SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

Preliminary Draft Staff Report
Proposed Rule 1147.1 - NOx Reductions from Aggregate Dryers

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EXECUTIVE SUMMARY

Proposed Rule 1147.1 – NOx Reductions from Aggregate Dryers, seeks emission reductions of oxides of nitrogen (NOx) from dryers at aggregate facilities and is part of a suite of "landing" rules for facilities currently regulated under the Regional Clean Air Incentives Market (RECLAIM) program or under another existing source specific rule. The goal is to conduct an updated Best Available Retrofit Control Technology (BARCT) analysis to ensure affected equipment is feasibly controlled to achieve cost effective maximum emission reductions.

The South Coast Air Quality Management District (South Coast AQMD) adopted Regulation XX – RECLAIM in October 1993. The purpose of RECLAIM is to reduce NOx and SOx emissions through a market-based approach. It also was designed to provide equivalent emission reductions, in the aggregate, for the facilities in the program compared to what would occur under a command-and-control approach.

Control Measure CMB-05 of the Final 2016 Air Quality Management Plan (AQMP) directed staff to transition the RECLAIM program to a command-and-control regulatory structure requiring BARCT as soon as practicable and to achieve a five tons per day NOx emission reduction as soon as feasible but no later than 2025.

Aggregate facilities conduct operations which support the construction industry by producing materials such as hot mix asphalt and other construction aggregates such as sand, gravel and recycled concrete. These operations have the potential to emit NOx and particulate matter, to which the latter pollutant is regulated elsewhere, requiring controls such as baghouses. NOx emissions are primarily generated from the burners needed to heat critical equipment in the processes such as rotary dryers.

Proposed Rule 1147.1 is a new rule that will primarily update NOx emission limits for aggregate dryers currently regulated under Rule 1147, as well as establish an implementation schedule, and requirements for monitoring and recordkeeping. The revised NOx emission limits represent BARCT and apply to RECLAIM and non-RECLAIM facilities. The proposed rule will replace the applicability of equipment previously subject to Rule 1147. Specifically, Proposed Rule 1147.1 will apply to gaseous fuel-fired aggregate dryers previously subject to the "asphalt manufacturing" category of Rule 1147. Proposed Rule 1147.1 will maintain the compliance schedule structure like that of Rule 1147, with updated compliance dates and new limits for NOx and CO emissions for RECLAIM, non-RECLAIM, and former RECLAIM facilities.

Units applicable to Proposed Rule 1147.1 will be subject to proposed emission limits of 30 ppm NOx and 1,000 ppm CO. Owners or operators of units with rated heat input of less than 2,000,000 BTU/hr or emit less than one pound per day of NOx will continue to be subject to Rule 1147. Units that comply with the existing Rule 1147 limit of 40 ppm NOx shall submit permit applications to meet proposed emission limits by July 1 of the year after the unit burner becomes 32 years old. Owners or operators of a units that are not in compliance with the existing Rule 1147 NOx limit must submit applications to meet proposed emission limits by July 1, 2022, or July 1 of the year after unit burner becomes 12 years old, whichever is later. The compliance deadlines for Proposed Rule 1147.1 were established by taking into consideration equipment size range, application type, the number of units per facility, and whether facilities had multiple pieces of equipment subject to multiple source-specific command-and-control rules. The total emissions inventory for the PR 1147.1 universe is 0.38 tons per day (tpd). Emission reductions from the three facilities expected to submit permit applications by July 1, 2022 is estimated to be 0.01 tpd by July 1, 2024 and

expected total reductions from the Proposed Rule 1147.1 universe to be 0.04 tpd by full implementation estimate of July 1, 2055.

CHAPTER 1: BACKGROUND

Introduction
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Introduction

The Regional Clean Air Incentives Market (RECLAIM) program was adopted in October 1993 under Regulation XX. RECLAIM is a market-based emissions trading program designed to reduce NOx and SOx emissions and includes facilities with NOx or SOx emissions greater than 4 tons per year. The 2016 Final Air Quality Management Plan (2016 AQMP) included Control Measure CMB-05: Further NOx Reductions from RECLAIM Assessment (CMB-05) to ensure the NOx RECLAIM program was achieving equivalency with command-and-control rules that are implementing Best Available Retrofit Control Technology (BARCT) and to generate further NOx emission reductions at RECLAIM facilities. The adoption resolution for the 2016 AQMP directed staff to achieve five tons per day of NOx emission reductions as soon as feasible but no later than 2025, and to transition the RECLAIM program to a command-and-control regulatory structure requiring BARCT as soon as practicable.

As facilities transition out of NOx RECLAIM, a command-and-control rule that includes NOx emission standards that reflect BARCT is be needed for all equipment categories. Proposed Rule (PR) 1147.1 – NOx Reductions from Aggregate Dryers is a "landing" rule for RECLAIM facilities with aggregate dryers and will establish NOx and CO emission limits for natural gas fired aggregate dryers at RECLAIM, non-RECLAIM, and former RECLAIM facilities. Non-RECLAIM facilities were previously subject to the Rule 1147 – NOx Reductions from Miscellaneous Sources category for asphalt manufacturing operations.

Background

For Non-RECLAIM facilities, aggregate dryers are currently regulated under Rule 1147 - NOx Reductions from Miscellaneous Sources. Includes a wide range of miscellaneous combustion sources, that are generally smaller in size. Aggregate dryers are unique due to their large size and lower operating temperatures, with a combustion environment which has high moisture and particulate levels. The average equipment size of aggregate dryers in the South Coast AQMD is 100 MMbtu/hr and operate at temperatures below 800°F. These factors create more unique challenges for control technologies such as selective catalytic reduction (SCR) and sophisticated in-stack monitoring techniques such as Continuous Emissions Monitory Systems (CEMS). As a result, staff decided to create Proposed Rule 1147.1 for aggregate dryers at non-RECLAIM, RECLAIM, and former RECLAIM facilities.

Regulatory History

PR 1147.1 will regulate aggregate dryers at RECLAIM and non-RECLAIM facilities. Prior to the adoption of RECLAIM, aggregate dryers were unregulated. Asphalt and aggregate facilities with annual NOx emissions greater than 4 tons per year are regulated under RECLAIM. Non-RECLAIM facilities with aggregate dryers are regulated under Rule 1147. The following provides the regulatory history for aggregate dryers under RECLAIM and Rule 1147.

Regulation XX – RECLAIM

The South Coast AQMD Governing Board adopted the RECLAIM program in October 1993.Regulation XX – Regional Clean Air Incentives Market (RECLAIM) (Regulation XX) includes a series of rules that specify the applicability and procedures for determining NOx and SOx facility emissions allocations, program requirements, as well as monitoring, reporting, and recordkeeping requirements for RECLAIM facilities. RECLAIM replaced a series of existing and future command-and-control rules and was designed to achieve BARCT in aggregate. At the start of RECLAIM, facilities received an allocation of RECLAIM Trading Credits (RTCs). At the end of each compliance year, facilities are required to hold RTCs that are equal or greater than were equal to their actual annual emissions.

Under RECLAIM, facilities can install pollution controls to reduce NOx emissions or buy or trade RTCs. Any unused RTCs from over control, reduction in throughput, or equipment shutdowns, can be sold or traded.

For aggregate dryers, allocations were based on the facility's reported emission rate since there were no proposed BARCT limits at the time. Over the life of RECLAIM, allocations have been "shaved" or reduced twice, however, only the first shave affected facilities with aggregate dryers. The second shave only affected facilities with the largest holdings of RTCs in 2015. In response to concerns regarding actual emission reductions and implementation of BARCT under RECLAIM, Control Measure CMB-05 of the 2016 AQMP committed to an assessment of the RECLAIM program to achieve further NOx emission reductions of five tons per day, including actions to transition the program and ensure future equivalency to command-and-control regulations. During the adoption of the 2016 AQMP, the adoption resolution directed staff to modify Control Measure CMB-05 to achieve the five tons per day NOx emission reduction as soon as feasible but no later than 2025, and to transition the RECLAIM program to a command-and-control regulatory structure requiring BARCT-level controls as soon as practicable. PR 1147.1 is needed to transition RECLAIM facilities with aggregate dryers to a command-and-control regulatory structure. PR 1147.1 will apply to facilities while in RECLAIM and after the facility transitions out of RECLAIM and becomes a former RECLAIM facility.

Rule 1147 – NOx Reductions from Miscellaneous Sources

Rule 1147 was adopted in December 2008 and establishes NOx limits for a wide variety of miscellaneous combustion sources at non-RECLAIM facilities. Rule 1147 applies to ovens, dryers, dehydrators, heaters, kilns, calciners, furnaces, crematories, incinerators, heated pots, cookers, roasters, fryers, closed and open heated tanks and evaporators, distillation units, afterburners, degassing units, vapor incinerators, catalytic or thermal oxidizers, soil and water remediation units and other combustion equipment with NOx emissions that require a South Coast AQMD permit and are not specifically required to comply with a NOx emission limit by other South Coast AQMD Regulation XI rules.

- December 2008 - Rule 1147 was adopted.
- September 2011 - Rule 1147 was amended in order to respond to compliance challenges by delaying compliance dates as well as providing alternative compliance pathways and reducing testing requirements for impacted equipment. The rule amendment also required staff to conduct a technology assessment for small combustion sources impacted by the rule.
- February 2017 - staff conducted a technology assessment focused on low-use equipment emitting less than one-pound NOx per day. The completed Technology Assessment was reviewed by an independent third-party consultant as well as the Rule 1147 Task Force.
- July 2017 - Rule 1147 was amended to reflect findings and recommendations from the Technology Assessment conducted in February 2017. This amendment provided additional compliance flexibility by including an exemption for equipment with heat input ratings of less than 325,000 BTU/hr. The amendment also removed the in-use requirement for low-use equipment, modified emission limits for various equipment categories in line with findings from the February 2017 Technology Assessment and provided additional compliance options for impacted equipment.

Under the asphalt manufacturing category of Rule 1147, applicable equipment including aggregate dryers are subject to the NOx limit of 40 ppm. All in-use aggregate dryers subject to Rule 1147

emitting one pound or more of NOx per day are required to demonstrate compliance with the Rule 1147 limit of 40 ppm according to the schedule outlined below in Table 1-1 – Rule 1147 Compliance Schedule.

Table 1-1 – Rule 1147 Compliance Schedule (≥1 lb/Day of NOx)

Equipment Category(ies)	Submit Permit Application	Unit Shall Be in Compliance
Specific UNIT		
Remediation UNIT manufactured and installed prior to March 1, 2012	Seven months prior to a combustion system modification, combustion system replacement or unit replacement or a relocation.	Upon combustion system modification, combustion system replacement or unit replacement or relocation beginning March 1, 2012
Evaporator, heated process tank, or parts washer with a District permit issued and operating prior to January 1, 2014	Seven months prior to combustion system modification, combustion system replacement or unit replacement	Upon combustion system modification, combustion system replacement or unit replacement
Tar Pot		All new permit applications beginning January 1, 2013
UNIT with Emissions ≥1 Pound/Day		
Afterburner, degassing unit, catalytic oxidizer, thermal oxidizer, vapor incinerator, fryer, or spray booth make-up air heater manufactured prior to 1998	December 1, 2013	July 1, 2014
Other UNIT manufactured prior to 1986	December 1, 2011	July 1, 2012
Other UNIT manufactured prior to 1992	December 1, 2011	July 1, 2012
Other UNIT manufactured prior to 1998	December 1, 2012	July 1, 2013
Any UNIT manufactured after 1997	December 1 of the year prior to the compliance date	July 1 of the year the unit is 15 years old

All new applicable aggregate dryers subject to Rule 1147 are required to demonstrate compliance with the rule limit existing at the time of permitting. Units emitting less than one pound per day of NOx are required to demonstrate compliance with Rule 1147 limit of 40 ppm when the unit becomes 35 years old unless opting to demonstrate NOx emissions of less than one pound per day through biennial emissions testing. Rule 1147 does not have periodic monitoring requirements. RECLAIM Rule 2012 requires periodic monitoring and bi-annual tune ups with frequency determined by source categorization of Major, Large or Process sources:

- Major sources are required to install CEMS with daily, monthly, quarterly, and annual reporting with minimum of semi-annual RATA
- Large sources are required to conduct source testing every 3 years with requirement for bi-annual tune up
- Process sources are required to conduct source testing every 5 years with requirement for bi-annual tune up

Rule 1147 itself does not have a CO requirement in the rule itself. Instead CO requirements of the asphalt manufacturing category of Rule 1147 are based on a limit of 2000 ppm corrected to 3% oxygen from South Coast AQMD *Rule 407 – Liquid and Gaseous Air Contaminants*.

AB 617

On July 26, 2017, Governor Brown signed AB 617 (Cynthia Garcia): Nonvehicular air pollution: criteria air pollutants and toxic air contaminants. AB 617 was companion legislation to AB 398 which extended California's cap and trade program for reducing greenhouse gas emissions from

stationary sources. RECLAIM facilities that are part of the cap-and-trade program are now also subject to the requirements of AB 617. AB 617 requires an expedited schedule for implementing BARCT for cap-and-trade facilities. Under AB 617, the State's air districts were to develop a schedule by January 1, 2019 for the implementation of BARCT no later than December 31, 2023. The schedule must give highest priority to those permitted units that have not modified emissions-related permit conditions for the greatest period of time and does not apply to an emissions unit that has implemented BARCT due to a permit revision or a new permit issuance since 2007.

Affected Industries

PR 1147.1 will affect RECLAIM and non-RECLAIM facilities that own or operate permitted gaseous fuel-fired aggregate dryers such as rotary dryers and fluidized bed dryers. Based on permitting data, affected facilities generally do not operate more than two pieces of applicable equipment in one location. Based on South Coast AQMD permitting data, staff identified 37 facilities that are subject to PR 1147.1. Of the 37 facilities, 13 facilities are in RECLAIM and 24 are non-RECLAIM facilities

Public Process

Development of PR 1147.1 was conducted through a public process. South Coast AQMD staff has held six Working Group Meetings. Staff recognized the challenges businesses and other stakeholders have experienced with the global COVID-19 pandemic and have conducted Working Group Meetings remotely via Zoom consistent with Governor Newsom's Executive Order N-29-20 dated March 17, 2020. Remote Working Group Meetings were held on June 25, 2020, December 3, 2020, January 20, 2021, February 24, 2021, March 11, 2021, and April 29, 2021. The Working Group is composed of representatives from the equipment manufacturers, trade organizations, permit stakeholders, businesses, environmental groups, public agencies, consultants, and other interested parties. The purpose of the Working Group Meetings was to discuss proposed concepts and to work through the details of staff's proposal. A Public Workshop was held on May 26, 2021. Staff has also had numerous individual meetings with stakeholders who will be impacted by this rulemaking and conducted virtual site visits to six potentially impacted facilities.

CHAPTER 2: BARCT ASSESSMENT

BARCT Assessment
Monitoring, Reporting, and Recordkeeping

BARCT Assessment

Health & Safety Code §40406 defines BARCT as follows:

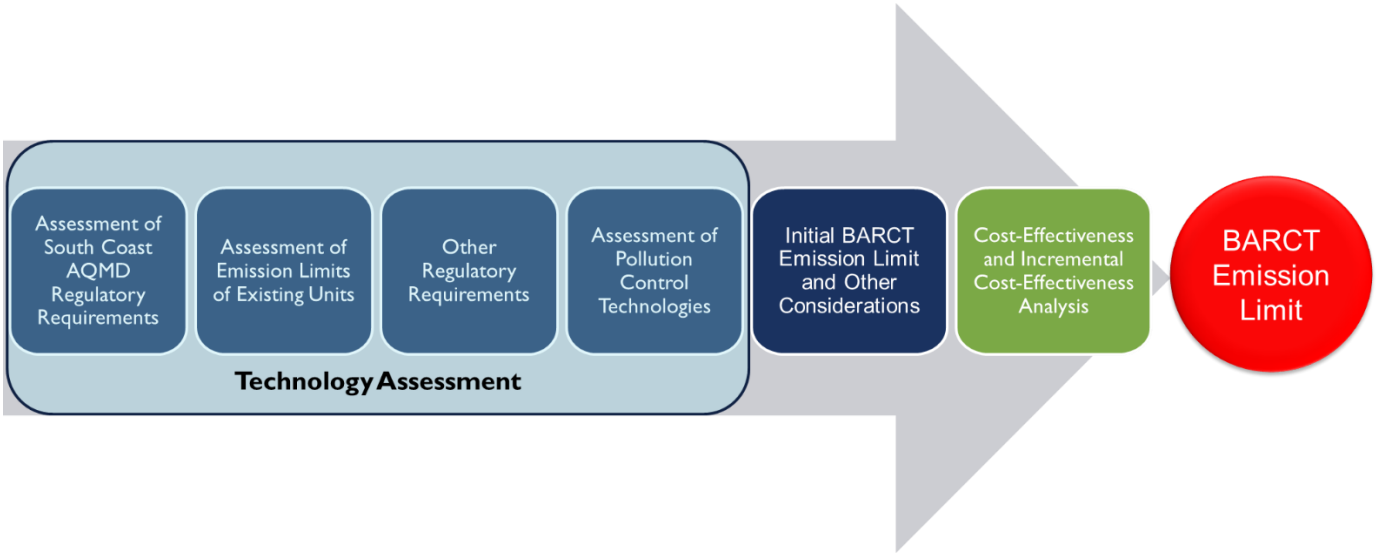
> *Best Available Retrofit Control Technology means an emission limitation that is based on the maximum degree of reduction achievable, taking into account environmental, energy, and economic impacts by each class or category of source.*

The California Health and Safety Code Section 40920.6 establishes requirements prior to adopting rules or regulations regarding retrofit control technologies. Some of these requirements include:

- Identifying one or more potential control options which achieves the emission reduction objective for the regulation.
- Reviewing the information developed to assess the cost-effectiveness of the potential control option, where cost-effectiveness is defined as the cost, in dollars, of the potential control option divided by emission reduction potential, in tons (i.e., the amount of dollars per ton of NOx reduced).
- Calculating the incremental cost-effectiveness for the potential control options is defined as the difference in the costs divided by the difference in the emission reduction potential between each progressively more stringent potential control option as compared to the next less expensive control option.

The BARCT technology assessment for aggregate dryers included a technology assessment that included assessment of existing regulatory requirements, existing NOx limits that have been achieved, and review of commercially available NOx emission reduction technologies for aggregate dryers. After staff conducts the technology assessment identifies potential control options. Before the proposed BARCT limit is established staff will evaluate the cost-effectiveness and incremental cost-effectiveness. A summary of the BARCT assessment is provided below in Figure 2-1.

Figure 2-1 – Summary of BARCT Assessment



Assessment of South Coast AQMD Regulatory Requirements

As part of the BARCT assessment, staff reviewed NOx limits in Rule 1147 which regulates NOx emissions from ovens, dryers, dehydrators, heaters, kilns, calciners, furnaces, crematories,

incinerators, heated pots, cookers, roasters, fryers, closed and open heated tanks and evaporators, distillation units, afterburners, degassing units, vapor incinerators, catalytic or thermal oxidizers, soil and water remediation units and other combustion equipment with nitrogen oxide emissions that require a South Coast AQMD permit and are not specifically required to comply with a nitrogen oxide emission limit by other South Coast AQMD Regulation XI rules. Current rule emission limits were adopted on July 7, 2017. All NOx concentration limits specified in Rule 1147 are referenced at 3 percent volume stack gas oxygen on a dry basis.

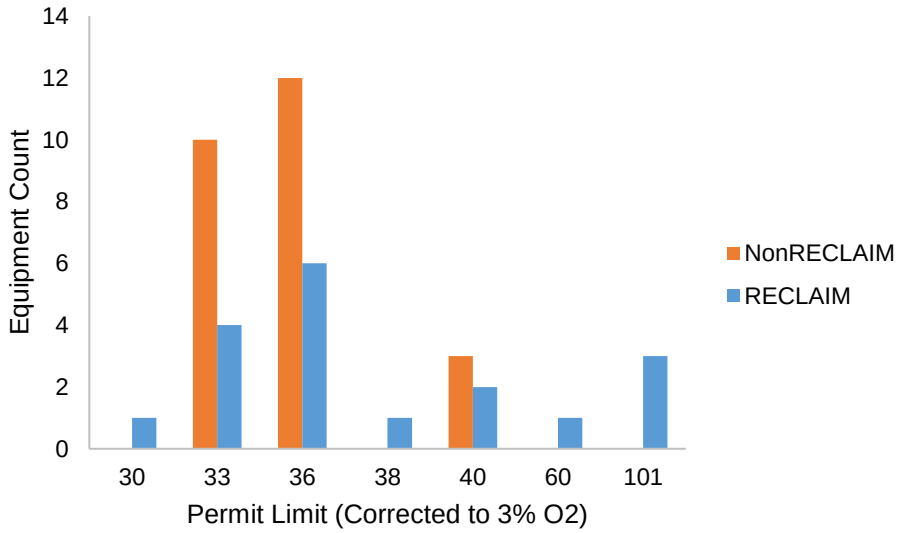
Under the asphalt manufacturing category of Rule 1147, applicable equipment including aggregate dryers are subject to the NOx limit of 40 ppm. All in-use aggregate dryers subject to Rule 1147 emitting one pound or more of NOx per day are required to demonstrate compliance with the Rule 1147 limit of 40 ppm.

Assessment of NOx Emission Limits for Existing Units

Permit Limits

As part of the BARCT analysis, permit limits for aggregate drying operations from within the South Coast AQMD were reviewed. The objective of this part of the technology assessment is to ascertain current permitted emission limits that at lower than the NOx limit established for the asphalt manufacturing category of Rule 1147. The analysis also identified other control technologies implemented by permitted equipment to achieve designated permit limits. Additional considerations were made regarding equipment configurations such as rotary dryers, hot asphalt mixers/dryers, and fluidized bed dryers. Permit limits of existing permitted aggregate dryer range between 30 ppm to 101.4 ppm (equivalent to RECLAIM default emission factor of 130 lb/mmscf). Summary of the assessment for permit limits of 43 permitted aggregate dryers are shown in Figure 2-2.

Figure 2-2 – Summary of Assessment on Aggregate Dryer Permit Limits



Source Test

Facility-submitted source test results were analyzed to assess NOx concentration levels being achieved. Within South Coast AQMD, there are a total of 25 non-RECLAIM units and 18 RECLAIM units subject to PR 1147.1. Burner size observed during source test assessment ranged between 25 MMBtu/hr to 125 MMBtu/hr. Staff reviewed 40 facility submitted source test reports

representing 27 permitted units at 24 facilities. Some source test reports were for the same unit. Of the 40 source test reports, staff removed one source test from the analysis due to noncompliant results and removed six source tests due to lack of CO testing. The remaining 33 source test results surveyed are shown in Table 2 and acquired from 25 permitted units that made up 60% of the total units located in South Coast AQMD with 10 units from the non-RECLAIM universe and 15 units from the RECLAIM universe. Two units highlighted in Table 2 were identified to be subject to RECLAIM default reporting factor of 130 lb/mmscf (equivalent to 102 ppm NOx). Source test results were obtained from the South Coast AQMD database which consists of source tests submitted by facilities to demonstrate compliance with various monitoring and testing requirements.

Of the 33 remaining source test results that were further evaluated, 17 units displayed both NOx emissions of below 30 ppm corrected to 3% O_2 and CO emissions below 1,000 ppm corrected to 3% O_2. Emissions data displayed in Table 2-1 show that it is technically feasible for equipment subject to PR 1147.1 to achieve an emission limit of both 30 ppm NOx corrected to 3% O_2 and 1,000 ppm CO corrected to 3% O_2 simultaneously with burner only control strategies. Some source test results suggest that a limit of below 30 ppm is feasible, staff is recommending a 30 ppm NOx limit in proposed rule 1147.1 to provide a built in compliance margin to account for variations due to aggregate quality and facility location.

Table 2-1 –Results of Source Test Evaluation

	Test Date	Equipment Heat Input (MMBtu/hr)	Permit NOx Limit (@3% O2)	NOx Result (@ 3% O2)	CO Result (@ 3% O2)
Non-RECLAIM	9/20/2018	50	36	24.0	151.0
	9/19/2018	113	36	26.9	251.0
	6/29/2010	66	40	35.0	321.0
	1/21/2013	100	33	28.3	41.6
	9/19/2018	100	33	26.9	251.0
	4/6/2017	100	36	26.5	328.0
	6/25/2010	110	40	33.3	116.0
	2/27/2013	125	36	26.8	11.9
	7/31/2007	125	33	28.7	204.0
	9/7/2016	135	33	29.0	659.0
	5/24/2018	100	33	28.3	1111.0
RECLAIM	3/15/2018	35	38	7.6	204.8
	6/20/2017	20	60	37.4	467.0
	6/20/2017	25	30	26.3	285.0
	6/16/2006	95	36	18.5	199.5
	5/30/2018	85	33	23.6	1091.0
	5/23/2018	100	36	24.4	580.0
	6/6/2018	153	36	27.0	1068.0
	2/24/2014	100	33	29.6	119.3
	8/16/2017	94	36	34.2	232.7
	12/15/2005	125	33	30.9	255.0
	6/7/2018	45	102*	82.5	186.0
	9/29/2020	100	40	27.1	75.4
	1/12/2015	25	30	29.4	213.0
	6/16/2015	100	36	17.1	889.0
	6/22/2017	150	36	27.1	328.0
	5/12/2015	85	33	21.7	1294.0
	3/10/2020	28	40	5.8	1231.43
	3/10/2020	35	38	30.2	2.7
	9/28/2020	94	36	31.7	32.8
	6/11/2020	150	36	27.2	392
	5/28/2020	95	36	30.1	1609.0
	11/14/2017	121	102*	74.0	990.0

**Reporting equivalent to RECLAIM Default of 130 lb/mmscf and not subject to a concentration limit*

Other Regulatory Requirements

Analysis of NOx Concentration Limits for Proposed Rule 1147.1 Equipment at Other Air Districts

Staff reviewed other air districts' requirements for Proposed Rule 1147.1 applicable equipment to identify rules and regulations with lower emission limits or limits representing improvements in pollution control technologies. A comparison of the existing requirements in Rule 1147 with the analogous rules adopted by two other air districts in California, one in San Joaquin Valley (SJVAPCD) and the other in Ventura, was made.

SJVAPCD Rule 4309

SJVAPCD Rule 4309 (Dryers, Dehydrators, and Ovens) regulates equipment located at asphalt/concrete plants that are greater than or equal to 5 MMBTU/hr with full compliance by December 1, 2009. Rule 4309 limits equipment located at asphalt/concrete plants to a NOx limit of 4.3 ppm and a CO limit of 42 ppm both corrected to 19% oxygen which are equivalent to 40 ppm NOx and 400 ppm CO corrected to 3% oxygen. Monitoring requirements of Rule 4309 include monthly emissions monitoring or installation of CEMS with source testing required every 24 months.

SJVAPCD has more stringent MRR requirements when compared to existing South Coast AQMD Rule 1147. Rule 4309 requires source testing at the frequency of every 24 months and periodic emissions monitoring every month as compared to the Rule 1147 requirement of one source test at the time of compliance determination with no additional requirements for periodic emissions monitoring. Emission limits from SJVAPCD are equivalent to the existing limits of 40 ppm NOx for the asphalt manufacturing category in Rule 1147, but are more stringent for CO.

Ventura County Air Pollution Control District (VCAPCD) Rule 74.34

VCAPCD Rule 74.34 –NOx Reductions from Miscellaneous Sources establishes a NOx emission limit of 40 ppm and CO limit of 400 ppm both corrected to 3% oxygen for any natural gas fired combustion unit where the unit total heat input is greater than or equal to 5 MMBtu/hr. Monitoring requirements of Rule 74.34 includes a NOx and CO source test every 48 months with annual screening of NOx and CO within 30 days of the anniversary date of the previous source test.

VCAPCD Rule 74.34 has more stringent MRR requirements when compared to South Coast AQMD Rule 1147. Rule 74.34 requires source testing at the frequency of every 48 months and annual screening of NOx and CO within 30 days of the anniversary date of the previous source test when compared to the Rule 1147 requirement of one source test at the time of compliance determination with no requirements for periodic emissions monitoring. Emission limits from VCAPCD are equivalent to the existing limits of 40 ppm NOx for the asphalt manufacturing category in Rule 1147, but are more stringent in CO.

Assessment of Pollution Control Technologies

Ultra-Low/Low NOx Burners Systems

For gaseous fuels, thermal NOx is generally the largest contributor of NOx emissions. High flame temperatures trigger the disassociation of nitrogen molecules from combustion air and a chain reaction with oxygen follows to form oxides of nitrogen. Factors that minimize the formation of thermal NOx include reduced flame temperature, shortened residence time, and an increased fuel to air ratio. To reduce NOx emissions, combustion parameters can be optimized, control techniques can be applied downstream of the combustion zone, or a combination of the two approaches can be utilized. Common types of combustion modification include: lowered flame temperature; reduced residence time at high combustion temperature; and reduced oxygen concentration in the high temperature zone.

There are a variety of configurations and types of burners for ultra-low NOx burner (ULNB) systems. Often, fuel and air are pre-mixed prior to combustion. This results in a lower and more uniform flame temperature. Some premix burners also use staged combustion with a fuel rich zone to start combustion and stabilize the flame and a fuel lean zone to complete combustion and reduce the peak flame temperature. These burners can also be designed to spread flames over a larger area to reduce hot spots and lower NOx emissions. Radiant premix burners with ceramic, sintered metal

or metal fiber heads spread the flame and produce more radiant heat. When a burner produces more radiant heat, it results in less heat escaping through the exhaust gases.

Most premix burners require the aid of a blower to mix the fuel with air before combustion takes place (primary air). A commonly used application in combination with these burners is flue gas recirculation (FGR). FGR recycles a portion of the exhaust stream back into the burner. Increasing the amount of primary air and/or use of FGR can reduce flame temperature, but it also reduces the temperature of combustion gases through dilution and can reduce efficiency. To maintain efficiency a manufacturer may have to add surface area to the heat exchanger. Increasing the primary air may also destabilize the flame. Ultra-low NOx burners require sophisticated controls to maintain emissions levels and efficiency, to stabilize the flame, and to maintain a turndown ratio that is enough for the demands of the operation.

Selective Catalytic Reduction (SCR) Systems

SCR is a post-combustion control technology that is a commercially available and commonly employed to control NOx emissions from wide range of NOx sources. It is considered to be BARCT, if cost-effective, for controlling NOx emissions from existing combustion sources such as aggregate dryers. A typical SCR system design consists of an ammonia storage tank, ammonia vaporization and injection equipment, a booster fan for the flue gas exhaust, an SCR reactor with catalyst, an exhaust stack plus ancillary electronic instrumentation and operations control equipment. The technology uses a precious metal catalyst that selectively reduces NOx in the presence of ammonia. Ammonia is injected in the flue gas stream where it reacts with NOx and oxygen in the presence of the catalyst to produce nitrogen and water vapor.

For conventional SCRs, the minimum temperature for NOx reduction is 500 degrees F and the maximum operating temperature for the catalyst is 800 degrees F. Depending on the application, the type of fuel combusted, and the presence of sulfur compounds in the exhaust gas, the optimum flue gas temperature of an SCR system is case-by-case and will range between 550 degrees F and 750 degrees F to limit the occurrence of several undesirable side reactions at certain conditions. Depending on the type of combustion equipment utilizing SCR technology, the typical amount of ammonia slip can vary between less than 5 ppm when the catalyst is fresh and 20 ppm at the end of the catalyst life. However, newly permitted SCR systems have an ammonia slip limit of 5 ppm. In addition to the conventional SCR catalysts, there are high temperature SCR catalysts that can withstand temperatures up to 1200 degrees F and low temperature SCR catalysts that can operate below 500 degrees F.

For applications where exhaust temperatures are below the minimum reaction temperature, additional heat in the form of duct burners would need to be installed for proper emission reduction. Doing so would increase mass emissions at the inlet of the SCR and lower total emissions reduction potential of the SCR system.

Vendor Discussions

The following five vendors and manufacturers (in alphabetical order) were contacted requesting information regarding ultra-low/low NOx burners and SCR systems. All five provided technical input and three out of five provided cost estimates that has been included in the discussion below and the cost-effectiveness analysis in this staff report.

- Astec Industries
- Gencor Industries
- Honeywell Thermal Solutions (Hauck)

- Nationwide Boiler Incorporated
- Tri-Mer Corporation

Ultra-Low/Low NOx Burners Systems

The current NOx limit for asphalt manufacturing operations in Rule 1147, which includes aggregate dryers, to be incorporated into Proposed Rule 1147.1 is 40 ppm corrected to 3% O_2. Based on the information obtained through vendor discussions, lower NOx emissions with ultra-low/Low NOx burners are feasible for burner replacements and new installations. Based on discussions with one burner manufacturer, achieving 25 ppm NOx and 400 ppm CO limit with an ultra-low NOx burner without SCR is feasible in new applications. From further discussions with the burner manufacturer, 25 ppm NOx is difficult to achieve in existing facilities due to limited excess air required for lower NOx burners and that 30 ppm is achievable for most retrofit applications. All three burner manufacturers provided assurance for retrofit applications to meet 30 ppm NOx and 1,000 ppm CO for retrofit applications, and observed source test data also suggests existing equipment and burner technology can feasibly achieve 30 ppm NOx and 1,000 ppm CO.

Selective Catalytic Reduction (SCR) Systems

Existing Rule 1147 NOx limits can be feasibly achieved with burner only control technologies. The NOx limit for new SCR applications within the South Coast AQMD is 5 ppm with a 5 ppm ammonia slip. SCR systems are scalable and generally utilized for units greater than 10 MMBtu/hr. From discussions with SCR vendors, system installations for PR 1147.1 is feasible with some limitations. One limitation for SCR applications in PR 1147.1 applicable equipment is the low exhaust temperature for aggregate drying operations. Due to SCR systems requiring minimum exhaust temperatures of about 500 Degrees F, aggregate dryers would require installations of additional heat input devices such as duct burners to meet a minimum exhaust temperature for proper emission reduction reaction to occur. Installation of duct burners would increase NOx emissions at the inlet of the SCR and decrease total reduction potential of the system. Vendor quotes also indicated that inclusion of duct burners would also increase the overall cost of the control system..

Initial BARCT Recommendations and Additional Considerations

Based on the review of the types of pollution control technologies available to reduce NOx and CO emissions applicable to aggregate dryers, burner control technologies are still the main technologies that can achieve the NOx concentration limits specified in these rules.[1]

Natural gas fired units make up for the majority of equipment subject to Proposed Rule 1147.1. Currently, San Joaquin Valley APCD Rule 4309 and Ventura County APCD Rule 74.34 limit aggregate drying operations to a NOx limit of 40 ppm and CO limit of 400 ppm corrected to 3% O_2. Stakeholders expressed concerns of a 400 ppm CO limit with the 30 ppm NOx limit due to potential variations on aggregate quality. Information obtained from vendor discussions confirms findings from the source test analysis that 30 ppm NOx and 1,000 ppm CO are feasible with burner technology. Summary of initial staff recommendations based on feasibility is shown in Table 2-2.

[1] In the event that an owner or operator installs a new burner to meet the proposed emission limit, a permit modification would be required. If the owner or operator chooses to increase the unit's rating in the process, the equipment would be subject to the emission limit set by Best Available Control Technology (BACT).

Table 2-2 -Initial BARCT Recommendations for Proposed Rules 1147.1

Equipment Size	Rule 1147 Limit*	Other Regulatory*	Technology Assessment*	Initial Staff Recommendations*
>2,000,000 Btu/hr	40 ppm No CO Limit	36 to 40 ppm NOx 400 ppm CO	30 ppm NOx 1,000 ppm CO	30 ppm NOx 1,000 ppm CO

* *Emissions limits are corrected to 3% O_2*

Cost-Effectiveness and Incremental Cost-Effectiveness Analysis

Cost-Effectiveness Methodologies

The South Coast AQMD routinely conducts cost-effective analyses regarding proposed rules and regulations that result in the reduction of criteria pollutants (NOx, SOx, VOC, PM, and CO). The analysis is used as a measure of relative effectiveness of a proposal. It is generally used to compare and rank rules, control measures, or alternative means of emissions control relating to the cost of purchasing, installing, and operating control equipment to achieve the projected emission reductions. The major inputs in a cost-effectiveness analysis include capital and installation costs, operating and maintenance costs, emission reductions, discount rate, and equipment life. There are two potential methods to calculate cost-effectiveness for emission reductions, discounted cash flow method and levelized cash flow method. The cost-effectiveness calculations were completed using the discounted cash flow method based on the discussions and comparisons of the two methods below.

Discounted Cash Flow (DCF)

The DCF method converts all costs, including initial capital investments and costs expected in the present and all future years of equipment life, to a present value. Conceptually, it is as if calculating the amount of funds that would be needed at the beginning of the initial year to finance the initial capital investments and to set aside to pay off the annual costs as they occur in the future. The fund that is set aside is assumed to be invested and generates a rate of return at the discount rate chosen. The final cost-effectiveness measure is derived by dividing the present value of total costs by the total emissions reduced over the equipment life. Below is the equation used for calculating cost-effectiveness with DCF as was presented in the 2016 AQMP Socioeconomic Report Appendix 2-B (p. 2-B-3):

$$Cost-effectiveness = \frac{Initial\ Capital\ Investments\ +\ (Annual\ O\&M\ Costs\ \times\ PVF)}{Annual\ Emission\ Reductions\ \times\ Years\ of\ Equipment\ Life}$$

Where:

$$PVF = \frac{(1+r)^N - 1}{r * (1+r)^N}$$

Where r = real interest rate (discount rate); and N = years of equipment life.

The present-value factor (PVF) converts a constant stream of payments made for N years into its single present-value equivalent.

Levelized Cash Flow (LCF)

The LCF method annualizes the present value of total costs as if all costs, including the initial capital investments, would be paid off in the future with an equal annual installment over the

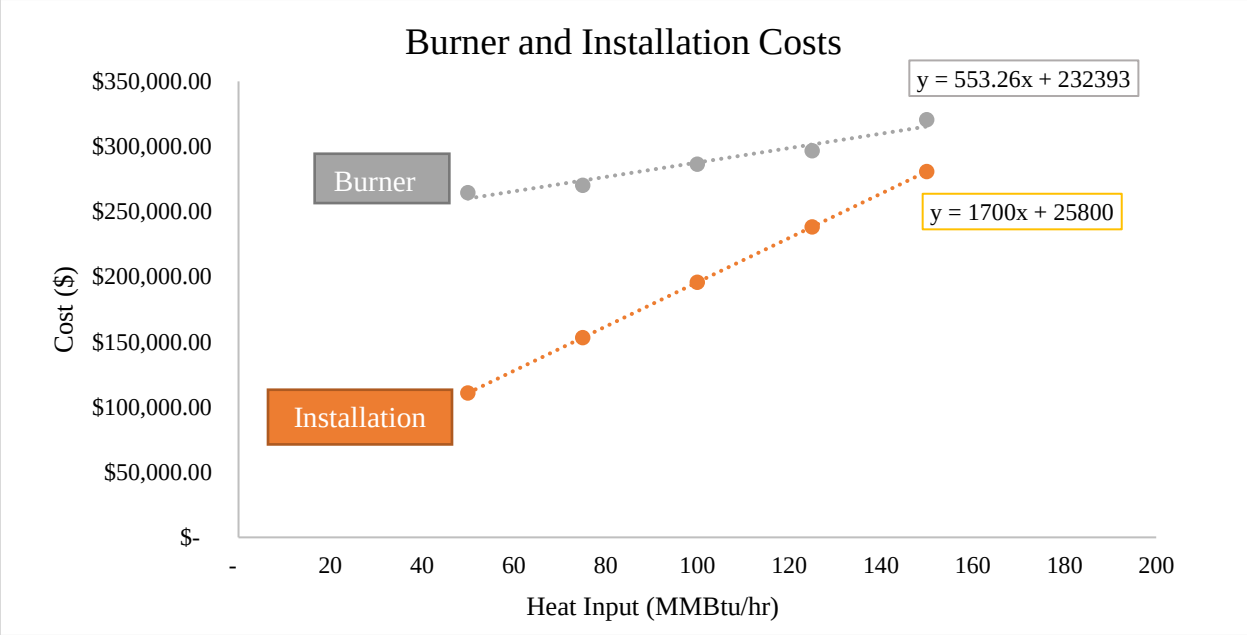
equipment life. What is less clear, however, is how to deal with non-constant emission reductions when using the LCF method. The LCF method is designed to compare the annualized cost with the annual emission reduction that can be potentially achieved by a project; thus implicitly, emission reductions are constant when the LCF method is applied.

$$LCF = \left(\frac{Annualized\ Present\ Value\ of\ Total\ Costs}{Average\ Annual\ Emission\ Reductions}\right)$$

Summary of Cost-Effectiveness and Incremental Cost-Effectiveness Analysis

To assess the cost-effectiveness for the proposed BARCT limits, cost information about the control equipment was obtained from discussions with manufacturers, vendors, and stakeholders. Additional references were made to the installation cost information obtained during the 2018 rulemaking for the Rule 1146 series. Extrapolated installation cost curve was presented to stakeholders during the third public working group that took place on January 20, 2021 and cost extrapolations were further compared to stakeholder provided vendor quotations which showed staff's estimates were generally more conservative than that of stakeholder quotations. Figure 2-2 shows the linear correlations between equipment and installation cost for natural gas fired units based on size (MMBtu/hr) for 30 ppm burner replacements.

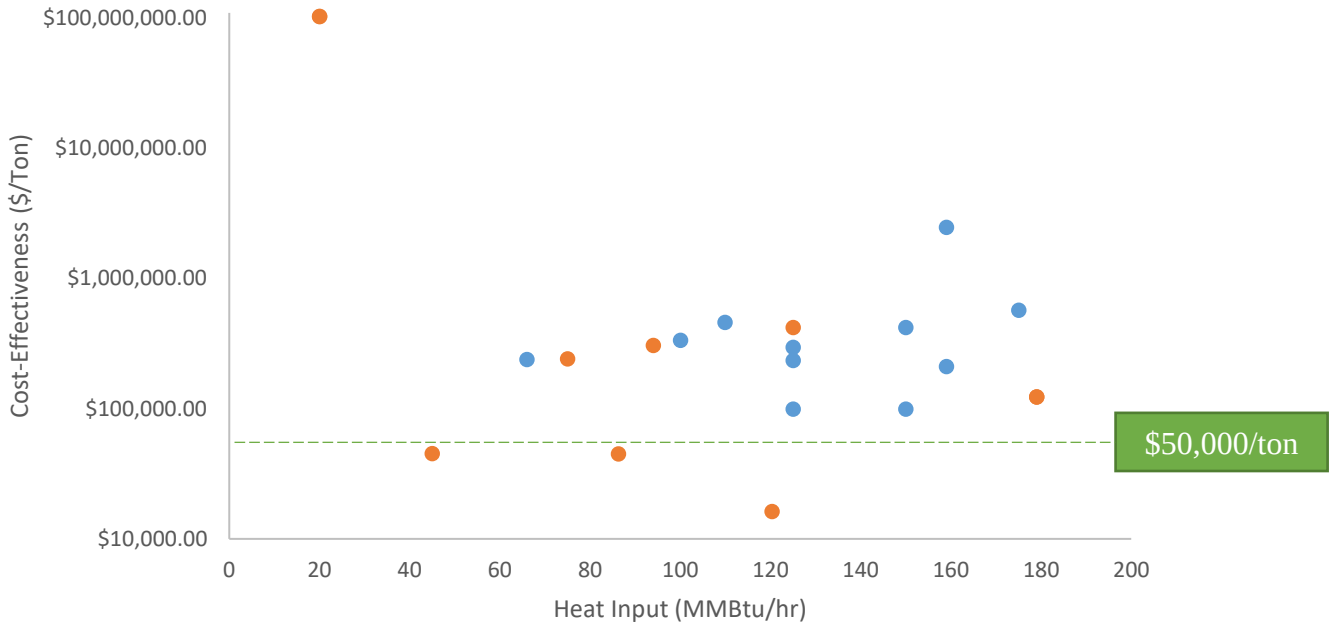
Figure 2-2 – Capital Costs for Equipment and Installation



Cost estimates for the equipment and installation were obtained from one vendor and three stakeholders. Burner costs depended on the equipment size and NOx emission limits. The budget prices obtained for burner retrofits, that indicate there would be no major changes to existing units such as major structural or foundation changes. Additionally, the useful life for the control equipment was assumed to be 15 years for equipment burners. Staff utilized a bottom-up approach which evaluated each equipment subject to Proposed Rule 1147.1 and conducted cost-effectiveness analysis on a per equipment basis. Baseline emissions for each equipment were calculated using latest usage information from facility Annual Emissions Reporting (AER), if available. For equipment without AER information, staff used operating capacity assumption of 80% based off the average industrial production and capacity utilization released by the United

States Federal Reserve printed on February 7, 2011[2]. In addition to the average cost for the equipment and installation, the permitting fees are included as part of the capital cost in the cost-effectiveness analysis. The most current fee rates in *Rule 301 – Permitting and Associated Fees* were used to estimate the permitting cost. Figure 2-3 shows cost-effectiveness for RECALIM equipment subject to PR 1147.1 and Table 2-4 further analyzes RECLAIM equipment that are above cost-effectiveness threshold of $50,000/ton. Vertical axis for graph displayed in Figure 2-3 is scaled logarithmically to display outliers with cost-effectiveness of >$100,000,000/ton. In general, all units with cost-effectiveness greater than $50,000/ton are permitted below 40 ppm. One unit in RECLAIM was identified with a permit limit of 60 ppm with cost effectiveness of $103,171,505. Upon further evaluation, the identified RECLAIM unit is part of a backup process line with annual emissions of ~2 pounds per year according to 2020 RECLAIM reported emissions. Based on the reported annual emissions total, PR 1147.1 will include a low-use provision.

Figure 2-3 –Cost Effectiveness Estimate for Aggregate Dryers



[2]Federal Reserve Statistical Release G.17, Industrial Production and Capacity Utilization http://www.federalreserve.gov/releases/g17/cap_notes.htm as printed on February 7, 2011.

Table 2-4 – Further Assessment of Applicable Equipment with Cost-Effectiveness >$50,000/Ton

RECLAIM/Non-RECLAIM	Equipment Size (MMBtu/hr)	Current Limit (PPM)	Cost-Effectiveness (DCF; $/ton)
Non-RECLAIM	159	36	$ 2,317,100
Non-RECLAIM	66	40	$ 238,500
Non-RECLAIM	100	36	$ 334,900
Non-RECLAIM	100	33	$ 826,500
Non-RECLAIM	110	40	$ 460,100
Non-RECLAIM	125	36	$ 99,100
Non-RECLAIM	125	33	$ 234,700
Non-RECLAIM	125	33	$ 295,700
Non-RECLAIM	150	40	$ 99,300
Non-RECLAIM	150	36	$ 419,000
Non-RECLAIM	159	36	$ 210,700
Non-RECLAIM	175	33	$ 571,900
RECLAIM	20	60	$ 103,171,600
RECLAIM	100	40	$ 57,200
RECLAIM	179	36	$ 123,300
RECLAIM	150	36	$ 119,200
RECLAIM	94	36	$ 305,100
RECLAIM	125	33	$ 421,300
RECLAIM	75	33	$ 240,600

After factoring in considerations for units with existing permit limits of greater than 30 ppm NOx and less than or equal to 40 ppm NOx, category average cost-effectiveness is calculated to be $46,000/ton of NOx reduced.

Incremental cost-effectiveness evaluates and compares two or more control options available for emission reductions. For equipment subject to proposed rule 1147.1, the two identified pollution control technologies are ultra-low NOx burners and selective catalytic reduction (SCR) systems. Due to low exhaust temperature present in aggregate dryers (between 200°F and 300°F), SCR systems would require additions of external heat sources, such as duct burners, to bring exhaust temperatures up to temperatures where reduction reactions can efficiently occur (~500°F). External combustion sources of SCR applications increase system cost and lower overall emission reduction potential when compared to SCR applications that do not require external heat input. The average cost-effectiveness for SCR systems including duct burners for aggregate dryers were calculated to be >$150,000/ton for all identified aggregate dryers with South Coast AQMD permits. As such post-combustion controls were found to be not cost-effective and incremental cost-effectiveness between combustion control and post-combustion control was not calculated.

Proposed BARCT Emission Limit

Staff evaluated applicable permitted equipment in the RECLAIM and non-RECLAIM universe to assess and develop the proposed NOx BARCT limit for Proposed Rule 1147.1. The proposal outlined in Table 2-5 was developed by considering data collected from vendor discussions as well

as analysis of source test results and cost-effectiveness. Separate compliance schedules will be developed for aggregate dryers with South Coast AQMD permits that limit emissions less than or equal to 40 ppm and aggregate dryers without South Coast AQMD permits that limit emissions less than or equal to 40 ppm. Aggregate dryers with heat input ratings below 2,000,000 BTU/hr or daily NOx emissions below one pound per day will continue to be regulated under Rule 1147 – NOx Reductions from Miscellaneous Sources.

Table 2-5 – Summary of Proposed Rule 1147.1

Equipment Category	Equipment Size	Existing Rule 1147 Limit*		Proposed Rule 1147.1 Limit*	
		NOx	CO	NOx	CO
Aggregate Dryers	>2,000,000 Btu/hr	40 ppm	-	30 ppm	1,000 ppm

CHAPTER 3: SUMMARY OF PROPOSALS

Introduction
Proposed Rule 1147.1

Introduction

The primary objective of PR 1147.1 is to establish NOx limits that represent BARCT requirements for applicable equipment and to remove the exclusion of RECLAIM facilities. Equipment applicable to the proposed rule were previously covered under South Coast AQMD Rule 1147 under the "Asphalt Manufacturing" category. Proposed Rule 1147.1 also proposes to include periodic monitoring requirements that are currently not included in Rule 1147. Key provisions included in PR 1147.1 are discussed below.

Proposed Rule 1147.1

Rule 1147.1 Purpose [Subdivision(a)]

The purpose of this rule is to reduce emissions of nitrogen oxide (NOx) and maintain carbon monoxide (CO) from gaseous fuel-fired aggregate dryers.

Rule 1147.1 Applicability [Subdivision(b)]

Proposed Rule 1147.1 applies to owner or operator of a facility that operates natural gas fired aggregate dryers with nitrogen oxide and carbon monoxide emissions with NOx emissions greater than one pound per day and rated heat input greater than 2,000,000 BTU per hour. This equipment category was previously controlled under the "Asphalt Manufacturing Operations" category under Rule 1147 and are reclassified as "Aggregate Dryers" under PR 1147.1. Definitions for this new equipment category as well as associated terms will be further discussed in subdivision(c). Aggregate dryers with rated heat input below 2,000,000 BTU per hour or daily NOx emissions of below one pound per day will continue to be subject to Rule 1147.

Rule 1147.1 Definitions [Subdivision(c)]

The following are key definitions for Proposed Rule 1147.1 to distinguish the applicable types of equipment and facilities regulated under this rule. For all definitions, refer to PR 1147.1.

AGGREGATE MATERIAL in paragraph (c)(1), which means:

> *"particulate materials used in construction and industrial manufacturing, including recycled concrete, recycled asphalt, and quarried materials such as sand, gravel, and crushed stone.*

AGGREGATE DRYERS in paragraph (c)(2), which means:

> "*any combustion equipment fired with gaseous fuel used to reduce or minimize the moisture content of aggregate material, including dryers, rotary dryers, fluidized bed dryers and rotary kilns."*

FORMER RECLAIM FACILITY in paragraph (c)(7), which means:

> *"a facility, or any of its successors, that was in the Regional Clean Air Incentives Market program as of January 5, 2018, as established in Regulation XX, that has received a final determination notification, and is no longer in the RECLAIM program."*

NON-RECLAIM FACILITY in paragraph (c)(9), which means:

> *"a facility, or any of its successors, that was not in the Regional Clean Air Incentives Market program as of January 5, 2018, as established in Regulation XX."*

RECLAIM FACILITY in paragraph (c)(13), which means:

> *"a facility, or any of its successors, that was in the Regional Clean Air Incentives Market program as of January 5, 2018, as established in Regulation XX."*

Rule 1147.1 Requirements [Subdivision(d)]

Paragraph (d)(1) – Interim Limit for Non-RECLAIM Facilities

As non-RECLAIM facilities that were regulated under Rule 1147 transition to PR 1147.1, an interim limit of 40 ppm, in line with existing requirements of Rule 1147, will be placed on non-RECLAIM facilities until the facility meets the new limits outlined in the proposed rule. Facilities with existing South Coast AQMD permits to operate with permit limits below the interim limit specified in (d)(1) will continue to adhere to the limit specified in the permit to operate.

Paragraph (d)(2) – Interim Limit for Former RECLAIM Facilities

As RECLAIM facilities transition out of RECLAIM which implements BARCT in aggregate to command-and-control which implements BARCT for each individual unit. U.S. EPA has commented that as RECLAIM facilities transition to the command-and-control regulatory program, an interim NOx limit is needed until the facility achieves the proposed NOx BARCT limit to ensure that after the RECLAIM cap is removed, there is an enforceable regulatory requirement that is representative of federal Reasonable Available Control Technology levels.

To ensure RECLAIM sources with compliance dates after a facility becomes a former RECLAIM facility continues to meet RACT in the interim, Proposed Rule 1147 will incorporate an interim limit of 102 ppm NOx (equivalent to 130 lb/mmscf RECLAIM default emission factor) for former RECLAIM facilities until the facility meets BARCT, as outlined in paragraph (d)(2).

Paragraphs (d)(3) and (d)(4) – Compliance Schedule for Aggregate Dryers

PR 1147.1 will establish a NOx concentration limit of 30 ppm at 3% oxygen, dry, and CO concentration limit of 1,000 ppm at 3% oxygen, dry. To allow adequate amount of time for non-RECLAIM. RECLAIM, and former RECLAIM facilities to come into compliance with the limits of PR 1147.1, staff proposes a two-step approach as specified in paragraphs (d)(3) and (d)(4) for facilities to come into compliance.

Paragraph (d)(3) will apply to owners or operators of an aggregate dryer at a non-RECLAIM, RECLAIM, or former RECLAIM facility without an existing permit that was established by July 2, 2022 limiting NOx emissions to 40 ppm or less. An owner or operator of an aggregate dryer subject to paragraph (d)(3) shall submit permit application to meet the emission limits of PR 1147.1 when the burner of the aggregate dryer becomes 12 years old and follow the compliance schedule specified in PR 1147.1 Table 1 (Table 3-1 of staff report). Age determination of the aggregate dryer burner will be determined pursuant to paragraph (e)(1). This provision is based on Rule 1147 that requires units to meet NOx limits when the burner reaches 15 years old. PR 1147.1 requires operators to submit a permit application when the unit reaches 12 years old and to meet the NOx limit 18 months after the permit to construct is issued. Assuming a permit is issued with 18 months, an operator under PR 1147.1 would be required to meet the proposed NOx limit when the burner is about 15 years old, consistent with Rule 1147.

Table 3-1 – Compliance Schedule for Aggregate Dryers at Greater than 40 ppm

Equipment Category	Permit Application Submittal Date	Compliance Date
Aggregate Dryer with burners installed prior to January 1, 2010	July 1, 2022	No later than 18 months after Permit to Construct is issued

Aggregate Dryer with burners installed on or after January 1, 2010	July 1 of the following calendar year after the burner reaches 12 years of age	No later than 18 months after Permit to Construct is issued

Paragraph (d)(4) will apply to owners or operators of an aggregate dryer at a non-RECLAIM, RECLAIM, or former RECLAIM facility with an existing permit that was established by July 1, 2023 limiting NOx emissions to 40 ppm or less. An owner or operator of an aggregate dryer subject to paragraph (d)(4) shall submit permit application to meet the emission limits of PR 1147.1 when the burner of the aggregate dryer becomes 32 years old and follow the compliance schedule specified in PR 1147.1 Table 2 (Table 3-2 of staff report). Age determination of the aggregate dryer burner will be determined pursuant to paragraph (e)(1). Aggregate dryers that are already 32 years or older at the time of rule adoption shall comply with the compliance schedule of PR 1147.1 Table 2 during the subsequent year of rule adoption. The proposed timeframe under PR 1147.1 is similar to Rule 1147 which allows 35 years for low use units.

Table 3-2 –Compliance Schedule for Aggregate Dryers at 40 ppm or less

Equipment Category	Submit Permit Application	Compliance Date
Aggregate Dryer with permit limit at or below 40 ppm by July 1, 2022	July 1 of the following calendar year after the burner reaches 32 years of age	Within 18 months after Permit to Construct is issued

Paragraphs (d)(5) and (d)(6) – Shutdown Provision

Paragraph (d)(5) provides a compliance pathway for owners and operators of aggregate dryers that are shutting down an aggregate dryer. Provision is designed to not require an operator to meet the proposed NOx limit, if the unit will be shut down within the timeframe required to meet the proposed NOx limit. Owners and operators must notify the Executive Officer of the intent to shut down the aggregate dryer prior to 36 months after the date a permit application is required specified in paragraph (d)(3) or (d)(4). The notification must be in writing and submitted on or before the date a permit application is required specified in paragraph (d)(3) or (d)(4). On or before 36 months after the date a permit application is due pursuant to paragraph (d)(3) or (d)(4), the owner or operator shall surrender equipment permit to operate as well as disconnect and bind the fuel line for the aggregate dryer.

Paragraph (d)(6) establishes requirements if owners or operators determines a unit originally designated to be shut down, will continue to operate. Under paragraph (d)(6) the owner or operator must submit permit application to the Executive Officer no later than 12 months after the date a permit application is due pursuant to paragraph (d)(3) or (d)(4). Owners or operators that choose to continue operating the aggregate dryer identified in paragraph (d)(5) must meet the NOx and CO emission limits of paragraph (d)(3)(B) or (d)(4)(B) in accordance to source testing provisions of paragraph (f)(1) within 12 months after the Permit to Construct is issued.

Paragraphs (d)(7) – On-Ramp Provision for Aggregate Dryers Exceeding 1 LB/Day NOx

Aggregate dryers with NOx emissions of less than one pound per day are exempt from PR 1147.1 and will continue to be regulated under Rule 1147. For owners or operators of aggregate dryers with NOx emissions below one pound per day that exceeds the threshold, paragraph (d)(7) provides an on-ramp into PR 1147.1 requirements. An owner or operator of an aggregate dryer that exceed one pound per day will be subject to comply with the NOx and CO limits specified in paragraph (d)(3)(B) in accordance to the schedule specified in (d)(3)(A). For an owner or operator of an aggregate dryer installed prior to January 1, 2010 that exceed one pound per day will be subject to comply emission limits specified in paragraph (d)(3)(B) no later than 180 days from the date the aggregate dryer failed to demonstrate NOx emissions of less than one pound per day and must demonstrate compliance with PR 1147.1 limits no later than 18 months after Permit to Construct is issued.

Paragraphs (d)(8) –Aggregate Dryers Exceeding 40 ppm NOx

Aggregate dryers with existing permit limiting NOx emissions to 40 ppm or below are provided an extended compliance schedule specified in paragraph (d)(4). To ensure facilities remain in compliance with their permit limits, facilities must conduct source testing pursuant to paragraph (f)(4) when the aggregate dryer becomes 15 years old pursuant to paragraph (f)(6). Paragraph (d)(8) provides owners or operators of aggregate dryers complying with paragraph (d)(4) that fail to demonstrate compliance to their permit limits a time frame to come into compliance with emission limits of PR 1147.1. An owner or operator of an aggregate dryer with existing permit limiting NOx emissions to 40 ppm or below complying with paragraph (d)(4) that exceeds their permitted NOx concentration before the burner reaches 12 years, shall meet the NOx and CO emission limits specified in subparagraph (d)(3)(B) in accordance with the schedule specified in paragraph (d)(3). For an owner or operator of an aggregate dryer installed prior to January 1, 2010 with existing permit limiting NOx emissions to 40 ppm or below complying with paragraph (d)(4) that exceeds their permitted NOx concentration shall submit a permit application to meet emission limits specified in paragraph (d)(3)(B) no later than 180 days from the date aggregate dryer failed to demonstrate compliance with its permit limit and must demonstrate compliance with PR 1147.1 limits no later than 18 months after Permit to Construct is issued.

Rule 1147.1 Burner Age Determination [Subdivision(e)]

Subdivision (e) provides guidance to determine burner age of aggregate dryers. Unlike the existing provision in Rule 1147(c)(2), PR 1147.1 subdivision (e) does not function as a hierarchy. Owners and operators of aggregate dryers subject to PR 1147.1 may choose any of the available options listed in subdivision (e) to determine burner age. Aggregate dryers without the information outlined in paragraph (e)(1) will be deemed by the South Coast AQMD to be 32 years old as of January 1, 2023.

Rule 1147.1 Monitoring [Subdivision(f)]

Background of Current MRR Requirements in RECLAIM and Non-RECLAIM

Under RECLAIM, mass emissions reported by each facility are used to track and demonstrate compliance. To ensure the integrity of reported emissions, RECLAIM includes substantial monitoring and reporting requirements, as specified in *Rule 2012 - Requirements for Monitoring, Reporting and Recordkeeping for Oxides of Nitrogen Emissions*. RECLAIM MRR requirements are developed to accurately determine mass emissions of NOx for each facility, which is necessary for emission reconciliation and compliance demonstration in the cap-and-trade regulatory

structure. RECLAIM MRR requirements are segregated by device classifications. The 4 device classifications are major sources, large sources, process units, and Rule 219 exempt equipment.

In a command-and-control regulatory structure, a device-level emission standard (expressed in concentration such as ppm in Rule 1147) is used for regulatory and compliance demonstration. Unlike RECLAIM equipment, Rule 1147 does not have periodic source testing requirements such as periodic source testing or emissions monitoring, and generally only an initial source test is required.

Major sources are units with a total heat input rating of greater than or equal to 40 MMBtu/hr with total annual fuel usage of greater than 90 Billion Btu. Units that are classified as major sources are required to install a continuous emissions monitoring system (CEMS) or South Coast AQMD approved equivalent. To ensure the integrity of reported emissions, RECLAIM includes substantial monitoring and reporting requirements for major sources such as annual (or semi-annual) RATA, daily emissions electronic reporting, quarterly aggregate electronic reporting, quarterly certifications of emissions reports (QCER), and annual permit emissions program (APEP) report.

Large sources are units with a total heat input rating of greater than or equal to 10 MMBtu/hr and less than 40 MMBtu/hr with annual emissions of between 4 and 10 tons. Under the RECLAIM program, units classified as large sources are required to electronically report monthly emissions and quarterly aggregate emissions as well as QCER and APEP requirements. Large sources are also required to conduct source testing every three years and conduct semi-annual tuning.

Process units are units with a total heat input rating of between 2 MMBtu/hr and 10 MMBtu/hr. Process units share similar reporting requirements as Rule 219 exempt equipment which are rated to less than or equal to 2 MMBtu/hr. Both process units and Rule 219 exempt equipment are required to submit quarterly electronic emissions reports as well as QCER and APEP requirements. Process units assigned concentration limits are required to conduct source testing every five years and all process units are required to conduct semi-annual tuning. Rule 219 exempt equipment are not subject to periodic testing or tuning requirements unless required by permit.

Non-RECLAIM aggregate dryers with total heat input rating of greater than or equal to 325,000 Btu/hr are subject to the Rule 1147 emission limit of 40 ppm corrected to 3% oxygen, dry. Compliance is determined either at the time required outlined previously in Table 1-1 or at the time of permitting.

Comparison of MRR Requirements in RECLAIM and Non-RECLAIM

Comparison of MRR requirements between RECLAIM and Rule 1147 are outlined in Table 3-1.

Table 3-1 – Comparison of MRR Requirements Between RECLAIM and Rule 1147

Requirements	RECLAIM	Rule 1147
Source Testing	**Major Source**: Semi-annual RATA which includes reference source test **Super Compliant Major Source:** Semi-annual source testing (Every 12 months after 2 years of consecutive passes)	**Units Emitting ≥1 Pound NOx/Day:** According to schedule found in Rule 1147 Table 2 or at the time of permitting
	Large Source: Source testing every 3 years	**Units Emitting <1 Pound NOx/Day:** At the time when unit is 35 years old*
	Process Source: Source testing every 5 years	

Periodic Monitoring	**Major Source**: Requires installation of CEMS or equivalent	**Units Emitting ≥1 Pound NOx/Day:** Tune up interval according to manufacturer specification
	Super Compliant Major Source: Semi-annual tuning with emissions monitoring	
	Large Source: Semi-annual tuning with emissions monitoring	**Units Emitting <1 Pound NOx/Day:** Tune up interval according to manufacturer specification and maintaining daily usage records to demonstrate low use
	Process Source: Semi-annual tuning with emissions monitoring	
CEMS Provision	Required for all units meeting definition of major source (≥40 MMBtu/hr and ≥90 Billion BTU/year; OR ≥500 MMBtu/hr)	Rule 1147 does not contain provisions for CEMS
Reporting	**Major Source**: - Daily electronic reporting - Monthly electronic reporting - Quarterly aggregate reporting - Quarterly certifications of emissions report (QCER) - Annual permit emissions program (APEP) report	Rule 1147 does not contain periodic reporting requirements
	Super Compliant Major Source: - Monthly electronic reporting - Quarterly aggregate reporting - QCER - APEP report	
	Large Source: - Monthly electronic reporting - Quarterly aggregate reporting - QCER - APEP report	
	Process Source: - Quarterly aggregate reporting - QCER - APEP report	

[*]*Units subject to Rule 1147 emitting less than 1 pound/day of NOx may continue to operate without complying with rule limits if the facility conducts biennial testing to continuously demonstrate emissions of <1 pound/day.*

In general, source testing and reporting requirements under RECLAIM are more stringent than Rule 1147. Proposed Rule 1147.1 aligns MRR requires for RECLAIM and non-RECLAIM facilities with aggregate dryers. Title V requires additional periodic monitoring. South Coast AQMD has developed guidelines, outlined in South Coast AQMD Periodic Monitoring Guidelines[3], for periodic monitoring, testing and recordkeeping requirements that may be incorporated in Title V permits. Currently, the monitoring requirements in the RECLAIM program are comprehensive and address the Title V periodic monitoring requirements. On March 5, 2021, the South Coast AQMD Governing Board voted to amend *Rule 218 - Continuous Emission Monitoring* and *adopt Rule 218.2 - Continuous Emission Monitoring System: General Provisions*, and *Rule 218.3 - Continuous Emission Monitoring System: Performance Specifications* which address the additional MRR requirements as required by the Title V program. Considerations of the different monitoring requirements between RECLAIM and non-RECLAIM are considered when developing MRR requirements for Proposed Rule 1147.1.

Paragraphs (f)(1) and (f)(2) –Source Test Provision

[3] Periodic Monitoring Guideline. http://www.aqmd.gov/home/permits/title-v/title-v-requirements#pm.

Aggregate dryers subject to paragraph (d)(3) or (d)(4) must conduct a source test to demonstrate compliance as specified in paragraph (f)(3) as well as obtaining approved source test protocol prior to conducting the source test. Source test protocols for subsequent testing would not need to be re-evaluated assuming burner or aggregate dryer was not altered in a way where a new permit is required in between tests.

Paragraphs (f)(3) –Source Test Methods

Paragraph (f)(3) outlines acceptable methods of compliance determination for PR 1147.1 emission limits.

Paragraphs (f)(4) –Periodic Source Testing Requirements

Paragraph (f)(4) outlines the following periodic source test schedule for aggregate dryers subject to PR 1147.1 based on rated heat input and stakeholder feedback:

- Below 10 MMBtu/hr – Every 5 calendar years and source test may not take place earlier than 54 calendar months after previous source test
- Between 10 MMBtu/hr and 40 MMBtu/hr – Every 3 calendar years and source test may not take place earlier than 30 months after the previous source test
- At or above 40 MMBtu/hr – Every calendar year and source test may not take place earlier than 6 months after the previous source test

PR 1147.1 will not require facilities to install new continuous emissions monitoring systems (CEMS) onto aggregate dryers; however, facilities with existing CEMS or alternative CEMS (ACEMS) must maintain the system for the list of the aggregate dryer. Aggregate dryers with installed ACEMS are required to conduct periodic relative accuracy test audits (RATA) as required in Rule 218.2 and 218.3. RATA may substitute for one instance of compliance demonstration required in paragraph (f)(3) as specified in paragraph (f)(7).

Paragraphs (f)(6) – Periodic Demonstration for Units Complying with Paragraph (d)(4)

To ensure facilities following the extended compliance schedule specified in paragraph (d)(4) remain in compliance with their permit limits, facilities must conduct periodic source testing pursuant to paragraph (f)(4) when the aggregate dryer becomes 15 years old. Facilities that fail to continuously demonstrate compliance with a permit limit will be subject to PR 1147.1 emission limits pursuant to the schedule specified in paragraph (d)(8).

Paragraphs (f)(7) – Accepted Alternatives to Periodic Source Test

Facilities subject to additional testing requirements such as periodic monitoring under a Title V permit pursuant to Regulation XXX and relative accuracy testing for continuous emissions monitoring systems subject to Rule 218.2 and 218.3 specified in paragraph (f)(7) may use the tests to satisfy one instance of the requirements of paragraph (f)(4) as long as the test is conducted within the same schedule as the required determination specified in paragraph (f)(4).

Rule 1147.1 Recordkeeping and Reporting [Subdivision(g)]

Subdivision (g) outlines reporting and recordkeeping requirements including compliance demonstration averaging time for aggregate dryers with existing CEMS or ACEMS.

Rule 1147.1 Labeling Requirements [Subdivision(h)]

Subdivision (h) outlines labeling requirements for owners and operators of aggregate dryings subject to PR 1147.1.

Rule 1147.1 Exemptions [Subdivision(i)]

Paragraphs (i)(1) – Aggregate Dryers Emitting Less Than One Pound Per Day

Aggregate dryers emitting less than one pound per day of NOx pursuant to methods specified in Rule 1147 will not be subject to PR 1147.1 and continue to be regulated under Rule 1147.

Paragraphs (i)(2) – Tunnel Dryers

Some tunnel dryers used for industrial manufacturing identified in South Coast AQMD potentially meet the definition of aggregate dryer, but with a significantly different process. Tunnel dryers are evaluated under Rule 1147 and exempt from PR 1147.1.

CHAPTER 4: IMPACT ASSESSMENT

Introduction
Emission Reductions
Socioeconomic Assessment
California Environmental Quality Act Analysis
Draft Findings Under California Health and Safety Code Section 40727
Comparative Analysis

Introduction

Among the 37 RECLAIM and non-RECLAIM facilities identified to be applicable to Proposed Rule 1147.1, 34 facilities are already in compliance with the existing Rule 1147 concentration limit of 40 ppm and would not need to comply with the BARCT limit of 30 ppm NOx and 1,000 ppm CO until the unit becomes 32 years old. One facility with a unit concentration limit of 60 ppm was identified as a low use back up with total annual emissions of around 2 pounds NOx, which would qualify for the low use provisions of PR 1147.1. A total of three RECLAIM facilities are expected to need to submit permit applications by January 1, 2022.

Emissions Reduction

The total NOx inventory for the RECLAIM units affected by the PR 1147.1 is estimated to be 0.38 tons per day. This estimate is taken from South Coast AQMD annual emission report (AER) inventory database for compliance year 2018 for permitted units. The South Coast AQMD's AER program was developed to track emissions of air contaminants from permitted facilities. Facilities with annual emissions exceeding 4 or more tons of nitrogen oxides (NOx), sulfur oxides (SOx), volatile organic compounds (VOCs), specific organics (SPOG), particulate matter (PM), or emissions of 100 tons per year or more of carbon monoxide (CO) are required by the South Coast AQMD to submit an annual emissions report. Facilities could also be required to submit AER if the facility receives a notification from South Coast AQMD or is subject to the AB2588 Program for reporting quadrennial updates to its toxics inventory. For each piece of RECLAIM equipment, the annual activity is estimated using the facility's reported emissions for the compliance year of 2020 and fuel usage is calculated using an emission factor represented by the permit limit specific for each unit. For units with missing AER data, emissions were calculated assuming 80% utilization capacity based off the average industrial production and capacity utilization released by the United States Federal Reserve printed on February 7, 2011.[4]

Emission reductions were calculated using the difference between the total aggregate emissions calculated using the concentration limit or emissions factor found on equipment permits (RECLAIM default of 130 lb/MMSCF for those without specified limits or factors) and total aggregate emissions using the PR 1147.1 proposed NOx concentration limit. The total emissions inventory for the PR 1147.1 universe is 0.38 tons per day (tpd). Emission reductions from the three facilities expected to submit permit applications by July 1, 2022 is estimated to be 0.01 tpd by July 1, 2024 and expected total reductions of 0.04 tpd by full implementation estimate of July 1, 2055.

Socioeconomic Assessment

A socioeconomic impact assessment will be conducted and released for public review and comment at least 30 days prior to the South Coast AQMD Governing Board Hearing, which is anticipated to be on August 6, 2021.

California Environmental Quality Act Analysis

Pursuant to the California Environmental Quality Act (CEQA) and South Coast AQMD's certified regulatory program (Public Resources Code Section 21080.5, CEQA Guidelines Section 15251(l) and South Coast AQMD Rule 110), the South Coast AQMD, as lead agency, is reviewing the proposed project to determine if it will result in any potential adverse environmental impacts. Appropriate CEQA documentation will be prepared based on the analysis.

Draft Findings Under California Health and Safety Code Section 40727

[4]Federal Reserve Statistical Release G.17, Industrial Production and Capacity Utilization http://www.federalreserve.gov/releases/g17/cap_notes.htm as printed on February 7, 2011.

Requirements to Make Findings

California Health and Safety Code Section 40727 requires that prior to adopting, amending or repealing a rule or regulation, the South Coast AQMD Governing Board shall make findings of necessity, authority, clarity, consistency, non-duplication, and reference based on relevant information presented at the public hearing and in the staff report.

Necessity

PR 1147.1 is needed to establish BARCT requirements for facilities that will be transitioning from RECLAIM to a command-and-control regulatory structure.

Authority

The South Coast AQMD obtains its authority to adopt, amend, or repeal rules and regulations pursuant to California Health and Safety Code Sections 39002, 40000, 40001, 40440, 40702, 40725 through 40728, and 41508.

Clarity

PR 1147.1 is written or displayed so that their meaning can be easily understood by the persons directly affected by them.

Consistency

PR 1147.1 are in harmony with and not in conflict with or contradictory to, existing statutes, court decisions or state or federal regulations.

Non-Duplication

PR 1147.1 will not impose the same requirements as any existing state or federal regulations. The proposed rule is necessary and proper to execute the powers and duties granted to, and imposed upon, the South Coast AQMD.

Reference

In amending these rules, the following statutes which the South Coast AQMD hereby implements, interprets or makes specific are referenced: Health and Safety Code sections 39002, 40001, 40702, 40440(a), and 40725 through 40728.5.

Comparative Analysis

Under H&SC Section 40727.2, the South Coast AQMD is required to perform a comparative written analysis when adopting, amending, or repealing a rule or regulation. The comparative analysis is relative to existing federal requirements, existing or proposed South Coast AQMD rules and air pollution control requirements and guidelines which are applicable to aggregate dryers. See Table 12 below.

Table 12 – Comparative Analysis of Proposed Rule 1147.1

Rule Element	PR 1147.1	RECLAIM	Equivalent Federal Regulation
Applicability	Aggregate dryers with maximum rated heat input capacities greater than or equal to 2 MMBtu/hr	Facilities regulated under the NOx RECLAIM program (South Coast AQMD Reg. XX)	New or modified minor source hot asphalt plants in tribal territory
Requirements* *All parts per million (ppm) emission limits are referenced at 3 percent volume stack gas oxygen on a dry basis averaged over a period of 15 consecutive minutes.	NOx limits: 30 ppm CO Limit: 1,000 ppm	Asphalt Heater/Concrete NOx Limit: 30 ppm	NOx limits: 36 ppm CO Limit: 400 ppm
Reporting	Every 6 months for units with existing continuous emissions monitoring system (CEMS) or equivalent prior to date of rule adoption (Rules 218.2 and 218.3).	• Daily electronic reporting for major sources • Monthly to quarterly reporting for large sources and process units • Quarterly Certification of Emissions Report and Annual Permit Emissions Program for all units	Permit specific
Monitoring	• A continuous in-stack NOx monitors for existing systems • Source testing once every 5 calendar years for units < 10 MMBtu/hr • Source testing once every 3 calendar years for units ≥10 MMBtu/hr and <40 MMBtu/hr • Source testing once every calendar year for units ≥40 MMBtu/hr	• A continuous in-stack NOx monitors for major sources • Source testing at least once every year for super compliant major sources • Source testing once every 3 years for large sources •Source testing once every 5 years for process units	Permit specific
Recordkeeping	• Source test records = 5 years	• < 15-min. data = min. 48 hours; • ≥ 15-min. data = 3 years (5 years if Title V) • Maintenance & emission records, source test reports, RATA reports, audit reports and fuel meter calibration records for Annual Permit Emissions Program = 3 years (5 years if Title V)	Permit specific