainment and maintenance of the NAAQS and California Ambient Air Quality Standard (CAAQS)<sup>14</sup> and ensure protection of the public from toxic air contaminants given the size and impact of the refineries;
- Authorized under Sections 40000, 40001, 40702, 40725 through 40728, and 44391 of the California Health and Safety Code;
- Written or displayed so that their meaning can be easily understood by the persons directly affected by them;
- Consistent with other Air District rules, and not in conflict with state or federal law;
- Non-duplicative of other statutes, rules or regulations; and
- Implementing, interpreting or making specific the provisions of the California Health and Safety Code Sections 40000, 40702, and 44391.

The proposed new rules have met all legal noticing requirements, have been discussed with the regulated community, and reflect consideration of the input and comments of many affected and interested parties. Air District staff recommends adoption of proposed new Regulation 6, Rule 5 and proposed amendments to Regulation 8, Rule 18 and Regulation 11, Rule 10.

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<sup>14</sup> The Bay Area is designated as a non-attainment area for the State 8-hour and 1-hour standard and the National 8-hour standard for ozone; and the State standards for fine particulate matter (PM<sub>2.5</sub>). [<http://www.baagmd.gov/research-and-data/air-quality-standards-and-attainment-status>]

## **APPENDICES**

Appendix A: Rule 6-5: Fluidized Catalytic Cracking Units (FCCU)

Appendix B: Changes to Rule 8-18: Equipment Leaks

Appendix C: Changes to Rule 11-10: Toxic and ROG emissions from Cooling Towers

Appendix D: California Environmental Quality Act, Negative Declaration

Appendix E: Socio-Economic Analysis

## **Appendix A:**

### **Rule 6-5: Fluidized Catalytic Cracking Units (FCCU)**

#### **Rule/Rule Amendment Description**

New Regulation 6, Rule 5, *Particulate Emissions from Refinery Fluidized Catalytic Cracking Units* (Rule 6-5) reduces emissions of particulate matter (PM) 2.5 microns or less (PM<sub>2.5</sub> or fine PM) from fluidized catalytic cracking units (FCCUs) at petroleum refineries.

#### **Goals**

The goal of this rulemaking is to achieve emission reductions of PM<sub>2.5</sub> and PM<sub>2.5</sub> precursors from FCCUs at Bay Area refineries. The Air District plans to do this in two actions as described in the staff report.

1. The first action will be a new ammonia emission limit at FCCUs. Ammonia is primarily a concern because of its role as a precursor to the formation of condensable PM<sub>2.5</sub> at the FCCU exhaust. Condensable PM<sub>2.5</sub> occurs when ammonia in the FCCU exhaust reacts with compounds such as NO<sub>x</sub> and SO<sub>x</sub>, and the resulting compounds condense into PM<sub>2.5</sub> once emitted from the FCCU exhaust. Thus, the proposed ammonia emission limit is an indirect limit on the emission of condensable PM<sub>2.5</sub>.

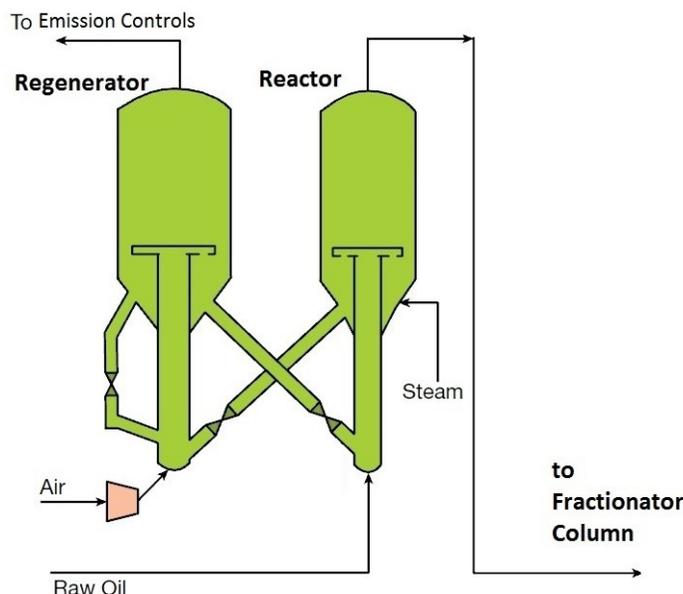
Although the Bay Area currently has a “clean data finding” from EPA for the PM<sub>2.5</sub> National Ambient Air Quality Standards (NAAQS), it has not been designated as being in attainment with PM<sub>2.5</sub> requirements. More urgently, the Bay Area continues to be a nonattainment area for the state PM<sub>2.5</sub> standard. Further, Air District staff has long held that ambient PM<sub>2.5</sub> concentrations remain the driver for air pollution-based health impacts in the Bay Area. For these reasons, the Air District is obligated to take action to further reduce emissions of PM<sub>2.5</sub> and its precursors in order to attain and maintain compliance with both state and federal PM<sub>2.5</sub> standards.

The Air District is currently working with refineries that operate FCCUs to perform source testing of condensable PM<sub>2.5</sub> emissions using the most recently developed and accurate testing methods. Although this testing will not be complete until 2016, testing at the Chevron FCCU using earlier versions of these methods suggests that FCCUs may be the largest source of condensable PM<sub>2.5</sub> in the Bay Area.

2. The second action will be a later amendment to Rule 6-5 to directly address emissions of condensable PM<sub>2.5</sub> (if additional cost effective emissions reductions can be realized) and in addition to address another fine PM precursor: SO<sub>x</sub>. The specific measures to be proposed in the second action depend on the emission reductions achieved by the first action.

#### **Background**

FCCUs are complex processing units at refineries that convert heavy components of crude oil into light, high-octane products that are required in the production of gasoline. This conversion reaction is promoted with the use of a fine, powdered catalyst in the FCCU reactor vessel. During the reaction phase, the catalyst becomes coated with petroleum coke, which reduces the catalysts effectiveness. As a result, the petroleum coke must be burned off in the FCCU regenerator vessel so that the catalyst can be reused. This process and equipment are shown in Figure 1.



**Figure 1 – FCCU Process**

The emission stream from the FCCU results from the combustion gas created in the regeneration vessel exhaust. In addition to the pollutants that originate in the regeneration process—particulate matter (PM), sulfur dioxide (SO<sub>2</sub>), carbon monoxide (CO), oxides of nitrogen (NO<sub>x</sub>), and volatile organic compounds (VOC)—other pollutants, such as ammonia and additional NO<sub>x</sub>, are introduced or created downstream of the regeneration vessel. Most of the ammonia that is ultimately emitted from the FCCU exhaust is introduced downstream of the regenerator either to suppress NO<sub>x</sub> formation or to increase the effectiveness of electrostatic precipitators (ESPs) in removing PM from the FCCU exhaust.

The Bay Area has five petroleum refineries. Four of these, Chevron, Shell, Tesoro and Valero, operate FCCUs. The Valero refinery has recently retrofitted its FCCU with a wet scrubber and therefore has lower PM<sub>2.5</sub> and SO<sub>2</sub> emissions than the other refineries. The Chevron and Tesoro FCCUs use ammonia to control filterable particulate matter emissions in ESPs, resulting in unreacted ammonia being emitted to the atmosphere (*ammonia slip*). The Shell FCCU uses ammonia or urea injection to control NO<sub>x</sub> emissions, as well as to improve ESP operation. Valero would be exempt from the proposed rule because the rule includes an exemption for FCCUs that are controlled by wet scrubbers that have been determined to be “best available control technology” (BACT).

### **Regulatory History and Context**

There are currently no Air District regulations that apply to ammonia emissions from FCCUs. There are two federal standards in part 60 that may apply to FCCUs, depending on the year of construction, reconstruction, or modification, but neither one applies limits to ammonia emissions.<sup>1</sup>

<sup>1</sup> 40 CFR part 60, subpart J, *Standards of Performance for Petroleum Refineries* and 40 CFR part 60, subpart Ja, *Standards of Performance for Petroleum Refineries for which Construction, Reconstruction, or Modification Commenced after May 14, 2007*

### **Emissions**

Based on recent source tests, ammonia concentrations at the FCCU catalyst regeneration outlet (post-control) are 29 parts per million by volume (ppmv) at the Chevron refinery and 23 ppmv at the Shell refinery. Source test data are not available for the Tesoro refinery, but emissions at Tesoro are estimated based on permitted use of ammonia. Based on these source test data and assumptions, District staff estimates the following condensable PM<sub>2.5</sub> emissions from FCCUs:

<b>Facility</b>	<b>2013 Condensable PM<sub>2.5</sub> FCCU Emissions (tpy)</b>
Chevron	255
Shell	98
Tesoro	91

### **Regulatory Concepts and Proposed Regulations**

In 2003, South Coast AQMD adopted an ammonia emission limit of 10 ppmv, corrected to 3 percent oxygen, for FCCUs in their Rule 1105.1. Air District staff is proposing the same limit in Rule 6, Rule 5. Staff is also proposing the use of continuous emission monitoring (CEMs) to measure ammonia, whereas the South Coast AQMD requires annual source tests. An emission limit of 10 ppmv, also corrected to 3% oxygen, was recently imposed at the Bay Area Valero refinery FCCU in an Air District permit. The South Coast limit in Rule 1105.1 and Valero's FCCU limit appear to be the most stringent ammonia emission limits imposed on refinery FCCUs.

Although District staff is proposing a stringent ammonia emission limit, they recognize that ammonia and urea injection are used to promote total PM control at FCCUs by improving the efficiency of electrostatic precipitators (ESPs) and that these ESPs are subject to Air District and federal PM emission limits. Staff also recognizes that fine PM, rather than ammonia itself, is the FCCU emission of greater concern. Therefore, and as suggested by WSPA in response to an earlier draft of Rule 6-5, the proposed rule includes an exception to the 10 ppmv ammonia limit for a refinery that successfully performs an ammonia optimization to establish the level of ammonia and/or urea injection that will minimize overall PM<sub>2.5</sub> emissions at the FCCU while still complying with other, existing FCCU emission limits. Any refinery utilizing this optimization limit would also be required to accept an enforceable ammonia emission limit at this optimized injection rate.

### **Control Mechanisms**

Staff believes that the three refineries that operate FCCUs subject to the 10 ppmv ammonia emission limit will all elect to perform an ammonia optimization because this approach has the potential to achieve significant reductions in ammonia, and in associated emissions of condensable PM<sub>2.5</sub>, with minimal capital expenses and minimal new operating costs.

### **Costs and Emissions Reductions**

Although there will be one-time optimization costs and a new ammonia monitoring system, reduced use of ammonia and urea could result in overall long-term cost savings.

Emission reductions are based on current emission rates of 29 ppmv (Chevron) and 23 ppmv (Shell) being reduced to 10 ppmv, then applying the resulting percentage reduction to the associated mass emissions of ammonia at each refinery. Because of a lack of test data, the Tesoro emission reduction is assumed to be the same as at Shell. For the ammonia optimization option, reductions are assumed to be half of those

that would result from compliance with the 10 ppmv limit. For condensable PM<sub>2.5</sub>, the goal of either a simple reduction in ammonia injection to achieve 10 ppmv ammonia slip, or an optimization of ammonia use is a 50% reduction in total condensable PM<sub>2.5</sub> emissions.

Facility	Ammonia Reduction (tpy)		Condensable PM <sub>2.5</sub> Reduction (tpy)	Capital Cost (\$ M)*	Annual Cost (\$ M)*	Total Annualized Cost (\$ M)*
	10 ppmv limit	Optimization				
Chevron	58	29	128	0.5*	0.025	0.093*
Shell	15	7.5	49	0.5*	0.025	0.093*
Tesoro	15**	7.5	46	0.5*	0.025	0.093*

\*The optimization option in Rule 6-5 should not require capital investment or significant additional operating costs; capital, annual and annualized costs are for ammonia emissions monitoring with CEMs. Annualized costs are calculated using the capital recovery factor (CRF) method described in the "Policy and Implementation Procedure" of the Air District's "BACT-TBACT Workbook", assuming a 10-year equipment lifetime, 6% interest and default assumptions for a CRF of 0.136, which is applied to the capital costs to determine the annualized capital cost. Total annualized cost is the sum of the annualized capital cost and annual costs.

\*\*Assumed to be the same as Shell refinery from reduced use of ammonia injection.

### **Regulatory Impacts**

Section 40727.2 of the California Health and Safety Code requires an air district, in adopting, amending, or repealing an air district regulation, to identify existing federal and air district air pollution control requirements for the equipment or source type affected by the proposed change in air district rules. The air district must then note any differences between these existing requirements and the requirements imposed by the proposed change. The attached table shows that there are no other ammonia emission limits applicable to refinery FCCUs in the Air District, state or federal requirements. Although compliance with federal NSPS and NESHAP standards for particulate emissions and opacity might be affected by a reduction in ammonia and/or urea use at a particular FCCU, the rule provides an alternative standard to allow refineries to avoid interfering with compliance with these particulate emission and opacity limits.

### **Economic Impacts**

The California Health and Safety Code generally requires two different economic analyses for proposed regulations by an air district. The first (H&S Code §40728.5) is a socioeconomic analysis of the adverse impacts of compliance with the proposed regulation on affected industries and business. The second analysis (H&S Code §40920.6) is an incremental cost effectiveness analysis when multiple compliance approaches that have been identified by an air district. These analyses are discussed below:

#### **Socio-Economic Analysis (H&S Code §40728.5)**

Section 40728.5 of the California Health and Safety Code requires an air district to assess the socioeconomic impacts of the adoption, amendment or repeal of a rule if the rule is one that "will significantly affect air quality or emissions limitations." Applied Development Economics of Walnut Creek, California has prepared a socioeconomic analysis of draft Rule 6-5. This analysis is based on the costs of compliance with the draft regulation discussed above, and is attached to the staff report. The analysis concludes that the socio-economic impact of compliance with the requirements of Rule 6-5 is less than significant.

### **Incremental Cost Evaluation (H&S Code §40920.6)**

Section 40920.6 of the California Health and Safety Code requires an air district to perform an incremental cost analysis for any proposed Best Available Retrofit Control Technology rule or “feasible measures” rule when the air district has identified more than one potential control option to achieve the emission reduction objectives of the rule. In the proposed rule, Air District staff has identified only one potential control option to achieve an ammonia emission rate of no more than 10 ppmv: a reduction in ammonia or urea use. The ammonia optimization option in Section 6-5-403 is expected to achieve a lesser level of ammonia emission reduction than simple compliance with the 10 ppmv limit. Therefore, no incremental cost analysis is necessary and none has been performed.

Because Air District staff believes that the three affected refineries will elect to perform an ammonia optimization, cost-effectiveness for the rule is conservatively based on the expected condensable PM<sub>2.5</sub> emission reductions for optimization (50% of the reductions shown above which correspond to compliance with the 10 ppmv ammonia emission limit) divided by the total annualized cost of compliance (for ammonia emissions monitoring):

<b>Facility</b>	<b>Total Annualized Cost (\$)</b>	<b>Condensable PM<sub>2.5</sub> Annual Reduction (ton)</b>	<b>Cost-Effectiveness (\$/ton of PM reduction)</b>
Chevron	93,000	64	1,500
Shell	93,000	24	3,900
Tesoro	93,000	23	4,000

### **Minor Changes from the Proposed Rule**

The Air District posted a proposed version of Regulation 6, Rule 5 on October 23, 2015. The final version of the rule includes a few minor changes intended to either make the rule more readable or to clarify the intent of the rule.

1. Editorial: Renaming two definitions and renumbering to maintain alphabetical order in Table of Contents.
2. Editorial: Corrected title of Section 112 in Table of Contents.
3. Clarification: In response to e-mailed comment from Shell refinery, Staff made explicit the provision that non-FCCU sources with emissions that are subject to Section 301 AND that have startup or shutdown provisions in a District permit are eligible for the limited exemption in Section 112 under the terms of their own permit conditions, rather than under the terms of the FCCU startup and shutdown provisions that are defined in this rule. Therefore, the limited exemption in Section 301 applies to all sources subject to this section whenever ANY source is in a startup or shutdown condition. This treatment is necessary because non-FCCU sources subject to Section 301 have a commingled emission stream with an FCCU and there is no way to differentiate emissions by source. This clarification is in Section 112.

## Regulation 6, Rule 5, Section 40727.2 Analysis

Section	Description (paraphrased)	Comparable State/District Rules	Comparable Federal Rules	Discussion
101	Description	NA	NA	No applicable requirements
111 - 115	Exemptions and Limited Exemptions	NA	NA	No applicable requirements
201 - 211	Definitions	NA	NA	No applicable requirements
301	Ammonia slip emission concentration limit	None	40 CFR 60 Subpart J (NSPS)	Subpart J does not include ammonia emission limits from FCCUs. Subpart J does include particulate emission limits and opacity limits, and compliance with these limits is potentially affected by a reduction in ammonia use. If this is an issue for a particular refinery, Section 403 provides an alternative standard to minimize condensable PM <sub>2.5</sub> emissions while remaining in compliance with other applicable limits, such as those in Subpart J.
	Ammonia slip emission concentration limit	None	40 CFR 60 Subpart Ja (NSPS)	Subpart Ja does not include ammonia emission limits from FCCUs. Subpart J does include particulate emission limits, and compliance with these limits is potentially affected by a reduction in ammonia use. If this is an issue for a particular refinery, Section 403 provides an alternative standard to minimize condensable PM <sub>2.5</sub> emissions while remaining in compliance with other applicable limits, such as those in Subpart Ja.
	Ammonia slip emission concentration limit	None	40 CFR 63 Subpart UUU (NESHAP)	Subpart UUU does not include ammonia emission limits from FCCUs. Subpart UUU requires compliance with the particulate emission limits in NSPS Subpart J – see discussion for NSPS Subpart J.
401	Ammonia Control Plan and Permit Applications	NA	NA	Administrative requirement
402	Ammonia Monitoring Plan	NA	NA	Administrative requirement
403	Ammonia Optimization (alternative to 301)	None	None	This is an alternative to Section 301.

Section	Description (paraphrased)	Comparable State/District Rules	Comparable Federal Rules	Discussion
501	Ammonia Monitoring	None	40 CFR 60 Subpart J (NSPS)	Subpart J does not include ammonia monitoring for FCCUs.
	Ammonia Monitoring	None	40 CFR 60 Subpart Ja (NSPS)	Subpart Ja does not include ammonia monitoring for FCCUs.
	Ammonia Monitoring	None	40 CFR 63 Subpart UUU (NESHAP)	Subpart UUU does not include ammonia monitoring for FCCUs.
502	Ammonia Records	NA	NA	Administrative requirement
601	Compliance Determination	NA	NA	Administrative requirement
602	Determination of Ammonia and Oxygen	NA	NA	Administrative requirement

## **Appendix B: Changes to Rule 8-18: Equipment Leaks**

### **Rule/Rule Amendment Description**

Regulation of equipment leaks at oil refineries requires amendments to Regulation 8, Rule 18, *Equipment Leaks* (Rule 8-18).

### **Goals**

The goal of this rulemaking is to achieve further reductions in fugitive emissions of volatile organic compounds (including toxic organics) at refineries.

### **Background**

Facilities that store, transport, and use volatile organic liquids lose some organic material as fugitive emissions wherever there is a leaking connection between two pieces of equipment. Valves, pumps, and compressors at these facilities can also leak organic material past internal seals.

To address emissions from the large facilities responsible for most of these emissions, Rule 8-18 requires oil refineries, chemical plants, bulk plants, and bulk terminals to maintain a leak detection and repair (LDAR) program. These programs are carried out by periodically checking components for leaks using leak detection equipment that measures leak concentrations, which are generally expressed in parts per million volume (ppmv).

Equipment subject to the monitoring requirements (initial boiling point of 302 degrees Fahrenheit or less) is inspected at specified intervals and, if a leak is found to exceed the leak concentration limit in the rule, the equipment must be repaired, replaced, or placed on limited list of non-repairable equipment. Currently, equipment in heavy liquid service (initial boiling point of greater than 302 degrees Fahrenheit) is subject to the applicable leak standards in Section 8-18-300. However, these components are not subject to the requirements in Section 8-18-400 for inspections using leak detection equipment. They are, however, subject to federal inspection requirements that do not rely on instrument measurements. But without routine inspections of equipment in heavy liquid service using leak detection equipment, leaks may not be found and repaired.

LDAR programs have been found to reduce (“control”) emissions from equipment leaks by over 98 percent (e.g. leaks from components in gas or light liquid service would be 50 times greater than current estimates). A similar reduction is expected for monitoring equipment in heavy liquid service. Emissions from equipment leaks come from a small portion (one to five percent) of all components with 95 to 99 percent of all components not leaking, regardless of service type (gas, light liquid or heavy liquid). Therefore, hundreds of components have to be monitored to find one that is leaking.

### **Process and Source Description**

Component leaks commonly occur at the joints or connections between sections of piping, at valves, at pumps or from barrier fluid contained between seals, and at the seat of pressure relief devices (PRDs).

### **Regulatory History and Context**

The Air District originally adopted Rule 8-18 in 1980 and has amended it twice, first in 1992 and again in 2004. In addition, some minor changes were made to the rule in 1998 and 2002. The original intent of the rule was to control fugitive organic gas leaks from valves and connectors at refineries, chemical

plants, bulk plants, and bulk terminals. Rule amendments adopted in 1992 significantly lowered the allowable leak concentration limits to the lowest levels in the country and required more effective inspection and repair programs in order to reduce emissions and promote self-compliance. The 1992 amendments reduced emissions by an estimated 1.2 tons per day (tpd).

The allowable leak standard is 500 ppmv for pumps, compressors, and PRDs.<sup>1</sup> For valves and other equipment, the allowable leak standard is 100 ppmv. Leaks are detected and the leak concentration is measured using a portable combustible gas indicator.

The U.S. Environmental Protection Agency (EPA) has promulgated LDAR standards for facilities in the synthetic organic chemical manufacturing industry and petroleum refineries. The EPA's standards in 40 CFR parts 60 and 63 include LDAR provisions for monitoring and repairing equipment in heavy liquid service that do not rely on instrumental monitoring, but instead rely on "visual, audible, olfactory, or any other detection method."

### **Emissions**

The Air District maintains an inventory that includes emissions from all stationary sources within its jurisdiction. For complex facilities like refineries, emissions from each type of source are calculated. For fugitive emissions subject to Rule 8-18, emissions are calculated using component counts and emission factors that represent average emissions for a particular component type in a particular type of service (e.g., valves in light liquid service). Emissions must be calculated because leak measurements give the concentration of leaking gases but not the mass emissions (which would require knowledge of the flow rate in addition to the concentration).

There are five large refineries operating within the jurisdiction of the Bay Area Air Quality Management District (Air District). Table B-1 summarizes the total equipment inventory currently regulated under Air District Rule 8-18 at the five major refineries in the Bay Area for the calendar year 2013.

**Table B-1: Fugitive Equipment Component Counts<sup>1</sup>**

<b>Valves</b>	<b>Pumps &amp; Compressors</b>	<b>Pressure Relief Devices<sup>2</sup></b>	<b>Connectors<sup>3</sup></b>	<b>Total TOG (TPY)<sup>4</sup></b>
273,239	2,705	1,142	1,016,636	1,791

<sup>1</sup>Counts do not include components in heavy liquid service.

<sup>2</sup>The count includes atmospheric PRDs only.

<sup>3</sup>Connector counts are not required to be identified per Section 8-18-402.1 or monitored per Section 8-18-401 unless refineries desire the repair period allowance of Section 8-18-304.2. Only two Bay Area refineries record all connector measurements, while three refineries record only connectors with leaks that exceed the standard. An average multiplier (3.5 x total valve inventory) was used to determine the total connector count for facilities that did not record all connector counts.

<sup>4</sup>Total organic emissions from the 2013 BAAQMD Emissions Inventory.

The emission factors used by the Air District for calculating refinery fugitive emissions come from a series of refinery studies by EPA in the late 1970's and early 1980's. EPA developed average emission factors for various types of equipment in various types of service. EPA later combined the refinery fugitive emission factors with factors for petroleum terminals and for gas and oil production in a 1995 guidance document ("EPA Protocol")<sup>2</sup>. The California Air Resources Board (ARB) and the California Air

<sup>1</sup> PRDs are also subject to the requirements of Air District Regulation 8, Rule 28, *Episodic Releases from Pressure Relief Devices at Petroleum Refineries and Chemical Plants*.

<sup>2</sup> Environmental Protection Agency, "1995 Protocol for Equipment Leak Emission Estimates" (EPA453/R-95-017

Pollution Control Officers' Association (CAPCOA) relied upon the EPA document in developing fugitive emission guidelines for refineries ("ARB Guidelines")<sup>3</sup>. The ARB Guidelines generally incorporate refinery fugitive emission factors from the EPA Protocol.

### **Regulatory Concepts and Proposed Regulations**

The Air District is proposing the following changes to Regulation 8, Rule 18 that would:

- Require identification of all equipment in heavy liquid service; monitoring of heavy liquid service valves, pumps and PRDs; and leak minimization and repair for these components, effective January 1, 2018;
- Amend the non-repairable equipment standard to reduce the allowable amount of equipment placed on non-repairable list;
- Identify the cause of any background reading greater than 50 ppmv;
- Require mass emission monitoring for all equipment placed on the non-repairable equipment list; and
- Add a maximum leak concentration and/or mass emissions limit for fugitive equipment subject to the rule.

In addition, administrative changes to rule language will be made to improve clarification and enforceability of the rule. The proposed changes are discussed in more detail below.

#### *Additional Requirements to Monitor Equipment in Heavy Liquid Service*

Equipment in heavy liquid service is not currently subject to routine inspection and repair under Rule 8-18. Effective January 1, 2018, the proposed amendments would require all facilities subject to the rule to include in their LDAR program identification and routine monitoring of heavy liquid equipment. Table B-2 summarizes equipment in heavy liquid service at the five major refineries that would become subject to new inspection and repair requirements.

**Table B-2: Heavy Liquid Service Equipment Fugitive Component Counts**

<b>Facility</b>	<b>Valves</b>	<b>Pumps</b>	<b>Pressure Relief Devices<sup>1</sup></b>	<b>Connectors<sup>2</sup></b>
Chevron	32,228	1,859	62	127,977
Phillips 66	6,655	293	6	27,350
Shell	12,734	337	20	37,361
Tesoro	10,976	250	70	38,416
Valero	15,570	193	0	56,596
<b>Total</b>	<b>78,163</b>	<b>2,932</b>	<b>158</b>	<b>287,700</b>

<sup>1</sup>The count includes atmospheric PRDs only.

<sup>2</sup>An average multiplier (3.5 x total valve inventory) was used to determine the total connector count for facilities that did not provide an accurate connector count.

Based on the Air District's 2013 emissions inventory, fugitive emissions from the heavy liquid equipment listed above are estimated at 1,476 tons per year (excluding methane). The Air District used EPA's

<sup>3</sup> California Air Resources Board, "California Implementation Guidelines for Estimating Mass Emissions of Fugitive Hydrocarbon Leaks at Petroleum Facilities". February 1999. Appendix A. Documentation of Guidelines Development. Appendix A-1, p. 2.

emission factors<sup>4</sup> to estimate baseline emissions for equipment in heavy liquid service. Both the Air District and the refineries have used the emission factors for decades to estimate and report emissions from heavy liquid service components in permit applications<sup>5</sup> and in annual inventory data submitted by the refineries.

The Western States Petroleum Association (WSPA) and the Bay Area petroleum refineries contend, however, that the average emission factors used to calculate emissions before controls do not represent actual emissions and that actual emission factors at the five refineries are lower. They collected data on components in heavy liquid service that suggests lower emissions. However, this effort represented less than 0.2 percent of heavy liquid service components, which was not a large enough sample size to identify potential leaks, did not include mass emissions sampling, and was not collected in such a way that the Air District could verify that it accurately represented the emissions from components in heavy liquid service. Because the data is inadequate, Air District staff have relied upon the EPA emission factors and the ARB Guidelines to estimate emissions. However, the Air District and WSPA are currently working on a mass emissions sampling study in an attempt to obtain the most accurate data. This study is expected to be finished before the end of 2016, well before proposed changes in heavy liquid monitoring are scheduled to take effect.

If the study shows actual emissions from components in heavy liquid service to be significantly lower than the EPA emission factors would suggest, the requirements for monitoring these components may not be cost effective. If District staff determine the requirements are not cost effective, staff will propose amendments to the rule.

#### *Reducing the Amount of Equipment on Non-Repairable List*

The Air District established the non-repairable list to allow sources to delay repairs of essential equipment for five years or until the next scheduled turnaround, whichever comes first.<sup>6</sup> Essential equipment is defined as any equipment that cannot be removed from service unless the process unit is shut down and the component is isolated. This activity would likely create more emissions than the actual fugitive leaks.

The five refineries in the Bay Area currently have an average of 24 pieces of equipment, mostly valves and connectors, on their non-repairable equipment lists.<sup>7</sup> The average percentage of valves and connectors on a non-repairable list is 0.04 percent (allowable percentage of valves including connectors is 0.30 percent), which indicates the LDAR programs implemented at the five refineries can achieve a much lower fraction of equipment placed on a non-repairable list than the fraction currently allowable by the rule. The inclusion of heavy liquid service components will increase the overall number of pieces of equipment allowed on the non-repairable list. It is expected that this increase will more than offset the reduction in percentage of overall allowable equipment on the non-repair list given the historical trends (0.04 on current lists versus current allowable of 0.30%).

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<sup>4</sup> As listed in the ARB Guidelines, Table IV-1a.

<sup>5</sup> E.g., 1981 Chevron Richmond Lube Oil Project (RLOP) application, 1992 Shell Clean Fuels Project application.

<sup>6</sup> BAAQMD Regulation 8, Rule 18, Section 306.1.

<sup>7</sup> Average non-repairable equipment count calculated with each connector counted as two valves pursuant to Section 8-18-306.3.

Further efforts in eliminating equipment from the non-repairable list may enable LDAR programs to approach the point where non-repairable equipment lists would no longer be necessary and the issue of non-repairable equipment could be addressed by other means.

#### *Mass Emissions Determination for Equipment on Non-Repairable List*

Because all equipment placed on the non-repairable list is allowed to leak above the applicable leak standard for up to five years, the mass emission rate of any equipment placed on the non-repairable equipment list should be determined and should not exceed a mass emissions limit. A mass emissions limit on non-repairable equipment provides an incentive to replace or repair the high emitting equipment as soon as possible, which is better than allowing equipment to remain on the non-repairable list up to five years, regardless of its emission rate.

#### *Addition of a Fugitive Mass Emission Limit*

Leak standards are expressed as concentration-based limits rather than mass-based limits to better allow field staff to quickly determine compliance. Mass emissions are determined by quantifying both the concentration and the flow rate of a leak. It is possible that low concentration leaks may have a high flow rate resulting in significant emissions. Currently, monitoring of mass emissions is only required for those valves that leak organic compounds greater than 10,000 ppm (a “major leak”) for more than 45 days. No Bay Area refinery has triggered this requirement to date, and therefore, no mass emissions monitoring has been done.

#### *Clarification of the Leak Repair Definition*

The current rule requires any leak discovered by the operator and not repaired within 24 hours to be minimized within the first 24 hours following leak discovery. The minimization must be done using best modern practices to reduce the leak to the lowest achievable level, regardless of whether the leak is ultimately repaired within the allowed seven days or placed on the non-repairable equipment list.

Many facility owner/operators incorrectly believe cleaning leaking equipment with soap and/or water complies with the best modern practice requirement. As stated in the Air District’s September 2013 Compliance Advisory, leak minimization should include some type of repair attempt, which may include tightening bolts, replacing bolts, tightening packing gland nuts, and injecting lubricant into packing. The rule amendments to clarify what is required for leak minimization by amending the definition language to identify specific types of minimization methods. Also, the definition will state that cleaning, scrubbing, or washing equipment alone is not considered best modern practice.

#### *Identification of High Background Readings*

Leak limits are expressed as “above background” where *background* is defined as, “The ambient concentration of total organic compounds determined at least three meters (10 feet) upwind from the equipment to be inspected and not influenced by any specific emission point as indicated by a hydrocarbon analyzer specified by Section 8-18-501.” A review of 2013 monitoring data from the five refineries identified numerous instances of high background concentrations, including a case with a background of 500 ppmv (five times the existing leak standard for equipment other than a pump or pressure relief device and equal to the limit for pumps and pressure relief devices). To address high background concentrations, the Air District is considering a new requirement that would require identification of the cause of any background reading greater than 50 ppmv (half the existing leak standard). Identification of a cause for elevated background concentrations may identify other equipment in need of repair or replacement.

### **Control Mechanisms**

The Air District proposes no new control mechanisms, only expansion and improvement of the existing LDAR program.

### **Costs and Emissions Reductions**

Table B-3 shows VOC emission reductions and costs associated with improvements to the LDAR program.

**Table B-3: Emissions Reductions and Costs**

<b>Facility</b>	<b>Emission Reduction (tpy)</b>	<b>Capital Cost (\$ M)</b>	<b>Total Annualized Cost (\$ M)</b>
Chevron	641	\$0.11	\$2.6
Phillips 66	117	\$0.02	\$0.70
Shell	156	\$0.04	\$0.90
Tesoro	143	\$0.03	\$1.4
Valero	170	\$0.05	\$1.2
<b>Total</b>	<b>1,227</b>	<b>\$0.25</b>	<b>\$6.8</b>

The Air District has only calculated emission reductions that would come from the proposed inspection requirements for components in heavy liquid service. The Air District has estimated the effect of these controls by relying upon a correlation equation method included in the EPA Protocol and the ARB Guidelines. The correlation equation method generally relies on measured leak concentration data. Instead of using actual measurements, the Air District conservatively assumed that with the new inspection requirements for heavy liquid components, all would leak at the highest concentration allowed by Regulation 8-18 leak limits.

#### *Incremental Cost*

Under Health and Safety Code section 40920.6, the Air District is required to perform an incremental analysis when adopting a Best Available Retrofit Control Technology (BARCT) rule or feasible measure required by the California Clean Air Act. To perform this analysis, the District must (1) identify one or more control options achieving the emission reduction objectives for the proposed rule, (2) determine the cost effectiveness for each option, and (3) calculate the incremental cost effectiveness of each option.

#### *Option 1*

The Air District considered the option of monitoring piping connectors quarterly, rather than annually. Monitoring costs increase by \$12.00 per connector, or \$3.45 M annually. Expected emission reductions from this increased monitoring frequency is estimated to be approximately 40 tons per year, so the incremental cost effectiveness of this option is more than \$86,000 per ton.

#### *Option 2*

The Air District considered the option of continuing to allow each refinery to monitor heavy liquid equipment using the “visual, audible, olfactory, or any other detection method” approach. This option was not considered adequate because the emission factor studies done to quantify emissions from heavy liquid equipment were conducted in facilities where equipment with significant leaks were found undetected using the visual, audible, olfactory methods.

### **Other Impacts**

#### *Regulatory Impacts*

California Health and Safety Code section 40727.2 requires the Air District to identify existing federal air pollution control requirements for the equipment or source type affected by the proposed rule or regulation. The District must then note any differences between these existing requirements and the requirements imposed by the proposal.

Regulation 8, Rule 18: Equipment Leaks applies to fugitive emissions from valves, pumps, compressors, pressure relief devices, connection and any other component that may have fugitive leaks. The proposal expands the applicability or the current rule to equipment in heavy liquid service.

Numerous federal requirements apply to fugitive emissions at the facilities subject to Regulation 8, Rule 18. New sources are subject to New Source Performance Standards found in 40 CFR Part 60, Subpart VV/VVa (Equipment Leaks of VOC in the Synthetic Organic Chemicals Industry) and Subpart GGG/GGGa (Equipment Leaks of VOC in Petroleum Refineries). Other sources are subject to National Emission Standards for Hazardous Air Pollutants (NESHAPS) found in 40 CFR Part 61, Subpart V (National Emission Standards for Equipment Leaks (Fugitive Emission Sources)), and to 40 CFR Part 63, Subpart CC (National Emission Standards for Petroleum Refineries). Table B-4 below is a simplified comparison between BAAQMD and federal requirements.

**Table B-4 - Comparison of the Basic Provisions of the Fugitive Emissions Rules of Federal and BAAQMD**

<b>BAAQMD Regulation 8 Rule 18</b>	<b>40 CFR 60 VV/VVa &amp; GGG/GGGa 40 CFR 63 CC</b>
<b>Applicability</b>	
Components at petroleum refineries, chemical plants, bulk plants and bulk terminals.	Affected equipment in petroleum refineries, synthetic organic chemicals manufacturing facilities, and onshore natural gas processing plants.
<b>Requirements</b>	
LDAR program including quarterly inspection of equipment in light liquid/gas/vapor. Connectors in light liquid/gas/vapor service and inaccessible equipment inspected annually.	Pumps and valves inspected monthly. Valves in light liquid/gas/vapor service inspected monthly. After two monthly inspections without leaks, equipment may be inspected quarterly until a leak is detected.
Leak threshold at 100 ppm for any general equipment, valves and connectors. Leak threshold	Leak threshold at 10,000 ppm for pumps and valves in heavy liquid service.

<b>BAAQMD Regulation 8 Rule 18</b>	<b>40 CFR 60 VV/VVa &amp; GGG/GGGa 40 CFR 63 CC</b>
of 500 ppm for any pumps, compressors and PRDs.	
Leaks detected by operator minimized within 24 hours and repaired within 7 days  Leaks detected by BAAQMD repaired within 24 hours  A percent of non-repairable equipment may delay repair until unit turnaround.	Pump, valves, PRDs and connectors in light liquid service/gas/vapor service leak threshold at 10,000 ppm. Compressors required to have a seal system with barrier fluid. PRDs in gas/vapor service leak threshold at 500 ppm
	Leaks > 10,000 ppm 15 days repair maximum, first attempt at repair with 5 days.
<b>Recordkeeping and Reporting</b>	
Submit quarterly reports of non-repairable equipment and their leak rates.  Submit equipment inventory report annually	Submit semiannual reports containing the number of equipment by type that were repaired and for which repair was delayed and the reason for delay
<b>Test Methods</b>	
U.S. EPA Method 21 for leak screening, ASTM Method D-86 for VOC content of liquids and EPA Protocol for Equipment Leak Emissions Estimates, Chapter 4 or monitoring for mass emission sampling.	U.S. EPA Method 21 for leak screening, ASTM E-260, E-168, E-169 for the VOC content, ASTM Method D-2879 for vapor pressure.
<b>Exemptions</b>	
Pressure vacuum valves on storage tanks not exempt from District Regulation 8 Rule 5	Components operating under negative pressure, pumps with closed vent system, PRDs vented to a control device.
Controlled seal systems and PRDs vented to a vapor recovery system or disposal system which reduces emissions of organic compounds by 95% or greater.	
Equipment in vacuum service	

This proposal is not duplicative of any current requirements for equipment in heavy liquid service.

#### **Minor Changes from the Proposed Rule**

The Air District posted a proposed version of Regulation 8, Rule 18 on October 23, 2015. The final version of the rule includes a few minor changes intended to either make the rule more readable or to clarify the intent of the rule.

1. Clarification: In response to a comment made by the Western States Petroleum Association (WSPA), the Air District has added a limited exemption 8-18-119 to the rule which addresses open-ended valves or lines in an emergency shutdown system designed to open automatically in the event of a process upset, and open-ended valves or lines containing materials which would

autocatalytically polymerize or would present an explosion, serious overpressure, or other safety hazard if capped or equipped with a double block and bleed system

2. Clarification: In response to a comment made by WSPA, the Air District has added limited exemption 8-18-120 which includes an effective date in which the new standards will not apply to the equipment currently on the non-repairable list.
3. Editorial: In response to a comment made by WSPA, the Air District has correct a formatting issue and removed the new proposed language and keep the definition as written in the current version of the rule.
4. Editorial: In response to a comment made by WSPA, the Air District has made a correction to the formatting in section 401. Subsection 8-18-401.3 now references section 403 and not 403.2.
5. Editorial: In response to a comment made by WSPA and Valero, the Air District is not deleting Section 8-18-308, Alternate Compliance. The Air District will assign a new section number (407) to the Recurrent Leak Standard and the existing 405 Section (Alternative Emission Reduction Plan) and 406 Section (Interim Compliance) will remain in the rule to comply with H&S Code Section 40001(d).
6. Editorial: In response to a comment made by WSPA, the Air District corrected the repeat section 404.2 and 404.3 formatting error to 407.2 and 407.3 so it follows sequentially after the preceding Section (407.1).

## Appendix C: Changes to Rule 11-10: Cooling Towers

### **Rule/Rule Amendment Description**

Regulation of organic gases and toxic air contaminants from cooling towers at refineries requires amendment to Air District Regulation 11, Rule 10, *Hexavalent Chromium Emissions from Cooling Towers* which will be renamed *Hexavalent Chromium from All Cooling Towers and Total Hydrocarbon Emissions from Petroleum Refinery Cooling Towers*.

### **Goals**

The goal of this rulemaking is to achieve technically feasible and cost-effective total hydrocarbon (THC) and Toxic Air Contaminant (TAC) emission reductions from cooling towers at Bay Area refineries by requiring more rapid detection of heat exchanger leaks.

### **BACKGROUND**

The Bay Area has five petroleum refineries which operate a total of 32 cooling towers that would be impacted by this amendment. These cooling towers are large, industrial heat exchangers that are used to dissipate significant heat loads to the atmosphere through the evaporation of water. When heat exchanger leaks go undetected for long periods of time, significant quantities of organic compounds can be stripped from the cooling tower water and emitted to the atmosphere. Many of these cooling towers are subject to EPA testing and repair requirements, but the Air District staff believes that more frequent and rigorous testing and repair requirements are needed to ensure protection of public health. These more rigorous requirements will not pose undue cost burdens on the refineries.

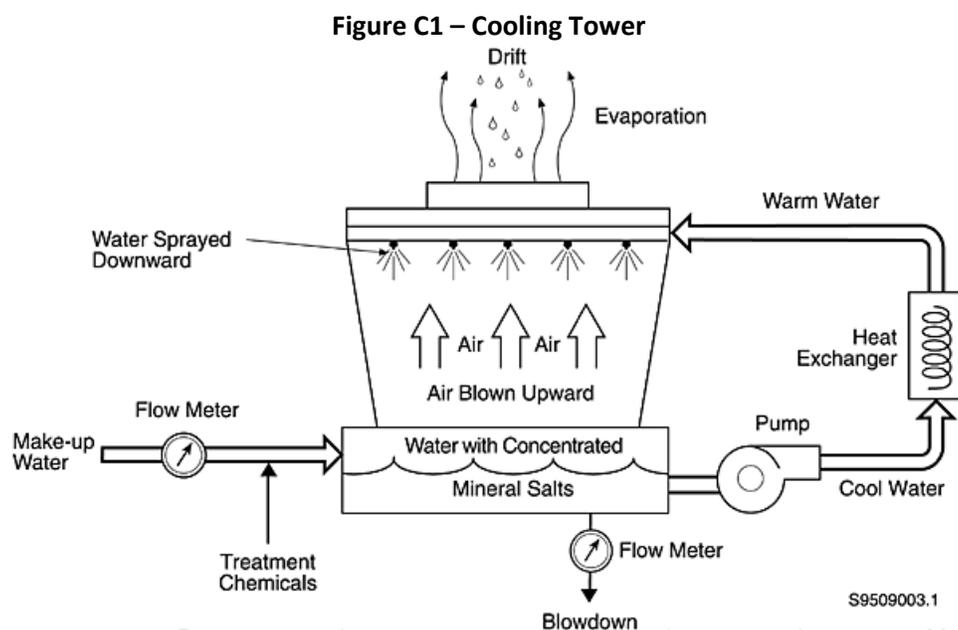
The following table (Table C1) provides the distribution of cooling towers throughout the five refineries.

**Table C1  
Number of Affected Cooling Towers at Each Refinery**

Facility	Number of Cooling Towers
Chevron	8
Shell	3
Tesoro	13
Phillips 66	7
Valero	1
<b>TOTAL</b>	<b>32</b>

### **Process and Source Description**

Cooling towers are part of a heat exchange system consisting of a device or a collection of devices used to transfer heat from process fluids to water without intentional direct contact of the process fluid with the water and to transport and/or cool the water in a closed-loop system (cooling tower system). Figure C1 (below) depicts a basic cooling tower structure.



Cooling towers can be designed as either natural draft or mechanical draft devices. Natural draft cooling towers are large hyperbolic structures that look similar to those found at nuclear power plants. They use natural convection of warmed air to create air to cool the water. Mechanical draft cooling towers use large fans to force air either through or across the water to cool it.

Regardless of the design, a small proportion of the cooling water is entrained in the updraft as mist, commonly called *drift*. When the water in the droplets evaporates, any dissolved solids in the cooling water form particulate matter.<sup>1</sup>

When heat exchanger leaks occur (from process fluids leaking into cooling water), the volatilization of hydrocarbons and/or TACs in the contaminated cooling water lead to emissions. Such leaks tend to occur when heat exchanger tube sheets fail or when tubes rupture as a result of corrosion or the use of inferior materials during the exchanger construction process.

Heat exchangers usually do not leak, but when there are mechanical failures in the sheets or tubes, the emissions can be very high. In 2010 a heat exchanger leak at a Bay Area refinery resulted in emissions of at least 52 tons of THC over a recorded period of 16 days. The total magnitude of emissions from the leak event was probably much greater; emissions from the event were only estimated once the leak was detected, which was likely at least several weeks after the leak began.

### **Regulatory History and Context**

District Regulation 11, Rule 10 was developed in 1989 to reduce hexavalent chromium emissions from cooling towers.

In 2009, The U.S. Environmental Protection Agency (EPA) promulgated, and in 2013 amended, 40 CFR part 63, subpart CC, *National Emission Standards for Hazardous Air Pollutants from Petroleum Refineries*

<sup>1</sup> Cooling tower water frequently contains additives such as biocides, anti-foaming agents and anti-scaling agents, any of which could be emitted as particulate matter

(MACT<sup>2</sup> CC). Section 63.654 in MACT CC requires periodic monitoring (monthly or quarterly) of heat exchangers in organic hazardous air pollutant (HAP) service.<sup>3</sup>

MACT CC requires leaks to be repaired as soon as practicable after they are discovered but no later than 45 days after detecting the leak, unless the repair is not feasible. Not all cooling towers are subject to the monitoring, leak, and repair requirements of MACT CC.<sup>4</sup>

Cooling Tower Emissions have also been addressed by the Texas Commission on Environmental Quality (TCEQ). The TCEQ developed Chapter 115 – Control of Air Pollution from Volatile Organic Compounds, SUBCHAPTER H: HIGHLY-REACTIVE VOLATILE ORGANIC COMPOUNDS to address Highly Reactive Volatile Organic Compound (HRVOCs) emissions from industrial cooling towers. This was part of an overall strategy to address spikes in ozone concentrations around the Houston Ship Channel. This rule requires the continuous monitoring of cooling towers that may leak HRVOCs. The monitors must meet a detection limit of 50 parts per billion by weight (ppbw).

## PROPOSED AMENDMENTS

Elements to be added to Regulation 11, Rule 10 are as follows:

1. THC leak monitoring, repair and minimization requirements for petroleum refinery cooling towers will be incorporated into an existing regulation that was adopted in 1989 to limit hexavalent chromium emissions from all Bay Area cooling towers that were subject to the provisions of the rule. The regulation's description will be modified to include THC emissions from petroleum refinery cooling towers.
2. Regulation 8, Organic Compounds, Rule 2: *Miscellaneous Operations* exempts cooling tower emissions provided "best modern practices" are used. Regulation 11, Rule 10 will define "best modern practices" and will require refinery staff to take steps to ensure heat exchanger equipment is kept corrosion free and in good working order; to make visual and odor inspections on a regular basis; to perform surrogate testing, such as residual chlorine measurements every shift, and to track the amount of biocide added to cooling tower water on a daily basis to maintain water chemistry. Refinery cooling towers that comply with best modern practice requirements in Regulation 11-10-4-2 will qualify for the exemption in Regulation 8-2-114 and, therefore, will qualify for the 15 lb/day requirement in Regulation 8-2-301.
3. The regulation will require each cooling tower to use one of three options to monitor cooling tower water hydrocarbon concentrations on a daily basis. Cooling towers that circulate less than 2,500 gallons per minute of cooling water will be allowed to monitor weekly, and any cooling towers that circulate less than 500 gallons per minute of cooling water will be allowed to monitor once every 14 days.
4. The regulation will include a THC concentration standard of 84 ppb (by weight) when cooling tower water is sampled for lab analysis. The THC concentration standard will be 6 ppm (by volume) when cooling tower water is monitored by a continuous analyzer or the use of an APCO approved alternative monitoring method. When the THC standard for any of the three allowable monitoring methods is exceeded, a leak action response will be required.

<sup>2</sup> "MACT" stands for Maximum Achievable Control Technology, which is the level of control that the emission standards regulation is intended to achieve.

<sup>3</sup> The EPA rule exempts heat exchangers that are designed to make leaks nearly impossible due to pressure differences or intervening fluids.

<sup>4</sup> Applicability criteria can be found in Section 63.654.

5. The refinery shall be required to minimize the leak within 5 calendar days and shall repair the leak within 21 days.
6. For leaks that cannot be repaired within 21 calendar days, the refinery would have to speciate and quantify THCs associated with the leak in order to ensure mass emissions are below 15 pounds per calendar day and the hourly and annual (if applicable) TAC emissions are below their corresponding acute and/or chronic trigger levels in Table 2-5-1 of Regulation 2, Rule 5.
7. Regulation 11, Rule 10 would also include detailed recordkeeping requirements.

Staff proposes that the new requirements in Regulation 11, Rule 10 go into effect on July 1, 2016

The refinery operators have been monitoring most of these cooling towers using a test method called the Modified El Paso Method (MEPM), as required under the EPA rules. The Air District will allow the MEMP sampling method to be used as an APCO approved method, one of three possible THC detection methods, provided the petroleum refineries follow the Air District's Manual of Procedures methodology that will update the MEPM in May of 2016 prior to the July 1, 2016 the effective date for these amendments to Regulation 11, Rule 10. A second method of THC detection Regulation 11, Rule 10 will allow is the use of water sampling with appropriate laboratory analysis. It is a very accurate THC detection method providing water samples are taken properly to protect the integrity of the sample and providing the correct lab analysis methodologies are used. The third method that petroleum refineries may use to detect THC in cooling tower water is the use of a continuous hydrocarbon analyzer.

Regulation 8, Rule 2, Section 114 states that "Emissions from cooling towers, railroad tank cars, marine vessels and crude oil production operations are exempt from this Rule, provided best modern practices are used." Regulation 1, Section 207 defines *best modern practices* in general as "The minimization of emissions from equipment and operations by the employment of modern maintenance and operating practices used by superior operators of like equipment and which may be reasonably applied under the circumstances."

Regulation 11, Rule 10 is now proposing a cooling tower-specific definition. In the draft rule, staff has compiled examples of best practices from several sources.

### **Control Mechanisms**

No add-on controls are proposed; only frequent monitoring and rapid leak detection, minimization, and repair.

### **AREAS OF CONTROVERSY**

In their written comments and presentations to the Board, refinery operators state that the cooling towers are well controlled and do not pollute enough to justify this rule amendment. The refinery operators have been monitoring most of these cooling towers using the MEPM. Some refiners have been using older continuous monitors and Phillips uses monthly water sampling. Based on those test results, the refineries comment that their cooling towers do not appear to be leaking significantly. The refinery operators contend that the costs of the more rigorous and frequent testing in this proposed amendment are not justified by the potential emission reductions. Furthermore, the refinery operators contend that it is not reasonable to expect them to repair leaks more quickly than required by the EPA rules.

Air District staff have concerns about the accuracy and reliability of the MEPM and the existing continuous monitors. In our technical opinion, the information provided by these methods is not sufficiently complete or reliable to detect all of the types of leaks that may be occurring and that this rule amendment is intended to address. In addition, Air District staff believe that leaks should be detected and fixed more quickly. Under the EPA requirements, a leak could go undetected for 30 days and then take 45 days to repair. Extending the example of the 2010 Bay Area refinery cooling tower leak, a 75 day leak could result in over 240 tons of emissions. Under this amendment, leaks will be detected in one day and repaired within 21 days.

The MEPM was developed by the TCEQ and adopted by EPA in their MACT rules. In both cases, it was designed to concentrate on the measurement of strippable hydrocarbons, compounds with lower molecular weights and boiling points. When the MEPM is utilized, a continuous stream of cooling water is sampled directly into an air stripping column apparatus. Air flowing countercurrent to the cooling water strips HRVOCs from the water for analysis.

The Air District's staff is concerned about the MEPM sampling method's ability to provide representative, accurate, precise and repeatable hydrocarbon emissions data on a consistent basis. There are three main concerns about the method. First, the specifications for appropriate sampling equipment and requirements for zero and span performance are incomplete or lack specificity, which could lead to the test not being accurate enough to measure at the levels required to detect leaks. Second, the method does not perform well for all compounds of concern. It is well suited to the principal compounds of concern to the TCEQ and the EPA but does not provide adequate response for all of the toxic and reactive compounds of concern to the Air District. Third, the method is not sufficiently specified, meaning that it could be performed in a way that gave a result that cannot be repeatedly obtained by others utilizing the same set of instructions.

Given all these concerns, Air District staff does not believe that the MEPM provides sufficient evidence that the cooling towers are well controlled and is therefore preparing a revised MEPM for inclusion in the District's Method of Procedures.

The MEPM was designed to address issues with direct water analysis where improper sampling techniques can severely impact leak detection or the use of an inappropriate analytical method can affect the type of compounds identified. The Air District addresses these issues with direct water analysis by requiring specific methods for sample collection and analysis.

Similarly, the continuous monitors in use at some of the refineries are not sufficiently precise and/or accurate for a wide enough range of compounds to provide results that demonstrate the cooling towers are well controlled.

With the exception of Phillips, Air District staff finds that the refineries do not have sufficient information to demonstrate that the cooling towers are not leaking in excess of the concentrations specified in this rule amendment. It is important to note that while Phillips does have sufficient information regarding compound concentration, the monitoring schedule they utilize would allow leaks to occur for a far greater time period than what staff believes would provide adequate control of potential emissions. Therefore, staff are using an EPA emission factor appropriate for cooling towers that are not well controlled when estimating the emission reductions associated with this rule, as discussed below.

The principal benefit of the rule will be to ensure that leaks, even small ones, are detected and repaired as quickly as possible. The Air District staff are recommending a regulatory regime that is most protective air quality. The socioeconomic analysis has demonstrated that the costs are not significant when compared to the potential emissions reductions and refinery profits.

## **EMISSIONS AND EMISSIONS REDUCTIONS**

### **Emissions**

There are five petroleum refineries within the Air District's jurisdiction that operate a total of 32 permitted cooling towers. The number of cooling towers per facility varies. One refinery has only one cooling tower while another has 13 permitted cooling towers. Based on the 2015 Air District emissions inventory, the cooling towers collectively emitted approximately 2.7 tons per day (TPD) of organic gases (978 tons per year), estimated using AP-42 emission factors for four of the refineries and emissions from water analysis data from the fifth refinery.<sup>5</sup>

As described above, there are many issues involved with current emissions measurement techniques used at the cooling towers. While many facilities are utilizing the MEPM, there are concerns regarding the accuracy and repeatability of the method as currently applied. Other facilities are using water sampling methods where proper sample collection techniques are critical to ensure accurate and repeatable analytic results and analysis methods for those samples is critical to ensure all relevant compounds are identified. In some instances, facilities may only be testing for easily strippable hydrocarbon compounds.

In absence of reliable data on current emissions from refinery cooling towers, it is common practice for the Air District to look to EPA emission factors. There are two EPA emission factors that could be applied: one is for well controlled cooling towers and one is for uncontrolled cooling towers. While current emissions may be lower than those calculated using the uncontrolled AP-42 emission factor, they are likely higher than the controlled factor due to the deficiencies in the current monitoring techniques discussed above. In order to take a more conservative approach, staff has used the higher emission factor in the above calculation.

The Air Districts' 2015 emissions inventory provides the Air District's best estimate of the rate at which refinery cooling towers are currently leaking. The refiners developed their own estimates when developing information for the EPA's Information Collection Request (ICR) as the EPA was preparing to update MACT rules applicable to the refineries. Some of the refiners submitted information to the Air District during this rulemaking process stating that their emissions are lower than they recently reported to EPA. These emissions estimates submitted in comments on the rulemaking are based on methods that are not reliable for the reasons listed above. These estimates assume that the cooling towers are well controlled, which cannot be justified by the available data and which conflict with information submitted to the EPA for the ICR by the refineries themselves.

Table C:2 compares the 2015 Air District emissions inventory to the data provided to EPA by the refineries.

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<sup>5</sup> AP-42, *Compilation of Air Pollutant Emission Factors, Volume I: Stationary Point and Area Sources*, Fifth Edition, April 2015, Table 5.1-3

**Table C2**  
**Estimated Current Emissions**

<b>Facility</b>	<b>BAAQMD Estimate (tpy)</b>	<b>ICR Data (tpy)</b>
Chevron	279	353
Shell	258	183
Tesoro	354	21
Phillips 66	3	0.43
Valero	84	91
<b>TOTAL</b>	<b>978</b>	<b>648</b>

Air District staff do not believe that the ICR data for Phillips is accurate, given that the 3 tpy estimate in the BAAQMD inventory is based on water sampling.

### **Emissions Reductions**

The amended rule will require that the refineries ensure that total hydrocarbons in the cooling tower water do not exceed 84 ppbw. This 84 ppbw limit translates into an emission rate of 0.7 lbs of hydrocarbons emitted for every million gallons of recirculated water. Through this calculation, staff estimated that the overall THC emissions would be reduced by approximately 88 percent by these rule amendments.

Table C3 lists the estimated emissions reductions from the implementation of the proposed amendments to Rule 11-10. It provides estimates based on staff's estimated baseline emissions and similar data provided by the refineries to EPA as part of the ICR.

**Table C3**  
**Estimated Emissions Reductions**

<b>Facility</b>	<b>BAAQMD Estimate (tpy)</b>	<b>ICR Data (tpy)</b>
Chevron	245	311
Shell	227	161
Tesoro	312	18
Phillips 66	3	n/a
Valero	74	80
<b>TOTAL</b>	<b>861</b>	<b>570</b>

Given the likely inaccuracy of the ICR data for Phillips, staff are not confident providing an estimated emission reduction for that refinery, based on the ICR data.

### **COST EFFECTIVENESS**

Rule 11-10 specifies three options for hydrocarbon monitoring: daily water sampling (currently used by one refinery for all cooling towers), use of continuous analyzers (currently used only at two individual cooling towers in the Bay Area), or use an improved version of the MEPM. Air District staff has estimated that the most costly option is for a refinery to perform daily water sampling and analysis using

contractors because of the high per-sample cost. The next most-expensive option is installation of dedicated analyzers at each cooling tower because of the high capital cost. The least expensive option is use of refinery staff to perform the MEPM with required sampling and analytical equipment. The MEPM option is the least expensive because the sampling and analysis systems have a low capital cost and the use of refinery staff limits labor costs.

Since costs can vary by refinery depending on the number of cooling towers and the pre-existing monitors, this report provides detailed costs on all three options. Refinery operators are free to select the option that best fits their unique situation.

**Table C:4a – Fixed Continuous Analyzers**

Refinery	Capital Cost (\$)	Operating Cost (\$/year)	Total Annual Cost (\$/year)	BAAQMD Cost Effectiveness (\$/ton reduced)	ICR Cost Effectiveness (\$/ton reduced)
Chevron	1,875,000	50,000	305,000	1,243	982
Phillips 66	2,100,000	50,000	335,000	122,625	n/a
Shell	375,000	25,000	76,000	335	472
Tesoro	3,900,000	50,000	580,400	1,861	31,407
Valero	300,000	25,000	65,800	889	822
<b>Total Cost</b>	<b>8,550,000</b>	<b>200,000</b>	<b>1,362,800</b>		
<b>Average Cost Effectiveness</b>				<b>1,393</b>	<b>2,388</b>

Table C:4a addresses the continuous monitoring option and assumes that each new analyzer and shelter costs \$300,00 to acquire and install. This cost estimate addresses the potential use of intrinsically safe shelters that may be required in some cases. The refinery operators estimated the costs of such shelters to be between \$500,000 and \$1,000,000. The Air District does not believe that every monitor will require an intrinsically safe shelter. The \$300,000 estimate is intended to be a mix of normal shelters and intrinsically safe ones. For refineries that already have a monitor installed. This cost estimate assumes that a modern monitor will be required for a capital cost of \$75,000 installed. This is consistent with information provided by vendors of monitors that meet the requirement of the rule. Capital costs are recovered at a rate of 13.6 percent a year. This is consistent with a 10-year life span and 6 percent cost of capital, as per usual Air District cost calculations. The cost estimate also assumes \$25,000/yr labor cost for up to 5 cooling towers, with an additional \$25,000/yr for facilities with more than 5 cooling towers.

**Table C:4b – In House Modified El Paso Method**

Refinery	Capital Cost (\$)	Operating Cost (\$/year)	Total Annual Cost (\$/year)	BAAQMD Cost Effectiveness (\$/ton reduced)	ICR Cost Effectiveness (\$/ton reduced)
Chevron	50,000	200,000	206,800	742	666
Phillips 66	50,000	200,000	206,800	66,495	n/a
Shell	50,000	200,000	206,800	802	1,284
Tesoro	75,000	300,000	310,200	875	16,786
Valero	50,000	200,000	206,800	2,459	2,582

<b>Total Cost</b>	<b>275,000</b>	<b>1,100,000</b>	<b>1,137,400</b>		
<b>Average Cost Effectiveness</b>				<b>1,163</b>	<b>1,993</b>

Table C:4b provides information on the use of the MEPM and assumes one sampling system for up to 5 cooling towers, two systems for up to 10 towers and 3 for more than 10. It also assumes \$25,000 capital cost for each system. Capital costs are recovered at a rate of 13.6 percent a year. The cost estimate also assumes \$100,000/yr for labor and lab analysis costs.

**Table C:4c – Outside Contractor Daily Sampling and Analysis**

<b>Refinery</b>	<b>Capital Cost (\$)</b>	<b>Operating Cost (\$/year)</b>	<b>Total Annual Cost (\$/year)</b>	<b>BAAQMD Cost Effectiveness (\$/ton reduced)</b>	<b>ICR Cost Effectiveness (\$/ton reduced)</b>
Chevron	0	518,800	518,800	1,861	1,670
Phillips 66	0	401,500	401,500	129,100	n/a
Shell	0	245,050	245,050	950	1,522
Tesoro	0	839,500	839,500	2,369	45,427
Valero	0	182,500	182,500	2,170	2,279
<b>Total Cost</b>	0	<b>2,187,350</b>	<b>2,187,350</b>		
<b>Average Cost Effectiveness</b>				<b>2,236</b>	<b>3,833</b>

Table C:4c addresses the water sample collection and laboratory analysis option and reflects an assumption that the first daily sample will cost \$500 and subsequent samples that same day will cost \$150. This is consistent with recent Air District use of private laboratories. The cost estimate also accounts for the fact that not all towers will require daily sampling. There are no capital costs associated with this option.

The Air District finds that the average cost effectiveness is reasonable for each option. This is true whether one uses the Air District's estimate or the estimate based on the data submitted by the refineries to the ICR. For refineries with low baseline emissions, the costs appear high. This is a particular issue with the Phillips 66 refinery, given their low baseline emissions estimate. But, there is no guarantee that the Phillips 66 cooling towers will continue to leak at the low rate shown in this inventory. Given that the Phillips cooling towers are currently sampled monthly, the early detection requirements in this rule amendment could avoid 29 days of leaks. If the leak were as large as the 2010 Bay Area refinery cooling tower leak, that would prevent 94 tons of emissions. If one such leak was avoided per year at Phillips, the cost effectiveness would be \$4,271/ton.

### **Incremental Cost Effectiveness**

Under Health and Safety Code section 40920.6, the Air District is required to perform an incremental analysis when adopting a Best Available Retrofit Control Technology (BARCT) rule or feasible measure required by the California Clean Air Act. To perform this analysis, the Air District must (1) identify one or more control options achieving the emission reduction objectives for the proposed rule, (2) determine the cost effectiveness for each option, and (3) calculate the incremental cost effectiveness of each option.

Three options were considered for the cost analysis, and incremental cost effectiveness analysis. Option 1 is for daily water sampling and testing, and is the highest cost. Option 2 is for installation and use of continuous monitoring and was considered with two sensitivity cases – one where a typical analyzer shelter is required, and a second where the shelter is twice the cost because of a unique location and/or utilities not being readily accessible. Option 3 is the lowest cost – using the Air District’s improved version of the MEPM to monitor for total hydrocarbons.

All three options are found to be cost effective. The cost effectiveness of the highest cost daily sampling and testing is well within typical cost effectiveness guidelines. The other two options are equally will within typical cost effectiveness guidelines. However, incremental cost effectiveness analysis of either daily sampling or continuous analyzers for small cooling towers were found to not be cost effective. This analysis resulted in a requirement for weekly sampling for cooling towers with less than 2,500 gallons per minute circulation rates, and sampling every 14 days for cooling towers with less than 500 gallons per minute circulation rates.

**Socioeconomic Impacts**

As required by the California Health and Safety Code, a thorough socioeconomic analysis of the impacts of the proposed amendments to Rule 11-10 is presented in Appendix E.

**REGULATORY IMPACTS**

Section 40727.2 of the California Health and Safety Code requires an air district, in adopting, amending, or repealing an air district regulation, to identify existing federal and air district air pollution control requirements for the equipment or source type affected by the proposed change in air district rules. The air district must then note any differences between these existing requirements and the requirements imposed by the proposed change. The following table (Table C5) provides a comparison of the proposed amendments to related provisions from other air quality regulations affected cooling towers at refineries.

**Table C5**  
**Regulation 11, Rule 10, Section 40727.2 Analysis**

Section	Description (paraphrased)	Comparable State/District Rules	Comparable Federal Rules	Discussion
101	Description	NA	NA	No applicable requirements
103 - 107	Exemptions for certain pieces of equipment	NA	NA	No applicable requirements
201 – 211	Definitions	NA	NA	No applicable requirements
301	Standards: Effective March 1, 1990, prevents the use of Cr6 chemicals		40 CFR 63, Subpart Q	Prevents the use of chromium-based water treatment chemicals in Industrial Process Cooling Towers
304	Standards: Effective July 1, 2016, provides Bay Area refinery owner/operators with the following three monitoring options to check for total hydrocarbon (THC) leaks in cooling towers (closed-loop recirculation systems): <ul style="list-style-type: none"> <li>• Continuous THC analyzer monitoring; or</li> <li>• Direct grab sampling and lab analysis of THC in cooling water; or</li> <li>• APCO approved alternative THC monitoring method</li> </ul>		40 CFR 63, Subpart CC (MACT CC) - 63.654 Provides owners/operators of heat exchange systems (closed-loop recirculation and once-through) the option of monitoring for total strippable volatile organic compounds (VOC) concentration via the Modified El Paso Method (MEPM) on a monthly or quarterly basis.  Heat exchange (HEX) systems constructed/reconstructed after August 18, 1995 and before September 4, 2007 are considered "existing" sources and are required to come into compliance with applicable requirements on/before October 29, 2012.  HEX systems constructed on/after September 4, 2007 are considered "new" sources and are required to come into compliance upon initial startup or October 28, 2009 whichever is later.	Reg. 11-10 vs. MACT CC: <ul style="list-style-type: none"> <li>• Reg. 11-10 addresses THC leaks from all cooling towers regardless of if they are in organic HAP service or not.</li> <li>• Reg. 11-10 has more frequent monitoring: Continuous/daily/weekly vs. monthly/quarterly</li> <li>• In Reg. 11-10, concentration of THC in cooling water determined via Method 8260/8270 vs. Concentration of total strippable VOC in stripped air determined via MEPM.</li> <li>• Delay of repair action level: None in Reg. 11-10 vs. 62 ppmv in MACT CC.</li> </ul>

Section	Description (paraphrased)	Comparable State/District Rules	Comparable Federal Rules	Discussion
305	Standards: Effective July 1, 2016, Bay Area refinery cooling tower owners/operators that exceed the THC leak action levels of 84 ppbw (existing) or 42 ppbw (new/modified) in water, or 6 ppmv in stripped air, will have to minimize the leak within 5-calendar days and repair/remove the defective piece of equipment from service within 21-calendar days.		MACT CC – 63.654: Requires the leak to be repaired within 45-days if technically feasible; if technically infeasible allows repair to be delayed until next scheduled heat exchange system (HEX) shutdown; if technically feasible but parts/personnel not available, allows repair to be delayed for 120-days.	Reg. 11-10 vs. MACT CC: <ul style="list-style-type: none"> <li>Unlike MACT CC, Reg. 11-10 does not contain a delay of repair action level. Therefore, the leak has to be minimized/repared ASAP.</li> <li>Though not explicitly stated in the rule, Bay Area refinery cooling tower owners/operators can request reprieve (variance, Compliance &amp; Enforcement Agreement, etc.) if leaks cannot be fixed due to technical infeasibility and/or if parts/personnel are unavailable.</li> </ul>
401	Reporting: Requires Bay Area refinery cooling tower owners/operators to follow notification procedures if continuous/daily/alternative monitoring determines the THC leak action of 84 ppbw (existing) or 42 ppbw (new/modified) is exceeded as discussed below.		MACT CC – 63.655	See more detailed sections below
401.1	Requires Bay Area refinery cooling tower owners/operators to notify the APCO within 1-calendar day if THC leak action levels of 84 ppbw (existing) or 42 ppbw (new/modified) is exceeded	NA	MACT CC – 63.655	Reg. 11-10 requires notification to be substantiated with info on: <ul style="list-style-type: none"> <li>pH, iron, and chlorine concentration in cooling water associated with leak;</li> <li>date and time when leak was discovered;</li> <li>list of all HEXs served by the cooling tower.</li> </ul>
401.2	Requires Bay Area refinery cooling tower owners/operators to provide additional information if an identified leak is not repaired within 21 days	NA	MACT CC – 63.655	Reg. 11-10 requires notification to be substantiated with info on: <ul style="list-style-type: none"> <li>Leak specifics (extent, repairs, re-inspection, further actions/potential delays in repairs)</li> </ul>
402	Best Modern Practices (BMP): Requires Bay Area refinery cooling tower owners/operators to minimize THC leaks from cooling towers by employing BMP. Records of collected data are to be maintained for at least 5 years and analyzed in a weekly report.		NA	No similar existing requirement
402.1	Visual examination or non-destructive examination of heat exchangers upstream of each cooling tower.	NA	NA	No similar existing requirement
402.2	Re-passivate steel within HEX's during turnaround.	None	None	No similar existing requirement
402.3	Seal tubes within HEX's if pitted/corroded.	None	None	No similar existing requirement
402.4	Perform visual observations once per shift to detect changes in cooling water appearance and algae growth.	None	None	No similar existing requirement

Section	Description (paraphrased)	Comparable State/District Rules	Comparable Federal Rules	Discussion
402.5	Monitor cooling tower decks once per shift for odors.	None	None	No similar existing requirement
402.6	Measure residual chlorine in cooling water once per shift.	None	None	No similar existing requirement
402.7	Monitor the air above cooling water once per shift with District approved hand-held monitors (~FIDs, etc.).	None	None	No similar existing requirement
402.8	Measure ORP in cooling tower water once per shift.	None	None	No similar existing requirement
402.9	Track and record the quantities of chlorine/biocide added every day.	None	None	No similar existing requirement
504	Monitoring and Records: Requires Bay Area refinery owners/operators to retain cooling tower operating records collected per Sections 301, 304, 305, 401, 402, and 602 for at least five years from the date of entry.	Regulation 2-6-501, 503	40 CFR 70.6(a)(3)(ii)	This requirement is similar to the recordkeeping requirement in the Air District's Major Facility Review (~Title V permit) Reg. 2, Rule 6 which is based on 40 CFR Part 70 "State Operating Permit Programs".
601	Analytic method for hexavalent chromium.	NA	NA	Administrative requirement
602	Installation locations of THC analyzers..	NA	NA	Administrative requirement
603	Specifies EPA methods to be used if Bay Area refinery cooling tower owners/operators choose to monitor for THC in cooling water by direct grab sampling followed by lab analysis to demo compliance with the THC leak action level.	NA	NA	Administrative requirement
604	Specifies sampling location (cooling water return line) to be used if Bay Area refinery cooling tower owners/operators choose to monitor for THC in cooling water by direct grab sampling followed by lab analysis to demo compliance with the THC leak action level.	NA	NA	Administrative requirement

Review of this information concludes that the proposed regulation is necessary to achieve the emission reductions anticipated, and is not duplicative of existing requirements.

## **ENVIRONMENTAL IMPACTS**

As required by the California Environmental Quality Act (CEQA), a thorough analysis of the environmental impacts of the proposed amendments to Rule 11-10 is present in Appendix D. No environmental impacts beyond reduction of hydrocarbon emissions from cooling towers is expected, so a Negative Declaration is recommended.

## **MINOR CHANGES FROM THE PROPOSED RULE**

The Air District posted a proposed version of Regulation 11, Rule 10 on October 23, 2015. The final version of the rule includes a few minor changes intended to clarify the intent of the rule.

1. Clarification: A short phrase was added to Section 11-10-305 to make it clear that the chemical speciation requirement is a daily requirement upon the discovery of a leak.
2. Clarification: To make it clear that it was never the Air District's intent to subject cooling towers that service heat exchangers with process fluids that do not contain hydrocarbons to the rule, an exemption (Section 11-10-107) was incorporated.
3. Clarification: In the introductory sentence in Section 11-10-205, the word "shall" was changed to "may" to make it clear that actions in either 205.1 or 205.2 are allowable as methods to repair leaks.

## **CONCLUSION**

The proposed amendments to Regulation 11, Rule 10 will result in significant reduction of THC emissions. The CEQA analysis found there to be no additional significant environmental impacts expected from these requirements, and the Socio-Economic analysis found no significant impact on refineries or other processing plants with cooling towers in hydrocarbon service.



BAY AREA  
AIR QUALITY  
MANAGEMENT  
DISTRICT

**STAFF REPORT**

**PROPOSED**  
**AIR DISTRICT REGULATION 12, RULE 15:**  
**PETROLEUM REFINING EMISSIONS**  
**TRACKING**

Prepared by the staff of the  
Bay Area Air Quality Management District  
April 2016

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- Appendix C: Socio-Economic Analysis
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## Acknowledgements

## EXECUTIVE SUMMARY

Bay Area refineries are among the largest stationary sources of air pollutants—criteria, toxic, and climate—in the region. Refineries process crude oil into various products, such as gasoline, diesel fuel, jet fuel, heating oil, and asphalt. Changes in the crude oil stock being processed in Bay Area refineries, along with other factors, can cause an increase in the air emissions of these pollutants. Also, refineries must be a key contributor to greenhouse gas (GHG) reductions necessary to successfully implement the state's climate change goals. As a result, the Bay Area Air Quality Management District ("Air District") has developed a new proposed rule: *Regulation 12, Rule 15: Petroleum Refining Emissions Tracking ("Rule 12-15")*.

Proposed Rule 12-15 would require that all refineries:

1. Submit consistent, enhanced periodic emissions inventory information, including information about cargo carriers;
2. Make available to the APCO historic and ongoing crude slate information, including volumes and composition data, for imported feedstocks as well as for crude oil; and
3. Install and operate new air monitoring facilities at refinery fence-lines.

These activities and the information they would provide would address the Air District goals to:

1. Accurately and fully characterize emissions of air pollutants (criteria, toxic, and climate) from all refinery-related emissions sources on an on-going basis to determine if additional rule development is required to further reduce emissions;
2. Track crude slate changes to assess whether those changes result in increased emissions
3. Improve real-time monitoring of emissions at refinery fence-lines to address public concerns about localized health impacts and to validate emissions inventories.

## I. INTRODUCTION

This report was prepared to provide information about the development of a new rule by the Bay Area Air Quality Management District ("Air District") that would apply to petroleum refineries located in the San Francisco Bay Area: *Regulation 12, Rule 15: Petroleum Refining Emissions Tracking ("Rule 12-15")*. The development of this rule was included as Action Item 4 in the Air District's *Work Plan for Action Items Related to Accidental Releases from Industrial Facilities*, which was approved by the Air District's Board of Directors on October 17, 2012.

In the development of this proposed rule, the Air District held several workshops to discuss the draft rule and gather stakeholder input. An initial series of public workshops were held on an earlier draft Rule 12-15 in Martinez on April 22, 2014; Richmond on April 24, 2014; and at the Air District offices on April 26, 2014. The Air District held a second series of workshops in Benicia on March 16, 2015; Richmond on March 17, 2015; Martinez on March 18, 2015; and at the Air District offices on March 20, 2015. At these workshops, staff presented and discussed a revised draft Rule 12-15 as well as guidance documents for air monitoring and developing emissions inventories. During these workshops, draft Rule 12-15 was presented as a companion to draft *Regulation 12, Rule 16; Petroleum Refining and Emissions Limits and Risk Thresholds ("Rule 12-16")*, which included emission-mitigation actions triggered in various ways.

The Air District hosted three open house events in September 2015, in Martinez, Benicia and Richmond. Although these events were focused on four different draft refinery rules, draft Rule 12-15 and draft Rule 12-16 were discussed with members of the public and the regulated community.

The Air District posted an amended version of draft Rule 12-15 and the air monitoring guidance as well as an interim Staff Report on September 11, 2015. (Also, see Section IX, Rule Development and Public Consultation Process, below.)

At this time, draft Rule 12-16 is being reassessed, and the elements in draft Rule 12-15 that were designed to explicitly support provisions of draft Rule 12-16 have been removed from proposed Rule 12-15.

## **II. BACKGROUND**

### **A. Bay Area Petroleum Refineries and Support Facilities**

Currently, the five petroleum refineries located in the Bay Area within the jurisdiction of the Air District that would be affected by the proposed rule are:

1. Chevron Products Company, Richmond (BAAQMD Plant #10)
2. Phillips 66 Company—San Francisco Refinery, Rodeo (BAAQMD Plant #21359)
3. Shell Martinez Refinery, Martinez (BAAQMD Plant #11)
4. Tesoro Refining and Marketing Company, Martinez (BAAQMD Plant #14628)
5. Valero Refining Company—California, Benicia (BAAQMD Plant #12626)

The five affected, refinery-related facilities ("Support Facilities" in the proposed rule) are:

1. Chemtrade West sulfuric acid plant, Richmond (BAAQMD Plant #23)
2. Eco Services sulfuric acid plant, Martinez (BAAQMD Plant #22789)
3. Air Products and Chemicals hydrogen plant, Martinez (BAAQMD Plant #10295)
4. Air Liquide hydrogen plant, Rodeo (BAAQMD Plant #17419)
5. Phillips 66 coke calcining plant, Rodeo (BAAQMD Plant #21360)

These five support facilities are subject to some provisions of the rule because their operation is closely linked to the operations of the five refineries and because they are significant sources of air pollutants.

#### 1. Petroleum Crude Oil

Petroleum refineries convert crude oil into a wide variety of refined products, including gasoline, aviation fuel, diesel and other fuel oils, lubricating oils, and feed stocks for the petrochemical industry. Crude oil consists of a complex mixture of hydrocarbon compounds with smaller amounts of impurities, including sulfur, nitrogen, oxygen, a variety of toxic compounds, organic acids, and metals (e.g., iron, copper, nickel, and vanadium). Crude oil is most often characterized by the oil's density (light to heavy) and sulfur content (sweet to sour). A more detailed explanation of these terms and others used to describe crude oil follows below.

Also, each of the properties described below, with the exception of "crude oil fractions", "nitrogen content," "total reduced sulfur," and "total acid number" are required to be included in the periodic Crude Slate Report described in proposed Rule 12-15. The District may consider adding these or other properties to Rule 12-15 in a future

amendment, if the data indicates that these properties are essential to fully understanding the emissions impact of crude slate changes.

*a. Crude oil fractions*

Crude oil is not a single substance but rather is a mixture of substances (hydrocarbons, water, metals, mineral salts, and sediments). Hydrocarbons are organic compounds composed of carbon and hydrogen atoms. Crude assays characterize petroleum fractions by boiling point ranges.

*b. API Gravity*

The industry standard measure for crude oil density is American Petroleum Institute (API) gravity, which is expressed in units of degrees, and which is inversely related to density (i.e., a lower API gravity indicates higher density; a higher API gravity indicates lower density). Refineries convert crude oils to gaseous products (propane gas for sale and "fuel gas" that is consumed at the refinery), high-value transportation fuels (gasoline, diesel and jet fuel) and lower-value heavy oils (such as "bunker fuel" that is used by ocean-going vessels). Crude oils with higher API gravity can theoretically be converted to higher-value light products with less processing than crude oils with lower API gravity. Refinery operators have asserted that, although this may suggest that a refinery operator would prefer to use high API gravity crudes exclusively, this is not the case because each refinery is designed and equipped to process crude oil with API gravity in a certain range. Processing crude oil outside of the design range—even if it is "light" crude—will result in processing bottlenecks that reduce the overall efficiency of the refinery. One of the purposes of proposed Rule 12-15 is to gather information to attempt to determine if changes in crude oil composition result in emissions increases. "Light crude" generally refers to crude oil with API gravity of 38 degrees or more; "medium crude" has API gravity between 29 and 38 degrees; and "heavy crude" has API gravity of 29 degrees or less.

*c. Sulfur Content ("Sweet" and "Sour" Crude)*

Sulfur is an impurity that occurs in crude oil and arrives in various forms including: elemental sulfur (S), hydrogen sulfide (H<sub>2</sub>S), carbonyl sulfide (COS), inorganic forms, and most importantly organic forms that include: mercaptans, sulfides, and polycyclic sulfides. "Sweet crude" is commonly defined as crude oil with sulfur content less than 0.5 percent, while "sour crude" has sulfur content greater than 0.5 percent. Sweet crude is more desirable because sulfur must be removed from the crude oil to produce more valuable refined products such as gasoline, diesel and aviation fuels.

*d. Nitrogen Content*

Nitrogen in the heavy gas oil component of crude oil is a contaminant that often requires additional processing. Nitrogen can poison catalysts used in hydrotreating and cracking processes; therefore, nitrogen removal often results in better gasoline and distillate product yields.

*e. Vapor Pressure*

Vapor pressure is a measure of crude oil volatility. Higher vapor pressure crude oil contains greater amounts of light Volatile Organic Carbon (VOC) compounds.

*f. Total Reduced Sulfur (Hydrogen Sulfide and Mercaptans) Content*

Total reduced sulfur (hydrogen sulfide and mercaptan content) is a measure of the highly odorous volatile components in crude oil.

*g. BTEX (Benzene, Toluene, Ethylbenzene, Xylene) Content*

BTEX content is a measure of the benzene, toluene, ethylbenzene, and xylene content in crude oil.

*h. Total Acid Number*

Total Acid Number is a measure of the quantity of organic acids in the crude oil.

*i. Metals (Iron, Nickel and Vanadium) Content*

The metals content of crude oil indicates both the solids contamination of crude oil and the potential for organic metals compounds in the heavy gas oil component of crude oil.

## 2. Petroleum Refining Processes

Refineries comprise the general processes and associated operations discussed below.

*a. Separation Processes*

Crude oil consists of a complex mixture of hydrocarbon compounds with small amounts of impurities such as sulfur, nitrogen, and metals. The first phase in petroleum refining is the separation of crude oil into its major constituents using distillation and "light ends" recovery (i.e., gas processing) that splits crude oil constituents into component parts known as "boiling-point fractions."

*b. Conversion Processes*

To meet the demands for high-octane gasoline, jet fuel, and diesel fuel, components such as residual oils, fuel oils, and light ends are converted to gasoline and other light fractions by various processes. These processes, such as cracking, coking, and visbreaking (a form of thermal cracking that breaks the viscosity), are used to break large petroleum molecules into smaller ones. Polymerization and alkylation processes are used to combine small petroleum molecules into larger ones. Isomerization and reforming processes are applied to rearrange the structure of petroleum molecules to produce higher-value molecules using the same atoms.

*c. Treating Processes*

Petroleum treating processes stabilize and upgrade petroleum products by separating them from less desirable products, and by removing other elements. Treating processes, employed primarily for the separation of petroleum products, include processes such as de-asphalting. Elements such as sulfur, nitrogen, and oxygen are removed by hydrodesulfurization, hydrotreating, chemical sweetening, and acid gas removal.

*d. Feedstock and Product Handling*

Refinery feedstock and product handling operations consist of unloading, storage, blending, and loading activities.

*e. Auxiliary Facilities*

A wide assortment of processes and equipment not directly involved in the processing of crude oil are used in functions vital to the operation of the refinery. Examples include boilers, wastewater treatment facilities, hydrogen plants, cooling towers, and sulfur recovery units. Products from auxiliary facilities (e.g., clean water, steam, and process heat) are required by most process units throughout a refinery. Note that as defined in proposed Rule 12-15, an operation such as a hydrogen plant that is not owned or under the operational control of the refinery would be deemed a “support facility.”

*f. Cargo Carriers*

While some crude oil is transported to refineries by pipeline, ships and trains also can be used to move large quantities of crude oil to refineries. Understanding these emissions provides a more complete picture of the environmental impact of the refinery operations.

*g. Possible Changes in Emissions Due to Changes in Crude Oil*

In the past several years, new sources of crude oil—including American shale oil and Canadian tar sands-derived oil—have become available to petroleum refineries in North

America, including the Bay Area refineries. The crude oil derived from shale, now accessible because of technological improvements in hydraulic fracturing ("fracking"), tends to be light and sweet. However, it also has higher VOC and H<sub>2</sub>S content than some other crude oils. Crude oil from tar sands, currently under development in the Canadian province of Alberta, tends to be heavy and sour.

In order to maximize production, refineries are designed to process crude oils within a certain range in compositions. For example, a refinery that is designed to process more sour crude must have the capacity to remove large amounts of sulfur from the crude oil, while a refinery designed to process sweet crude does not require as much sulfur processing capacity. Bay Area refineries traditionally process heavier and more sour crude oils and would likely need to make changes to their facilities in order to accommodate different sources of crude oil with different compositions while maintaining current production levels.

It is anticipated that refineries will update and/or modify their equipment to meet stricter regulatory fuel requirements and potentially to process crude oil from different sources. Proposed Rule 12-15 provides a means to determine if overall changes in refinery emissions occur as both processes and equipment change, and to make emissions and new monitoring information available to the public.

### 3. Air Pollutants Emitted from Petroleum Refineries

Air pollutants are categorized and regulated based on their properties and there are three primary categories of regulated air pollutants: (1) criteria pollutants; (2) toxic pollutants (toxic air contaminants, which in federal programs are referred to as "hazardous air pollutants"); and (3) climate pollutants (e.g., greenhouse gases). Additional categories of air pollutants include odorous compounds and visible emissions, although these are most often also components of one or more of the three primary categories of regulated air pollutants listed above.

Criteria pollutants are emissions for which Ambient Air Quality Standards (AAQS) have been established, or they are atmospheric precursors to such air pollutants (i.e., they participate in photochemical reactions to form a criteria pollutant, such as ozone). The AAQS are air concentration-based standards that are established to protect public health and welfare. The U.S. Environmental Protection Agency (EPA) sets AAQS on a national basis (National Ambient Air Quality Standards, or NAAQS), and the California Air Resources Board (CARB) sets AAQS for the state of California (California Ambient Air Quality Standards, or CAAQS). Although there is some variation in the specific pollutants for which NAAQS and CAAQS have been set, the term "criteria pollutants" generally refers to the following:

- Carbon monoxide (CO);
- Nitrogen dioxide (NO<sub>2</sub>) and oxides of nitrogen (NO<sub>x</sub>);

- Particulate matter (PM) in two size ranges—diameter of 10 micrometers or less (PM<sub>10</sub>), and diameter of 2.5 micrometers or less (PM<sub>2.5</sub>);
- Precursor organic compounds (POCs) for the formation of ozone and PM<sub>2.5</sub>; and
- Sulfur dioxide (SO<sub>2</sub>).

Each of these criteria pollutants is emitted by petroleum refineries.

Toxic pollutants, also known as toxic air contaminants (TACs), are emissions for which AAQS generally have not been established, but that nonetheless may result in human health risks. TACs generally are emitted in much lower quantities than criteria pollutants, and may vary markedly in their relative toxicity (e.g., some TACs cause health impacts at lower concentrations than other TACs). The state list of TACs currently includes approximately 190 separate chemical compounds and groups of compounds. TACs emitted from petroleum refineries include volatile organic TACs (e.g., acetaldehyde, benzene, 1,3-butadiene, formaldehyde, and xylenes); semi-volatile and non-volatile organic TACs (e.g., benzo(a)pyrene, chlorinated dioxin/furans, cresols, and naphthalene); metallic TACs (e.g., compounds containing arsenic, cadmium, chromium, mercury, and nickel); and inorganic TACs (e.g., chlorine, hydrogen sulfide, and hydrogen chloride).

Climate pollutants (greenhouse gases or GHGs) are emissions that contribute to climate change. Carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), and three groups of fluorinated compounds (hydrofluorocarbons, or HFCs; perfluorocarbons, or PFCs; and sulfur hexafluoride, or SF<sub>6</sub>) are the major anthropogenic GHGs, and are regulated under the federal Clean Air Act and the California Global Warming Solutions Act (AB32). The climate pollutants emitted from petroleum refineries include CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O.

## **B. Regulation of Air Pollutants from Petroleum Refineries**

### 1. Criteria Pollutants

Bay Area refineries are subject to various air quality regulations that have been adopted by the Air District, CARB, and the EPA. These regulations contain standards that ensure emissions are effectively controlled, including:

- Requiring the use of specific emission control strategies or equipment (e.g., the use of floating roofs on tanks for VOC emissions);
- Requiring that emissions generated by a source be controlled by at least a specified percentage (e.g., 95 percent control of VOC emissions from pressure relief devices);
- Requiring that emissions from a source not exceed specific concentration levels (e.g., 100 parts per million [ppm] by volume of VOC for equipment leaks unless those leaks are repaired within a specific timeframe; 250 ppm by volume SO<sub>2</sub> in exhaust gases from sulfur recovery units; 1,000 ppm by volume SO<sub>2</sub> in exhaust

- gases from catalytic cracking units);
- Requiring that emissions not exceed certain quantities for a given amount of material processed or fuel used at a source (e.g., 0.033 pounds NO<sub>x</sub> per million BTU of heat input, on a refinery-wide basis, for boilers, process heaters, and steam generators);
- Requiring that emissions be controlled sufficiently so that concentrations beyond the facility's property are below specified levels (e.g., 0.03 ppm by volume of hydrogen sulfide [H<sub>2</sub>S] in the ambient air);
- Requiring that emissions from a source not exceed specified opacity levels based on visible emissions observations (e.g., no more than 3 minutes in any hour in which emissions are as dark or darker than No. 1 on the Ringelmann Smoke Chart); and
- Requiring that emissions be minimized by the use of all feasible prevention measures (e.g., flaring prohibited unless it is in accordance with an approved Flare Minimization Plan).

Air quality rules generally do not expressly limit mass emissions (e.g., pounds per year of any particular regulated air pollutant) from affected equipment unless that equipment was constructed or modified after March 7, 1979, and is subject to the Air District's New Source Review (NSR) rule. All Bay Area refineries have "grandfathered" emission sources that were not subject to NSR but are generally regulated by equipment-specific Air District regulations or operational conditions contained in Air District permits. As a result, none of the Bay Area refineries have overall mass emission limits that apply to the entire refinery. Nonetheless, mass emissions of regulated air pollutants from Bay Area refineries are tracked at the source level, and these mass emissions generally have been substantially reduced over the past several decades.

Air pollutant emissions from Bay Area petroleum refineries have been regulated for more than 50 years, with most of the rules and regulations adopted following enactment of the 1970 Clean Air Act amendments. The Air District has the primary responsibility to regulate "stationary sources" of air pollution in the Bay Area, and the Air District has adopted many rules and regulations that apply to petroleum refineries.

In December 2015, the Air District adopted two amended rules and one new rule that affect refinery operations and emissions:

- New Regulation 6, Rule 5: Particulate Emissions from Refinery Fluidized Catalytic Cracking Units (FCCUs);
- Amended Regulation 8, Rule 18: Equipment Leaks;
- Amended Regulation 11, Rule 10: Cooling Towers

The Air District is considering additional revisions to several rules and the development of new rules that may further affect refinery operations and emissions. Rule amendments under development include:

- Regulation 1: General Provisions & Definitions;
- Regulation 2, Rule 1: Permits, General Requirements;
- Regulation 2, Rule 2: New Source Review, including GHG evaluation;
- Regulation 2, Rule 5: New Source Review of Toxic Air Contaminants;
- Regulation 6, Rule 1: Particulate Matter General Requirements;
- Regulation 9, Rule 1: Sulfur Dioxide; and
- Regulation 9, Rule 9: Nitrogen Oxides and Carbon Monoxide from Stationary Gas Turbines.

The Air District is also developing a new rule (Regulation 9, Rule 14) to address SO<sub>2</sub> emissions from petroleum coke calcining. Regulation 12, Rule 16 is being re-assessed. The Air District is considering alternative approaches to addressing the concern that refinery emissions may increase as the refineries adopt new sources of crude oil.

In addition, the Air District currently is developing an update to its Clean Air Plan that will investigate and evaluate further measures that could result in revised and/or new rules affecting refineries.

## 2. Toxic Pollutants

The Air District uses three approaches to reduce TAC emissions and to reduce the health impacts resulting from TAC emissions: (1) Specific rules and regulations; (2) Preconstruction review; and (3) the AB 2588 Air Toxics "Hot Spots" Program.

### *a. Rules and Regulations*

Many of the TACs emitted by petroleum refineries also result in the formation of criteria pollutants. For example, benzene and formaldehyde are precursor organic compounds to the formation of ozone, while arsenic and cadmium can be found in particulate matter emissions. Thus, many regulations that reduce criteria pollutant emissions from refineries will also have a co-benefit of reducing toxic air contaminant emissions. In addition, the Air District implements EPA, CARB, and Air District rules that specifically target toxic air contaminant emissions from sources at petroleum refineries, for example, the EPA's National Emission Standards for Hazardous Air Pollutants (NESHAPS) and CARB's Reducing Toxic Air Pollutants in California Communities Act (AB1807) Rules. Additional rules dealing with TACs are listed below.

### *b. Preconstruction Review*

The Air District's Regulation 2, Rule 5 is a preconstruction review requirement for new and modified sources of TACs implemented through the Air District's permitting process. Regulation 2, Rule 5 includes health impact thresholds, which require the use of the best available control technology for TAC emissions (TBACT) for new or modified equipment, and established health risk limits that cannot be exceeded for any proposed project.

*c. Air Toxics "Hot Spots" Program*

The Air Toxic "Hot Spots" program, or AB 2588 Program, was a statewide program implemented by each individual air district pursuant to the Air Toxic "Hot Spots" Act of 1987 (Health and Safety Code [H&SC] Section 44300 *et seq.*). The Air District used standardized procedures to identify health impacts resulting from industrial and commercial facilities. Health impacts were expressed in terms of cancer risk and non-cancer (acute and chronic) hazard index.

Under this program, the Air District used a prioritization process to identify facilities that warrant further review. This prioritization process used toxic emissions data, health effects values for TACs and Air District–approved calculation procedures to determine a cancer risk and non-cancer prioritization score for each site. Facilities that had a cancer risk prioritization score greater than 10 or a non-cancer prioritization greater than 1 were subject to further review. If emission inventory refinements and other screening procedures indicated that prioritization scores remain above these thresholds, the Air District required that the facility perform a comprehensive site-wide HRA. The Air District updates the prioritization scores annually, based on the most recent toxic emissions inventory data for the facility.

An HRA conducted in accordance with AB 2588 estimates the health impacts from a site due to stationary source TAC emissions. The HRA must be conducted in accordance with statewide HRA guidelines developed by the Office of Environmental Health Hazard Assessment (OEHHA) in the Guidance Manual for Preparation of Health Risk Assessments. This manual includes health effects values for each TAC and establishes the procedures to follow for modeling TAC transport, calculating public exposure, and estimating the resulting health impacts. OEHHA periodically reviews and updates the Guidance Manual through a Scientific Review Panel and public comment process. The HRA guidelines were approved in 2003, but OEHHA proposed major revisions to these HRA guidelines in June 2014. The proposed revisions to the Guidance Manual were adopted March 6, 2015.

In 1990, the Air District Board of Directors adopted the current risk management thresholds pursuant to the Air Toxic "Hot Spots" Act of 1987. These risk management thresholds; summarized in Table 1, below, set health impact levels that require sites to take further action, such as conducting periodic public notifications about the site's health impacts and implementing mandatory risk reduction measures. These thresholds as well as other methods to address and lower emissions or TACs are currently under review.

**Table 1**  
**Summary of Current Bay Area Air Toxics "Hot Spots" Program Risk Management Thresholds**

	<b>Site Wide Cancer Risk</b>	<b>Site Wide Non-Cancer Hazard Index</b>
Public Notification	10 in a million	1.0
Mandatory Risk Reduction	100 in a million	10

### 3. Climate Pollutants

CARB recently adopted rules to reduce emissions of GHGs from mobile and stationary sources in California. All refineries in California are subject to CARB's Cap on Greenhouse Gas Emissions and Market-based Compliance Mechanisms ("Cap-and-Trade Rule"). The Cap-and-Trade Rule will reduce GHG emissions collectively from all subject sources using a market-based approach, although there is no requirement that any specific source reduce its emissions. The Cap-and-Trade system will reduce emissions from subject sources to 1990 levels by 2020, a roughly 15 percent reduction.

The Air District's recently adopted Ten Point Climate Action Work Program calls for enhanced GHG emissions inventory and forecasting, the implementation of GHG emissions monitoring and additional rule development specifically addressing GHG emissions; all of which will affect the five Bay Area refineries and support facilities.

### 4. Accidental Release Regulation

In addition to Air District regulations, petroleum refineries are also subject to regulatory programs that are intended to prevent accidental releases of regulated substances. Accidental release prevention programs in California are implemented and enforced by local administering agencies, which, in the case of the Bay Area refineries, are Solano County (for the Valero Refining Company) and Contra Costa County (for Chevron Products Company, Phillips 66 Company, Shell Martinez Refinery, and Tesoro Refining and Marketing Company).

The primary regulatory programs of this type are based on requirements in the amendments to the 1990 Clean Air Act as follows: (1) the Process Safety Management (PSM) program, which focuses on protecting workers, and is administered by the U.S. Occupational Safety & Health Administration (OSHA); and (2) the Accidental Release Prevention program (commonly referred to as the Risk Management Program, or RMP), which focuses on protecting the public and the environment, and is administered by EPA. Bay Area refineries are subject to Cal/OSHA's PSM program, which is very similar to the federal OSHA program focusing on worker safety, but with certain more stringent state provisions. Bay Area refineries are subject to the California Accidental Release

Prevention (CalARP) Program, which is very similar to EPA's RMP program to limit exposure of the public, but with certain more stringent State provisions. In addition, Contra Costa County and the City of Richmond have both adopted an Industrial Safety Ordinance (ISO). These ISOs are very similar to CalARP requirements, but with certain more stringent local provisions.

## 5. Air District Rules Affecting Refineries

The following is a partial list of the air pollution rules and regulations that the Air District implements and enforces at Bay Area refineries:

- Regulation 1: General Provisions and Definitions
- Regulation 2, Rule 1: Permits, General Requirements
- Regulation 2, Rule 2: New Source Review
- Regulation 2, Rule 5: New Source Review of Toxic Air Contaminants
- Regulation 2, Rule 6: Major Facility Review (Title V)
- Regulation 6, Rule 1: Particulate Matter, General Requirements
- Regulation 6, Rule 5: Particulate Emissions from Refinery Fluidized Catalytic Cracking Units;
- Regulation 8, Rule 1: Organic Compounds, General Provisions
- Regulation 8, Rule 2: Organic Compounds, Miscellaneous Operations
- Regulation 8, Rule 5: Storage of Organic Liquids
- Regulation 8, Rule 6: Terminals and Bulk Plants
- Regulation 8, Rule 8: Wastewater (Oil-Water) Separators
- Regulation 8, Rule 9: Vacuum Producing Systems
- Regulation 8, Rule 10: Process Vessel Depressurization
- Regulation 8, Rule 18: Equipment Leaks
- Regulation 8, Rule 28: Episodic Releases from Pressure Relief Devices at Petroleum Refineries and Chemical Plants
- Regulation 8, Rule 33: Gasoline Bulk Terminals and Gasoline Delivery Vehicles
- Regulation 8, Rule 44: Marine Vessel Loading Terminals
- Regulation 9, Rule 1: Sulfur Dioxide
- Regulation 9, Rule 2: Hydrogen Sulfide
- Regulation 9, Rule 8: Nitrogen Oxides and Carbon Monoxide from Stationary Internal Combustion Engines
- Regulation 9, Rule 9: Nitrogen Oxides and Carbon Monoxide from Stationary Gas Turbines
- Regulation 9, Rule 10: Nitrogen Oxides and Carbon Monoxide from Boilers, Steam Generators and Process Heaters in Petroleum Refineries
- Regulation 11, Rule 10: Cooling Towers
- Regulation 12, Rule 11: Flare Monitoring at Petroleum Refineries
- Regulation 12, Rule 12: Flares at Petroleum Refineries
- 40 CFR Part 60, Subpart J: Standards of Performance for Petroleum Refineries

(NSPS)

- 40 CFR Part 61, Subpart FF: Benzene Waste Operations (NESHAP)
- 40 CFR Part 63, Subpart CC: Petroleum Refineries (NESHAP)
- 40 CFR Part 63, Subpart UUU: Petroleum Refineries: Catalytic Cracking, Catalytic Reforming, and Sulfur Plant Units (NESHAP)
- State Airborne Toxic Control Measure for Stationary Compression Ignition (Diesel) Engines (ATCM)

### III. NEED FOR REGULATORY ACTION

Refineries are among the largest single sources of criteria pollutants, precursors to the formation of criteria pollutants and climate pollutants in the Bay Area. Further, the five Bay Area refineries rank among the top ten facilities in the Bay Area for risk-weighted emissions of TACs, based on an evaluation of emissions from stationary sources in 2012 and using risk factors for cancer and chronic hazard index. Bay Area refineries are also some of the largest individual sources of NO<sub>x</sub> and SO<sub>2</sub> in the region. Bay Area refineries are also the largest industrial sources of greenhouse gas emissions. While historically, refinery emissions have tended to decrease overall over time; there are occasions when some emissions have increased despite the regulatory environment in which they operate. Some of the factors that can result in increased refinery emissions include higher production rates to meet increased demand or to compensate for loss of production in other regions, upset conditions and accidents, and changes in crude oil or product slates.

Table 2 includes the most recent criteria pollutant emissions data for the five affected refineries and five affected support facilities.

**Table 2: Baseline Emissions from the Refineries and Associated Facilities**

Facility Name	Average Annual Emissions (tons/year)				
	PM (filterable)	PM (cond.) <sup>1</sup>	TOG	NO <sub>x</sub>	SO <sub>2</sub>
Chevron	173	255	2,187	910	339
Phillips 66	53	—	337	266	409
Shell	409	98	1,749	971	1,084
Tesoro	80	91	1,200	763	572
Valero	123	—	494	1,205	111
Chemtrade West	4	—	55	3	127
Eco Services	18	—	1	13	362
Air Products	10	—	9	3	2
Phillips 66 (Carbon Plant)	29	—	0	239	1,242
Air Liquide	16	—	29	2	2
<b>Total Emissions</b>	<b>915</b>	<b>444</b>	<b>6,061</b>	<b>4,375</b>	<b>4,250</b>

Given the significance of these facilities, it is important to have a wholistic and accurate understanding of their impact on the environment and surrounding communities. The improved emissions inventories required by the proposed Rule 12-15 will help accomplish this goal. These improved inventories would cover a broader set of sources

<sup>1</sup> Condensable PM emissions are estimated based on a very small number of non-standard tests on FCCUs. These numbers will change as more testing is completed at the refineries.

than have been traditionally reported and would ensure that consistent and state-of-the-art methods are used to estimate emissions.

Proposed Rule 12-15 would also require monitoring of emissions at the refinery fence-line. This monitoring is an important complement to the effort to improve emissions inventories because it will help “ground truth” the engineering estimates used in the emissions inventory, with the ultimate goal of ensuring that public health is protected.

In addition, proposed Rule 12-15 would require refineries to provide to the Air District crude slate and non-crude feedstock information. This will enable the Air District to determine whether there is a correlation between changes in crude slate and feedstock changes and increases in emissions. Determination of a correlation (or lack thereof) will help the Air District decide whether such changes should be addressed in future regulations. Apart from future rule development, any relationship between changes in feedstocks and increased emissions would also be relevant to implementation of the Air District’s current new source review program codified in Air District Regulation 2, Rule 1 and Rule 2. Under some circumstances, a change in process feed materials could be an “alteration” or “modification” as defined in Regulation 2, Rule 1, and thus require a permit.

#### **A. Crude Slate and Emissions**

As new sources of North American crude oil become available, the refining of these different crude oils may also lead to increased emissions. As mentioned above, heavy, sour crude from Canadian tar sands may increase GHG emissions due to the need for more intensive processing. The high sulfur content of crude oil from tar sands may also lead to higher SO<sub>2</sub> emissions and may potentially contain more toxic metals. Crude oil from shale has characteristics that may also lead to increases in other emissions. The crude from shale is lighter and, therefore, more easily converted to products, which may lead to lower GHG emissions. However, this crude has higher VOC and H<sub>2</sub>S content, which may lead to increased emissions of these pollutants from storage and loading operations and from equipment leaks. Because of the potential for changes in the sources of crude oil, the Air District seeks to improve our understanding of the relationship between these changes and resulting changes in emissions. This section (III.A.) of the staff report discusses the theory underlying the relationship between crude oil composition and refinery air emissions.

For optimal performance, petroleum refineries are designed to process crude oil with a certain range of characteristics. A refinery may either directly purchase crude oil that has parameters within these ranges or purchase crude oils that do not and then blend these crude oils to create a blended crude oil that does. The crude oils and crude oil blends that a refinery may process is commonly referred to as a refinery’s “crude slate.”

Key crude oil parameters include:

- Crude oil fractions
- API Gravity (Density)
- Sulfur content
- Nitrogen content
- Vapor pressure
- Benzene, Toluene, Ethylene, and Xylene content
- Total Acid Number
- Metals content

These parameters are measured through tests on crude oil called "crude assays." Through the crude assay, refiners are able to determine the values of each of the parameters listed above.

*Crude oil fractions*

Crude oil is not a single substance but rather is a mixture of substances (hydrocarbons, water, metals, mineral salts, and sediments). Hydrocarbons are organic compounds composed of carbon and hydrogen atoms. Crude assays characterize petroleum fractions by boiling point ranges. Typical crude oil fraction boiling points are shown in Table 3.

**Table 3  
Typical Boiling Point Ranges of Crude Oil Fractions**

Product	Boiling Point Range (° F)
Propane, Butanes, and Other Gases	< 85
Gasoline	85 – 185
Naphtha	185 – 350
Kerosene	350 – 450
Diesel	450 – 650
Gas Oil	650 – 1050
Residue (e.g. asphalt)	> 1050



The first step in crude oil refining (after cleaning the crude oil) is heating the crude oil to over 1000 °F to separate the crude oil fractions. Crude oils that have more diesel, gas oil, and residue fractions than gasoline, naphtha, and kerosene fractions require more heating and are, therefore, more energy intensive, resulting in more emissions of GHGs and other combustion products such as NOx and possibly SO<sub>2</sub>.

*API Gravity (Density)*

Density is a ratio of how much something weighs relative to its volume (e.g., pounds per gallon). Because of the manner in which API gravities are determined, more dense ("heavier") crude oils will have lower API gravities while less dense ("lighter") crude oils will have higher API gravities as shown in Table 4.

**Table 4  
Crude Oil Classification Based on API Gravity**

Category	API Gravity	
Light Crudes	> 38	Lighter
Medium Crudes	29 to 38	
Heavy Crudes	8.5 to 29	
Very Heavy Crudes	< 8.5	

Heavier crude oils will have greater amounts of heavier crude oil fractions. Because heavier crude oils and crude oil fractions are denser, they require more power to pump. Power at a refinery is typically supplied by refinery gas turbines. Therefore, an increase in required power directly increases the amount of emissions from gas turbines. Heavier crude oils also require more heating from refinery furnaces and process heaters, directly increasing emissions.

#### *Sulfur Content*

The total amount of sulfur (in all forms) is reported in crude assays as sulfur content in percentage by weight. Typically, crude oils with sulfur content greater than 0.5 percent by weight are called "sour" while crude oils with sulfur content less than 0.5 percent by weight are called "sweet." Sour crude oils require more treatment to remove the sulfur. This directly results in higher emissions from sulfur treatment plants.

Crude assays also include the concentration (in units of parts per million by weight) of a subset of sulfur compounds including H<sub>2</sub>S and mercaptans. H<sub>2</sub>S is considered a toxic air contaminant that has an odor similar to rotten eggs while mercaptans are organic compounds that have a particularly strong odor similar to rotting cabbages. Crude oils with more H<sub>2</sub>S and mercaptans may result in more odors from storage tanks storing crude oil and recovered oil. Odors from such tanks have resulted in public nuisances in nearby communities.

Increased crude oil sulfur content will increase the:

- Amount of hydrogen needed in refinery hydrotreaters,
- Emissions from hydrogen plant furnaces and CO<sub>2</sub> vent,
- Sulfur content in refinery process gas,
- Sulfur content in refinery fuel gas,
- Emissions of SO<sub>2</sub>, H<sub>2</sub>S, and SAM from refinery fuel gas combustion, and
- Elemental sulfur produced and resulting number of trucks carrying sulfur offsite.

#### *Nitrogen Content*

Crude oils typically contain very low amounts of nitrogen compounds, but have a great significance in refinery operations. Nitrogen compounds can destroy or "poison" refinery

catalysts used in fluid catalytic crackers, hydrocrackers, and catalytic reformers. Poisoned catalyst will require more processing of the feedstock, which will increase emissions from those types of equipment.

Nitrogen compounds are also removed in refinery hydrotreaters; but are harder to remove than sulfur. Similar to sulfur, higher nitrogen content will require more hydrogen treatment resulting in more emissions from refinery hydrogen plant furnaces and vents. When treated with hydrogen, nitrogen compounds are transformed to ammonia (NH<sub>3</sub>), a toxic air contaminant. Ammonia may then be carried over in refinery fuel gas and combusted at refinery equipment (boilers, furnaces, etc.) as well as be emitted in fluid catalytic crackers.

#### *Vapor Pressure*

Vapor pressure is an indication of a liquid's evaporation rate. Materials with higher vapor pressure are more volatile. For crude oils and crude oil products, vapor pressure is reported as Reid Vapor Pressure (RVP), which is the vapor pressure determined in a volume of air four times the liquid volume at 100 °F. Crude oils with higher RVP will evaporate more easily, leading to more emissions from storage tanks and as fugitive equipment leaks in refinery components (valves, pumps, flanges, etc.).

#### *Benzene, Toluene, Ethylbenzene, and Xylene*

Benzene, toluene, ethylbenzene, and xylenes are collectively called "BTEX" and each is considered a toxic air contaminant. BTEX are VOCs and toxic air contaminants lead to the formation of criteria pollutants. Crude oils and petroleum feedstocks with higher BTEX will result in increased BTEX and VOC emissions from storage tanks and fugitive equipment leaks from refinery equipment (valves, pumps, flanges, etc.).

#### *Total Acid Number*

Total acid number (TAN) is a measurement of the acidity of crude oil and is a measurement of potential corrosivity of a crude oil. Corrosive crude oils may result in deactivated catalysts, which will require more processing of materials to get the same amounts of product and will increase emissions. Corrosive crude oils may also result in the corrosion of crude unit internal components, piping and process vessels. Corrosion in crude unit components will reduce the efficiency of the crude unit and require more processing of the crude oil to get the same amount of products. More processing will require more heat from crude unit furnaces, directly increasing emissions. Corrosion of piping and process vessels may lead to fugitive equipment leaks and unexpected fires, explosions, and large quantities of emissions.

#### *Metals Content (Iron, Nickel, and Vanadium)*

Metallic compounds exist in all crude oils. Metals cause operational problems by poisoning catalysts used for hydroprocessing and cracking. All metals are considered a pollutant (particulate matter and possibly a toxic air contaminant) when emitted.

Solids contamination of crude can lead to air emissions when these metals settle in the heavy fuel oil or in the petroleum coke produced by the refinery. Air emissions of these metals can occur when the fuel oil or petroleum coke is burned. The organic metals in heavy gas oils are also a concern when the organic metals deposit on the coke formed in the fluid catalytic cracking (FCC) unit. This coke is burned in the FCC regenerator and these metals deposit on the catalyst. A portion of this catalyst is emitted from the FCC as particulates containing these metal compounds. In addition, metals in the feedstock can result in the deactivation of the catalyst in a FCC, which results in increased coke formation, which in turn, results in increased emissions.

Iron, nickel, and vanadium are especially problematic for a refinery. Iron can cause corrosive compounds such as iron oxide (rust) and iron sulfide. Also, high levels of iron may cause iron deposits in refinery pumps, resulting in more power to pump materials. Iron deposits in heat exchangers result in a decrease in the heat transfer efficiency, requiring more heat from boilers, furnaces, or process heaters directly increasing emissions from boilers, furnaces, or process heaters. Iron deposits in pumps, piping, and heat exchangers may also cause metal to corrode creating holes in the equipment and creating fugitive equipment leaks or cooling tower emission leaks.

Nickel can cause corrosion of crude distillation towers and gas turbines and catalytic poisoning. Nickel may be emitted when combusting refinery fuel gas. When directly emitted, nickel is considered a carcinogen and a toxic air contaminant.

For high temperature power generators (gas turbines), the presence of vanadium in refinery fuel gas may lead to ash deposits on the turbine blades, cause severe corrosion, and ultimately may cause a refinery power plant to fail. An unexpected shutdown of a refinery power plant leads to refinery imbalances in fuel gas, steam, and power resulting in unplanned flaring and flared emissions.

Vanadium in refinery fuel gas may also cause the deterioration of refractory furnace linings. A deteriorated refractory lining will result in less heat transfer in a boiler, furnace or process heater. To get the same amount of heat from a boiler, furnace, or process heater with a deteriorated refractory lining; a refinery will have to increase the amount of fuel burned, which directly increases emissions from the boiler, furnace, or process heater.

### *Refinery Configuration*

As previously mentioned, refineries are designed and operated ("configured") to process crude oil and petroleum feedstocks within certain ranges of: API gravity, sulfur content, nitrogen content, TAN, and metals content. If crude oil and/or petroleum feedstocks with parameters outside of these ranges are processed, "routine" emissions could increase and catastrophic failures may occur resulting in refinery fires or explosions and unexpected shutdowns of refinery process units and excessive flaring. Unexpected shutdowns of refinery equipment generate large amounts of emissions. A summary of

refinery emissions impact by crude oil parameter and refinery equipment is listed in Table 5.

**Table 5  
Summary of Refinery Emissions Impact by Crude Oil Parameter**

Parameter	Parameter Impact	
	Pollutants	Refinery Equipment/Activity
API Gravity	<ul style="list-style-type: none"> <li>• NO<sub>x</sub></li> <li>• CO</li> <li>• SO<sub>2</sub></li> <li>• VOC</li> <li>• PM<sub>10</sub>/PM<sub>2.5</sub></li> <li>• GHGs</li> <li>• Toxics</li> </ul>	<ul style="list-style-type: none"> <li>• Crude Unit furnaces</li> <li>• Fluid Catalytic Cracking Unit (FCCU)</li> <li>• Delayed Coker</li> <li>• Fluid Coker</li> <li>• Flexicoker</li> <li>• Solvent Deasphalting Unit</li> <li>• Process unit furnaces</li> </ul>
Sulfur Content Total Reduced Sulfur	<ul style="list-style-type: none"> <li>• SO<sub>2</sub></li> <li>• H<sub>2</sub>S</li> <li>• Odors</li> </ul>	<ul style="list-style-type: none"> <li>• Sulfur Recovery Units (SRUs)</li> <li>• Fuel gas combustion (furnaces, boilers, turbines, etc.)</li> <li>• Flares</li> <li>• Wastewater treatment</li> <li>• Storage tanks</li> </ul>
Nitrogen Content	<ul style="list-style-type: none"> <li>• NH<sub>3</sub> (a toxic)</li> <li>• NO<sub>x</sub></li> </ul>	<ul style="list-style-type: none"> <li>• FCCU</li> <li>• Fuel gas combustion</li> <li>• Hydrocrackers</li> </ul>
Vapor Pressure	<ul style="list-style-type: none"> <li>• VOC</li> <li>• GHGs</li> <li>• Toxics</li> </ul>	<ul style="list-style-type: none"> <li>• Storage tanks</li> <li>• Fugitive equipment leaks</li> <li>• Loading operations</li> <li>• Pressure relief devices</li> <li>• Process vessels</li> </ul>
BTEX	<ul style="list-style-type: none"> <li>• Benzene</li> <li>• Toluene</li> <li>• Ethylene</li> <li>• Xylene</li> </ul>	<ul style="list-style-type: none"> <li>• Storage tanks</li> <li>• Fugitive equipment leaks</li> <li>• Fuel gas combustion (furnaces, boilers, turbines, etc.)</li> </ul>
Total Acid Number	<ul style="list-style-type: none"> <li>• NO<sub>x</sub></li> <li>• CO</li> <li>• SO<sub>2</sub></li> <li>• VOC</li> <li>• PM<sub>10</sub>/PM<sub>2.5</sub></li> <li>• GHGs</li> <li>• Toxics</li> </ul>	<ul style="list-style-type: none"> <li>• Heat Exchangers</li> <li>• Cooling Towers</li> <li>• Process upsets</li> <li>• Flares</li> <li>• FCCU</li> <li>• Delayed Coker</li> <li>• Fluid Coker</li> <li>• Flexicoker</li> <li>• Solvent Deasphalting Unit</li> </ul>
Metals Content	<ul style="list-style-type: none"> <li>• NO<sub>x</sub></li> <li>• CO</li> <li>• SO<sub>2</sub></li> <li>• VOC</li> <li>• PM<sub>10</sub>/PM<sub>2.5</sub></li> <li>• GHGs</li> <li>• Toxics</li> </ul>	<ul style="list-style-type: none"> <li>• FCCU</li> <li>• Flares</li> <li>• Fuel gas combustion (furnaces, boilers, turbines, etc.)</li> <li>• Delayed Coker</li> <li>• Fluid Coker</li> <li>• Flexicoker</li> <li>• Gas Turbine</li> <li>• Hydrocracker</li> <li>• Solvent Deasphalting Unit</li> </ul>

## **IV. PROPOSED RULE REQUIREMENTS**

Proposed Rule 12-15 is included in Appendix A of this report. The air monitoring guidance document is included in Appendix B. Explanations of the various provisions of proposed Rule 12-15 are provided below.

### **A. Administrative Procedures**

Proposed Rule 12-15 would require refinery owners/operators to submit to the Air District emission inventories and air monitoring plans, subject to review by members of the public and other interested stakeholders. For air monitoring plans, comments received would be considered by Air District staff before taking final action to approve, require revisions, or disapprove the plans. Comments on emission inventories would be considered by Air District staff with no time limit, which is consistent with inventories being "living documents" that may change as best practices evolve. Emission inventories and air monitoring plans would be posted on the Air District's website.

The administrative procedures by which the Air District would review and take final action to approve or disapprove the inventories and plans are specified in Sections 12-15-402 and 404 of proposed Rule 12-15.

It should be noted that California law specifies that "trade secrets" are not public records. While air pollutant emissions data and air monitoring data may not be considered trade secrets, many other types of information may be (e.g., production data used to calculate emissions data). The definition of "trade secrets" provided in Section 6254.7 of the California Government Code follows:

"Trade secrets," as used in this section, may include, but are not limited to, any formula, plan, pattern, process, tool, mechanism, compound, procedure, production data, or compilation of information which is not patented, which is known only to certain individuals within a commercial concern who are using it to fabricate, produce, or compound an article of trade or a service having commercial value and which gives its user an opportunity to obtain a business advantage over competitors who do not know or use it.

Section 12-15-407 of proposed Rule 12-15 specifies that a refinery owner/operator may designate as confidential any information required to be submitted under the rule that is claimed to be exempt from public disclosure under the California Government Code. The owner/operator is required to provide a justification for this designation, and must submit a separate public copy of the document with the information that is designated "trade secret" redacted. These provisions are intended to facilitate processing of trade secret information by expediting release of related public information while helping ensure that trade secret portions are not inadvertently released. The purpose of Section 407 is purely administrative. Actual trade secret protections derive from the Government Code. The Air District's Administrative Code sets forth procedures for how the Air District will handle trade secret information that is responsive to Public Records Act requests.

## **B. Pollutant Coverage**

Proposed Rule 12-15 would cover the three primary categories of regulated air pollutants: (1) criteria pollutants (and their precursors), (2) toxic pollutants, i.e., toxic air contaminants (TACs), and (3) climate pollutants, e.g., greenhouse gases. These terms are defined in the proposed rule.

The definition of TAC refers to the California State TAC list and includes those state-identified TACs that have a basis for the evaluation of health effects under guideline procedures adopted by OEHHA for the Air Toxics "Hot Spots" Program.

The Air District realizes the importance of reducing climate pollutants and staff has developed the *Regional Climate Protection Strategy, 10-Point Climate Action Work Program* and created a new department, the Climate Protection Section, to investigate and implement ways to reduce climate pollutants. Proposed Rule 12-15 requires that emissions inventories for climate pollutants be developed and submitted to the Air District. This information will help the Air District begin to address climate change issues. Air District staff will assess emissions of climate pollutants and the refineries' abilities to make feasible improvements in their operations to reduce climate pollutants. While the Statewide AB32 Cap-and-Trade system represents a major effort towards control of climate pollutants, the Air District intends to explore ways to further reduce these pollutants in a manner that complements, and does not conflict with, the Cap-and-Trade system.

## **C. Source Coverage**

Proposed Rule 12-15 would apply to air emissions from "stationary sources" at petroleum refineries. Stationary sources, as opposed to mobile sources such as trucks and other vehicles, are the sources over which the Air District has regulatory jurisdiction. However, there are instances in which the Air District has a need to understand emissions from these mobile sources, in order to have a complete understanding of refinery emissions as sources of crude oil change. Thus emissions from these regulated operations are included in the requirements of the rule. This concept is addressed in the definition of "Emissions Inventory". Several other definitions in the proposed rule are intended to clarify source coverage.

Proposed Rule 12-15 would apply to petroleum refinery operations whether or not these operations are owned or operated by different entities. For example, some Bay Area refineries include co-located hydrogen plants that are owned or operated by separate companies, but that provide hydrogen for refinery operations. The definition of "Support Facility" in the proposed rule identifies these independently-controlled facilities that are subject to the rule.

## D. Emissions Inventory Development

Emissions inventories are used in a variety of air quality programs, and methodologies for establishing these inventories are provided in various publications. Depending on the specific type of source, and the specific type of air pollutant emitted, "state-of-the-art" emissions inventory techniques may involve continuous emission monitors, source-specific emission tests, general emission factors (i.e., representative values that relate the quantity of a pollutant emitted with an activity associated with the release of that pollutant), material balances, or empirical formulae. The term "Emissions Inventory" is defined in the proposed rule.

Because of the diversity of emissions inventory methodologies that exist, and the need to update these methodologies on an on-going basis due to improvements in scientific understanding and available data, the Air District has decided not to include detailed emissions inventory methodologies in the rule itself. Doing so would make the rule language extremely cumbersome, and would necessitate frequent rule amendments as the state of the art progresses. As reflected in Section 12-15-405 of proposed Rule 12-15, the Air District staff will continue to publish, and periodically update, emissions inventory guidelines for petroleum refineries that set the most accurate available methodologies to be used for emissions inventories required by proposed Rule 12-15. Inventories submitted by refineries will be evaluated on a case-by-case basis. Any inconsistencies between the submitted inventories and Air District guidance will be judged based upon whether the refinery has provided an adequate justification for methodologies used.

The Air District previously published a refinery emissions inventory guidelines document ("*Refinery Emissions Inventory Guidelines: An Assessment of EPA Document Emission Estimation Protocol for Petroleum Refineries*") in 2013, and expects to publish updated guidelines prior to the public hearing for adoption of proposed Rule 12-15.

The Emissions Inventory described in proposed Rule 12-15 serves the same purpose as the "permit renewal questionnaire" that is currently sent to each refinery (and every other permitted facility) on an annual basis. This questionnaire is required to be completed by the refinery as a condition of permit renewal, and is the basis for the refinery's estimated emissions. The new Emissions Inventory will eventually replace the "permit renewal questionnaire," with possible duplication of these two documents necessary for 2016 calendar year data. The new Emissions Inventory, like the current "permit renewal questionnaire," is a necessary element of the Air District's permitting program (required by EPA) and also necessary for the Air District to meet its obligation to provide emissions data to CARB. The authority for both the current "permit renewal questionnaire" and the new Emissions Inventory is Healthy & Safety Code Sections 41511 and 42303.

## **E. Emissions Inventories and Crude Slate Report**

### 1. Emissions Inventories Report

The establishment of annual emissions inventories would provide a basis for determining emissions variations that occur at each refinery from year to year.

Each refinery would be required to prepare and submit an annual refinery emissions inventory report. The public would be given an opportunity to provide input regarding emissions inventory reports, as described in Section 12-15-402 of proposed Rule 12-15.

### 2. Crude Slate Report

Each refinery, but not support facilities, would be required to provide information on the crude oil volume and composition, or "crude slate," processed at its crude units as described above, as well as the volume and composition of pre-processed feedstock processed at other process units. The combined information would be included in a "crude slate report." As explained below, the Air District would use this information to determine if significant crude slate changes lead to increased emissions.

The crude oil and pre-processed feedstock parameters required for the crude slate report are:

- Total volume (thousands of barrels)
- API gravity as it relates to higher crude density (degrees)
- Sulfur content (percentage by weight)
- Vapor pressure (psia)
- Benzene, toluene, ethylbenzene, and xylenes (BTEX) contents
- Selected metals (iron, nickel and vanadium) content as an indicator of potential heavy metals that may be released when coke is burned in the fluid catalytic cracking unit

The refinery operators must collect monthly values of each of these parameters and provide this information to the Air District.

Parameters such as nitrogen content, acid content, and total reduced sulfur may be required in future updates of this rule if the Air District deems that data to be necessary to determine the relationship between crude slate and emission rates.

The Authority for this requirement is Health & Safety Code Sections 41511 and 42303. Section 42303 gives the Air District broad authority to require the submittal of information that "will disclose the nature, extent, quantity, or degree of air contaminants which are, or may be, discharged" by a source. Section 41511 expressly allows this authority to be exercised through rulemaking, and gives the Air District authority to adopt rules requiring sources of air pollution to take actions deemed reasonable to determine the amount of air emissions.

These statutory authorities do not limit the Air District's authority to requesting only information about actual emissions. As explained above, crude slate composition can affect air emissions in a myriad of ways. Tracking changes in crude slate is thus reasonably calculated to "disclose the nature, extent, quantity, or degree of air contaminants."

The Air District acknowledges that there is uncertainty regarding the relationship between crude slate changes and refinery air emissions. Refinery representatives have contended throughout the development of this rule either that there is no relationship, or that any such relationship is obscured by intermediary variables. While the Air District does not entirely discount these arguments, the refineries' position is by no means self-evident. As explained above, it is apparent that the potential for changes in crude slate to affect air emissions is significant. The crude slate requirements of proposed Rule 12-15 establish a process to determine whether and to what extent air emissions vary according to changes in crude slate and other feedstocks.

The crude slate requirements of proposed Rule 12-15 will not be burdensome for the refineries. These requirements use information already in refineries' possession, without the need for additional testing or other procedures. The information is being required in a form that does not reveal data that a refinery might reasonable deem "trade secret."

In balancing the degree of uncertainty regarding the relationship of crude and feedstock changes to refinery air emissions, the high potential for an impact upon the breathing public if the relationship is positive, and the minimal burden on the refineries associated with complying with the provisions of this rule, the Air District believes it has struck an appropriate balance and that the crude slate report requirements of proposed Rule 12-15 are "reasonable" within the meaning of Health & Safety Code Section 41511.

## **F. Air Monitoring**

Proposed Rule 12-15 would require the refinery owner/operator to prepare and submit to the Air District an air monitoring plan for establishing and operating a fence-line monitoring system. The term "fence-line monitoring system" is defined in the proposed rule. The Air District will publish guidelines describing the factors it will use in evaluating air monitoring plans (see Sections 12-15-406).

Monitoring plans submitted by refineries will be evaluated on a case-by-case basis. Any inconsistencies between plans and Air District guidance will be evaluated based upon whether the refinery has adequately explained why the plan meets the requirements of proposed Rule 12-15 notwithstanding the inconsistency with the guidance. The same standard of review will be applied to plan updates.

An air monitoring guideline document was developed concurrently with Rule 12-15. Much of the information gathering for the guideline document was completed under Action Item 3 of the Air District's *Work Plan for Action Items Related to Accidental*

*Releases from Industrial Facilities.* Under this Action Item, Air District staff retained a contractor to create a report that identifies equipment and methodological options for monitoring systems. A panel of monitoring experts was gathered from academia, industry, the community, and other government agencies to discuss and weigh the various options and the expert panel provided input to guide the Air District in developing the air monitoring guidelines.

Under proposed Rule 12-15, within one year of Air District approval of a refinery's air monitoring plan, the refinery owner/operator would be required to ensure that fence-line monitoring systems are operational. The systems would be installed, operated, and maintained, in accordance with the approved plan (see Section 12-15-501 of proposed Rule 12-15).

The Air District would review the initial air monitoring guideline document within a five-year period of the publication of the initial guideline document. The guidelines would be updated if necessary in consideration of advances in monitoring technology, updated information regarding the health effects of air pollutants, and review of data collected by existing monitoring systems required under the rule. Updated guidelines would be subject to Air District Board approval. The refinery owner/operator would be required to implement any needed modifications to existing monitoring systems within one year of publication of the updated guidelines.

The fence-line monitoring required by proposed Rule 12-15 is an important element in the effort to improve understanding of refinery emissions. Data in emissions inventories is based to a large extent on emissions factors, which can be described very broadly as multipliers applied to throughput data to yield estimates of actual emissions. Fence-line monitors, by contrast, measure actual emissions. While fence-line monitoring alone is not sufficient to assess total emissions from a refinery, it can provide vitally important reference points to help "ground truth" emissions inventories.

The Authority for this requirement is Health & Safety Code Sections 41511 and 42303.

## V. ECONOMIC IMPACTS

The California Health and Safety Code generally requires two different economic analyses for proposed regulations by an air district. The first (H&S Code §40728.5) is a socioeconomic analysis of the adverse impacts of compliance with the proposed regulation on affected industries and business. The second analysis (H&S Code §40920.6) is an incremental cost effectiveness analysis when multiple compliance approaches have been identified by an air district. Table 6 in Section V.A of this report lists the estimated costs of compliance with each element of proposed Rule 12-15 that has a significant cost. Section V.B of this report discusses the required socioeconomic analysis that is based on the costs in Section V.A. Section V.C of this report discusses the incremental cost analysis, which is not applicable to this proposed rule because they do not require specific emission controls.

### A. Cost of Compliance

<b>Table 6 - Regulation 12, Rule 15 Costs</b>		
<b>Section</b>	<b>Requirement</b>	<b>Cost (per refinery)</b>
12-15-401	Prepare Annual Petroleum Refinery Emissions Inventory (beginning with year 2016 data)	\$90,000 annual cost (annualized)
12-15-408.2	Prepare Monthly Crude Slate Report (beginning with year 2017 data)	
12-15-408.1	Prepare Historical Monthly Crude Slate Reports for 2013, 2014, 2015 and 2016	
12-15-403	Prepare Air Monitoring Plans (one time submittal)	\$250,000 (one-time)
12-15-501	Fence-line Air Monitoring System (construction and operation)	\$2,000,000 one-time capital cost (\$280,000 / year annualized basis)  PLUS \$50,000 annual maintenance & operation cost

### B. Socioeconomic Analysis

Section 40728.5 of the California Health and Safety Code requires an air district to assess the socioeconomic impacts of the adoption, amendment or repeal of a rule if the rule is one that "will significantly affect air quality or emissions limitations." Applied Development Economics of Walnut Creek, California has prepared a socioeconomic analysis of proposed Rule 12-15. This analysis is based on the costs of compliance with the proposed rule discussed in Section V.A, and is attached to this report as Appendix C. The analysis concludes that the socio-economic impacts of compliance with the requirements of these rules is less than significant.

### **C. Incremental Cost Effectiveness**

Section 40920.6 of the California Health and § Code requires an air district to perform an incremental cost analysis for any proposed Best Available Retrofit Control Technology (BARCT) rule or for a rule that is part of an Alternative Emission Reduction Strategy as described in Section 40914 of the Health and Safety Code. This analysis is omitted here because the proposed rule does not include either of these elements.

## **VI. REGULATORY IMPACTS**

Section 40727.2 of the California Health and Safety Code requires an air district, in adopting, amending, or repealing an air district regulation, to identify existing federal and air district air pollution control requirements for the equipment or source type affected by a proposed change in air district rules. The air district must then note any differences between these existing requirements and the requirements imposed by the proposed change. Appendix D of this report identifies the federal and air district control requirements that affect the sources potentially impacted by proposed Rule 12-15.

## **VII. ENVIRONMENTAL IMPACTS**

Pursuant to the California Environmental Quality Act, the Air District has had an initial study for the proposed rule prepared by Environmental Audit, Inc. of Placentia, California. The initial study concludes that there are no potential significant adverse environmental impacts associated with the proposed rule. A negative declaration will be proposed for adoption by the Air District Board of Directors and is included as Appendix E of this report. The initial study and negative declaration were circulated for public comment prior to the public hearing for this rule.

## **VIII. AIR DISTRICT COST RECOVERY**

The administrative procedures in proposed Rule 12-15 (described in Section IV.A of this report) represent a significant workload increase for the Air District. Although most of these procedures are one-time events and processes, they cannot be completed on the required schedule with existing staff.

The Air District has the authority to assess fees to regulated entities for the purpose of recovering the reasonable costs of implementing and enforcing applicable regulatory requirements. On March 7, 2012, the Air District's Board of Directors adopted a Cost Recovery Policy that specifies that newly adopted regulatory measures should include fees that are designed to recover increased regulatory program activity costs associated with the measure (unless the Board of Directors determines that a portion of those costs should be covered by tax revenue).

In accordance with the adopted Cost Recovery Policy, Air District staff is developing new fee schedules to be included in Regulation 3, Fees, through a separate rule development process.

## IX. RULE DEVELOPMENT AND PUBLIC CONSULTATION PROCESS

Since July 2012, Air District staff has engaged in an extensive and comprehensive rule development process involving a wide range of stakeholders that has resulted in this proposed rule, Emissions Inventory Guidelines, Air Monitoring Guidelines, and staff report.

In October of 2012, a *Work Plan for Action Items Related to Accidental Releases from Industrial Facilities* was adopted by the Board of Directors that included development of a Petroleum Refinery Emissions Tracking Rule. In March of 2013 a workshop report and initial draft rule were issued and the rule development process began.

The following meetings and efforts to work with the interested public and affected industry then took place:

- Apr. 2013: Public workshops held (Martinez, Richmond, District office via webcast).
- May 2013: Stationary Source Committee briefing.
- Jul. 2013: Desert Research Institute (DRI) report on air monitoring finalized documenting air monitoring options and methodologies that might be utilized to measure air quality impacts in communities near refineries.
- Jul. 2013: Panel of national air monitoring experts convened that expanded on the air monitoring options and methodological information contained in the DRI report via webcast.
- Sep. 2013: Draft refinery emissions inventory guidelines issued.
- Sep. 2013: Stakeholder Technical Work Group meeting.
- Jan. 2014: Revised draft rule and preliminary responses to comments issued.
- Jan. 2014: Stakeholder Technical Work Group meeting.
- Feb. 2014: Stationary Source Committee briefing.
- May 2013–Apr. 2014: Additional meetings with stakeholders held.
- Apr. 2014: Stationary Source Committee briefing.
- Jun. 2014: Amended draft Rule 12-15 posted on the Air District website.
- Aug. 2014: Air monitoring guidance draft released and comments accepted.
- Aug.–Oct. 2014: Continued meetings with stakeholders.
- Jan. 2015: Comment period opened.
- Mar. 2015: Public workshops held (Martinez, Richmond, Benicia, Air District Office via webcast).
- Sep. 2015: Comments addressed; interim staff report and revised draft rules released.  
Three open houses for four refinery emission reduction rules

- Jan. 2016: (Martinez, Richmond, Benicia). Draft Rule 12-15, staff report, and associated documents posted for public review.
- Mar. 2016 Amended draft Rule 12-15 posted for public review.

A number of substantive changes were made to the January 2016 version of draft Rule 12-15 in response to comments from stakeholders. This is why a draft rule was re-posted in March 2016. A summary of the changes and the reasoning behind them is listed below:

### Community Air Monitoring

Several commenters expressed concerns about the refinery operators being responsible for siting and operating community air monitors. The Air District has decided to take the responsibility for siting and operating these monitors. The monitoring stations will be funded with a broad-based fee through the pending update to Regulation 3: Fees. This approach will offer the same level of information to the Air District and the public, while addressing concerns raised by both the refineries and community groups.

### Crude Slate Reporting

The definitions and administrative requirements for crude slate reporting have been clarified and the data requirements have changed. The purpose of these changes is to focus on the data elements most relevant to emissions: volume, API gravity, sulfur content, vapor pressure, BTEX<sup>2</sup> content and certain metals. Other changes were made to address refinery operator concerns about confidential business information and to clarify how the data is to be summarized for use by the Air District.

### Emissions Inventory

The process for public participation in the emissions inventory development has been modified to ensure that Air District-approved inventories are made available to the public as quickly as possible. The public will have the opportunity to review the emissions inventories and provide comments to the Air District after they are posted. The Air District will correct deficiencies identified to ensure a more accurate and complete emissions inventory.

In addition, refinery operators will not be responsible for providing data on the emissions of support facilities. Those facilities will provide emissions inventory data directly to the Air District.

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<sup>2</sup> BTEX is an acronym for benzene, toluene, ethylbenzene and xylene. These are toxic organic compounds found in some crude oils.

## Energy Utilization

The requirement to submit energy utilization reports has been removed. The Air District is continuing to evaluate various approaches for addressing greenhouse gas emissions from refineries. Some of these approaches require this information and some do not. If needed, this information will be required in future rulemaking actions.

The Air District received several comments on draft Rule 12-15. A full response to comments will be included in the package that is presented at the Board Hearing.

## **X. CONCLUSION**

Pursuant to Section 40727 of the California Health and Safety Code, the proposed new rule must meet findings of necessity, authority, clarity, consistency, non-duplication, and reference. Proposed new Regulation 12, Rule 15 is:

- Necessary to ensure the maintenance of the NAAQS and ensure protection of the public from toxic air contaminants given the size and impact of the refineries and the possibility of changes to the properties of crude oil processed at these refineries;
- Authorized under Sections 40000, 40001, 40702, 40725 through 40728, and 44391 of the California Health and Safety Code;
- Written or displayed so that their meaning can be easily understood by the persons directly affected by them;
- Consistent with other Air District rules, and not in conflict with state or federal law;
- Non-duplicative of other statutes, rules or regulations. To the extent duplication exists, such duplication is appropriate for execution of powers and duties granted to, and imposed upon, the Air District; and
- Implementing, interpreting or making specific the provisions of the California Health and Safety Code Sections 40000, 40702, and 44391.

The proposed new rule has met all legal noticing requirements, has been discussed with the regulated community, and reflects consideration of the input and comments of many affected and interested parties. Air District staff recommends adoption of proposed new Regulation 12, Rule 15.

### **Appendices:**

Appendix A: Proposed Regulation 12, Rule 15

Appendix B: Air Monitoring Guidelines for Petroleum Refineries

Appendix C: Socio-Economic Analysis

Appendix D: Regulatory Impacts Analysis

Appendix E: CEQA Initial Study / Negative Declaration

## ACKNOWLEDGEMENTS

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