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Baseline Inventory Development Description and Rationale For Proposed Rule 2301 Control of Emissions from New or Redevelopment Projects

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I. Background

In the 2007 Air Quality Management Plan (AQMP) SCAQMD proposed an indirect source control measure, EGM-01, to mitigate growth emissions from new development and redevelopment projects. This measure is designed to reduce emissions related to new residential, commercial, industrial and institutional development, including redevelopment required to accommodate future growth in the South Coast Air Basin (SCAB). The measure is committed to reduce 0.5 tons per day of VOC; 0.8 tons per day of NOx and 0.5 tons per day of PM2.5 in 2023. The control measure is to meet the "all feasible measures" requirement of state law, H&S Codes 40716; 40913 (6); 40914(b)(2); 49020.5(c); and 14 CA Code of Regulation Section 15364, and to capture emission reduction opportunities during the project development phase. The Proposed Rule 2301 (PR2301) is to implement this control measure commitment in the AQMP.

This paper describes the inventory methodology used to derive the baseline emissions for the sources subject to the proposed regulation.

II. Source Category

The growth in emissions from new development and redevelopment projects occur in two phases: construction phase and operation phase. Typical emissions during a construction phase include, but are not limited to, fugitive dust emissions, combustion emissions from off-road mobile sources (construction equipment), on-road mobile sources, architectural coatings, and asphalt evaporative emissions. Operation phase emissions include, but are not limited to, stationary area sources (e.g., water heater and space heater emissions), on-road mobile source emissions (worker commute trips, daily trips, etc.), consumer products, architectural coatings, and lawn and garden equipment. Table 1 summarizes the emission source categories that are associated with new or redevelopment projects. These categories are currently included in the air quality analysis of any project subject to CEQA review.

TABLE 1- EMISSION SOURCE CATEGORIES

Construction Phase	-Construction and Demolition PM Dust -Construction Equipment -On-Road Emissions (commute, delivery) -Architectural Coatings -Asphalt Paving -Re-Entrained Paved Road Dust
Operation Phase	-On-Site Natural Gas Consumption From Water Heaters, Space Heaters, Boilers, Appliances, etc. -Consumer Products -On-Road Emissions (commute, delivery) -Architectural Coatings -Lawn & Garden Equipment

III. Inventory Methodology

This section describes the inventory methodology for each source category identified for new and re-development projects. The methodology largely follows the approach taken in developing the 2007 AQMP, representing the most recent growth and planning assumptions. Generally speaking, the inventory methodology involves three steps: 1) Identify possible source categories which are related to new and re-development projects; 2) Determine the growth emissions for these categories; and 3) Estimate the appropriate portion of the growth emissions for each category attributive to new and re-development projects and subject to this rule.

A. Emission Growth Projections

This section describes how emission growth was projected for PR2301, which follows the same methodology for the 2007 AQMP. The future year emissions are obtained using the following equation:

Projected Emissions with Growth & Control: $(F.Y.)_i = (B.Y.)_i\ (C.F.)_i\ (G.F.)_i$
Projected Emissions with Control-Only: $(F.Y.)_j = (B.Y.)_i\ (C.F.)_i$
Net Emission Growth: $(F.Y.)_i - (F.Y.)_j$

Where $(F.Y.)_i$ is the forecast emissions of an air pollutant (i) for a future year (i.e., 2010, 2014, 2023). $(B.Y.)_i$ refers to the base year emissions of the air pollutant (i.e., 2002). The control factor, $(C.F.)_i$ is an indicator of the level of control efficiency for a specific source category as a result of adopted federal, state and local air quality regulations and proposed 2007 short-term measures with an expected implementation date beyond 2002. $(G.F.)_i$ is a growth factor determined for different categories of industry and socioeconomic data. Growth projections are developed primarily by SCAG. Each emission inventory source grows based on its growth surrogate. Growth surrogates include industry output growth, employment growth, demographic growth and others. The growth surrogates for emission sources identified for PR2301 are summarized in Table 2. For the purposes of PR2301, all the short-term measures in the 2007 AQMP (with the exception of PR2301) are assumed to be implemented as proposed. This assumption provides a more constrained estimate of emissions available for further control under PR2301. The control-only emissions are derived by excluding the growth factors. The difference between the growth and control emissions and the control-only emissions is, for this purpose, considered the emissions due to growth. The growth emissions between 2010 and 2014 and between 2010 and 2023 are identified in PR2301. 2010 is selected based on the proposed rule adoption schedule for PR2301. 2023 is selected in accordance with the year that PR2301 emissions are targeted for reduction. Therefore, two milestone year inventories were prepared for PR2301: 2014 and 2023. 2014 is the year in which reductions from specified control measures, as outlined in the 2007 AQMP, are needed to achieve the federal PM2.5 annual standard, and 2023 corresponds to the 8-hour ozone standard. PR2301 claims zero emission reductions from this control measure by 2014. The portion of emission growth attributable to PR2301, by 2023, for each source category is described under “Emission Apportionment”.

TABLE 2- Source Category Growth Surrogates

Source Category	Growth Surrogate
Service & Commercial (space & water heating)	Service Sector Output (SIC 70-89)
Residential Fuel Combustion (cooking, space & water heating)	Housing Unit
Construction & Demolition	Construction Employment
Re-Entrained Paved Road Dust	Road Miles
Consumer Products	Population
Architectural Coatings	Housing Unit
Asphalt Paving	Construction Employment
Construction Equipment	Employment (CSU Fullerton/REMI)*
Lawn & Garden Equipment	Housing Unit (CSU Fullerton)*
TRU-Transport Refrigeration Units	Employment (CSU Fullerton)*
Light-Duty Auto and Trucks	Land Use/Population
Medium-Duty Trucks	Land Use/Population
Heavy-Duty Trucks	Land Use/Population

*Actual growth factors provided by SCAG forecasts unless otherwise noted.

B. Emission Apportionment

Construction Equipment

Construction equipment emissions, to be included in PR2301, are based on the California Air Resources Board's (CARB's) Off-Road Model (2007). The off-road emission estimate methodology and model details can be found at http://www.arb.ca.gov/ei/areasrc/arbomobilsrcoffrdequip.htm. In the model, construction and mining equipment emissions are tracked together. Emissions were derived from equipment population data, travel activity, and fuel usage. The annual growth rate of construction equipment is derived based on construction employment data obtained from the Regional Economic Models, Inc. (REMI 2001) between the years 1970 and 2000. A 1.96% increase per year is used in the Off-Road Model starting in year 2001. Pre-2001 growth is from the 1994 Cal State Fullerton's "Study to Develop Projected Activity for Non-Road Mobile Categories in California, 1970-2020". Staff estimates that twenty percent (20%) of the combined emissions are likely from mining equipment and the remaining eighty percent (80%) are from construction equipment, based on the CARB 2005 off-road diesel equipment survey. Construction emissions associated with government funded public roads and transportation projects are proposed to be excluded from the PR2301. Based on the data from the Construction Industry Research Board, 14.6% of total construction costs are allocated to government funded public roads and transportation projects. Therefore, AQMD staff assumes that the same proportion applies in which 14.6% of total construction emissions were associated with government funded public roads and transportation projects, resulting in approximately 85% of construction emissions inventory attributable to PR2301.

Asphalt Paving

Asphalt paving emissions data are also developed by CARB. CARB's emissions estimate methodology can be found at http://www.arb.ca.gov/ei/areasrc/distsolevapasphpav.htm. The growth surrogate used for asphalt paving is construction employment. Similar to the discussion for the construction equipment, government funded public roads and transportation project emissions associated with this category are also exempt from PR2301. In order to

address this exclusion, all road oil used in asphalt paving is assumed to be for government funded public roads and transportation related projects. Based on the inventory data, 43% of the total asphalt paving VOC emissions is from road oil. Therefore, it is assumed that the remaining 57% of asphalt paving emissions is attributable to PR2301.

Fuel Combustion

Fuel combustion emissions for the purpose of this rule consist of service & commercial, and residential sectors. The industrial sector is excluded from the PR2301 inventory, because the industrial equipment is mostly permitted by the District and is subject to Best Available Control Technology (BACT) and other New Source Review (NSR) requirements, including offsets. Service and commercial combustion includes space heating and water heating. Residential combustion fuel types include cooking, space heating, and water heating using mostly natural gas with limited liquid petroleum gas (L.P.G.) and distillate oil. The base year emissions inventory (2002) reflected energy efficiency standards as of 2002. Because of the growth surrogates used for these two categories (i.e., housing units and service sector output), it is assumed that 100% of emission growth is attributable to PR2301.

On-Road Mobile Sources

On-Road mobile source emissions rely on CARB's EMFAC 2007 model. The EMFAC 2007 methodology and model detail can be found at http://www.arb.ca.gov/msei/onroad/latest_version.htm. The on-road mobile source emissions attributable to the proposed rule include emissions from worker commute trips during a project's construction and operation phases, daily trips from the new residents or tenants, delivery truck trips, etc. To address potential VMT increase not associated with new development such as population increase in the absence of new development, induced growth from transportation projects committed in the California Transportation Improvement Program, AQMD staff assumes that only 50% of VMT growth in the light- and medium-duty vehicle categories is attributable to PR2301. Furthermore, with respect to heavy-duty trucks, some trucks pass through the region for destinations outside the region. These pass-through trips have very little correlation to the growth in the region. Therefore, pass-through trips are excluded from PR2301. The South Coast Air Basin (SCAB) transportation demand data is generated by SCAG. According to SCAG, twenty percent (20%) of heavy-duty trips in the basin are pass-through trips. Consequently, only 40% (50% x 80%) of emission growth in the heavy-duty truck categories is assigned to the PR2301 inventory.

Re-Entrained Paved Road Dust

Re-entrained paved road dust PM2.5 emissions are estimated by CARB. The emission estimate methodology can be found at http://www.arb.ca.gov/ei/areasrc/arbmiscprocpaverddst.htm. The growth surrogate of re-entrained paved road dust is road miles. Consistent with the assumption for the on-road mobile source, 50% of the road mile growth is attributable to PR2301. As a result, only 50% of emission growth from the entrained paved road dust category is associated with PR2301.

Construction and Demolition Dust

Construction and demolition dust emissions are estimated by CARB. The growth surrogate for this category is construction employment. Based on the AQMP inventory data, four percent (4%) of the total construction and demolition PM2.5 emissions are from road construction. Therefore, the remaining 96% of the growth in construction and demolition emissions are

attributable to PR2301. The emission estimate methodology can be found at http://www.arb.ca.gov/ei/areasrc/arbmiscprocresconstdem.htm.

Transport Refrigeration Units

Transport refrigeration unit (TRU) emissions are from CARB's Off-Road model. The emission estimate methodology and model detail can be found at http://www.arb.ca.gov/ei/areasrc/arbomobilsrcoffrdequip.htm. In CARB's Off-Road Model, the growth surrogate of transport refrigeration units is employment. Employment growth projections are from the 1994 Cal State Fullerton's "Study to Develop Projected Activity for Non-Road Mobile Categories in California, 1970-2020". In the future, CARB intends to use more current employment data for improved emission factors. The growth in TRUs can be associated with both regional growth and national growth. Since the SCAB is a major hub for the import and export of goods, it is reasonable to assume that a portion of growth in TRUs is due to growth outside of the air basin. Consistent with the assumptions used for heavy duty trucks, it is also assumed that an overall 40% of emission growth from this source category is assigned to PR2301.

Consumer Product

CARB estimates the emissions from consumer products. This source category includes emissions for the residential, industrial and institutional usages. The emission estimate methodology can be found at http://www.arb.ca.gov/ei/areasrc/arbsolevapaercoatcp.htm. The growth surrogate for this source category is population. Staff believes that the new development or redevelopment projects correlate more with the increase in housing units than with population. However, further review of growth factors for housing units vs. population indicates that SCAG projects housing unit growth at a rate similar to population if not higher. Therefore, one hundred percent (100%) of the emission growth from the consumer product category is applicable to PR2301.

Architectural Coatings

CARB estimates emissions from architectural coatings. The growth surrogate for architectural coatings is housing units. The emission estimate methodology for this source category can be found at http://www.arb.ca.gov/ei/areasrc/arbsolevaparccoat.htm. One hundred percent (100%) of the emission growth in these coatings are assumed to be attributable to the proposed rule.

Lawn and Garden Equipment (Landscape Equipment)

Lawn and garden equipment emissions are from CARB's Off-Road model. The emission estimate methodology can be found at http://www.arb.ca.gov/ei/areasrc/arbomobilsrcoffrdequip.htm. In CARB's Off-Road model, housing unit projections from Cal State Fullerton's "Study to Develop Projected Activity for Non-Road Mobile Categories in California, 1970-2020" is used to project lawn and garden equipment growth. CARB intends to revise the growth with more current data for future improvement. 1994 One hundred percent (100%) of the emission growth from these is assumed to be subject to PR 2301.

Table 3 summarizes the baseline emission growth attributable to PR2301 between 2010 and 2014 (as 2014), and 2010 and 2023 (as 2023) respectively. The results show that 15.2 tons per

day and 28.3 tons per day of VOC are attributable to this rule for 2014 and 2023 respectively; 49.6 tons per day and 29.8 tons per day of NOx are attributable to this rule for 2014 and 2023 respectively; 7.3 tons per day and 8.8 tons per day of PM2.5 are attributable to this rule for 2014 and 2023 respectively. Emission reductions beyond what is assumed in the 2007 AQMP are potentially SIP creditable toward SIP obligations (e.g., local ordinances, state energy efficiency standards after 2002).

TABLE 3 – PR2301 BASELINE EMISSIONS (T/D)

Source Category	Contribution to PR2301 (%)		2014[1]			2023[2]	
		VOC	NOx	PM2.5	VOC	NOx	PM2.5
Service and Commercial Combustion	100	0.0	0.1	0.0	0.0	0.2	0.0
Residential Fuel Combustion	100	0.1	0.8	0.1	0.2	1.9	0.3
Consumer Products	100	3.8	0.0	0.0	10.8	0.0	0.0
Architectural Coatings	100	1.0	0.0	0.0	3.3	0.0	0.0
Asphalt Paving	57	0.1	0.0	0.0	0.2	0.0	0.0
Construction & Demolition	96	0.0	0.0	5.4	0.0	0.0	6.5
Construction Equipment	85	6.5	43.0	1.3	4.1	15.9	0.5
Re-Entrained Paved Road Dust	50	0.0	0.0	0.2	0.0	0.0	0.6
Lawn & Garden Equipment	100	1.5	0.2	0.0	4.7	0.8	0.1
TRU Transport Refrigeration Units	40	0.1	0.6	0.0	0.3	1.7	0.0
Light Duty Automobiles and Trucks	50	1.2	1.2	0.2	2.6	1.9	0.5
Medium Duty Trucks	50	0.6	0.7	0.1	1.1	0.9	0.2
Heavy Duty Trucks	40	0.5	3.0	0.1	1.0	6.5	0.2
Total[3]		15.2	49.6	7.3	28.3	29.8	8.8

[1]Growth emissions between 2010 and 2014
[2]Growth emissions between 2010 and 2023
[3]Totals may vary slightly due to rounding

IV. Emission Reduction Target – 2007 AQMP Commitment

Air quality emissions resulting from new residential, commercial, and industrial development as well as operation activities must be mitigated in order to help facilitate the South Coast Region's attainment of federal air quality standards. Based on the 2007 AQMP emission inventory of growth related source categories (listed in Table 3), it is estimated that the total growth emissions from new development will result, by 2023, in 29.8 t/d of NOx, 28.3 t/d of VOC, and 8.8 t/d of PM2.5.

The 2007 AQMP's emission reduction target of 0.8 t/d of NOx, 0.6 t/d of VOC, and 0.5 t/d of PM 2.5 from new development, by 2023, was established in consideration of: 1) all control measures included in the AQMP and the emissions reductions associated with their implementation; 2) emissions growth projected to occur in this region beyond the next decade; and 3) conservative assumptions of practical mitigation measures that developers could implement to reduce air quality emissions resulting from new or redevelopment projects. These SIP commitment targets represent a small fraction of the total net growth emissions, during years 2010 to 2023, from new development (Table 4).

TABLE 4- PR2301 Inventory and AQMP Commitment (2023)

	NOx (t/d) (range)	VOC (t/d) (range)	PM2.5 (t/d) (range)
Emissions Inventory	29.8	28.3	8.8
SIP Commitment	0.8	0.5	0.5

In summary, the inventory methodology described in this paper outlines the emission growth projections and the emission apportionment, by emission source category, attributable to PR2301.