APPENDIX A
Emissions Inventory

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A Emissions Inventory

The 2017, 2023, 2026, 2029, and 2032 emissions inventories are presented in various format and details in this appendix.

A.1 Emissions Inventory Spreadsheets

A.1.1 Estimated Emissions Forecast Summary

Appendix A-1-1 is a spreadsheet, which is available in a separate file. The spreadsheet included estimated Volatile Organic Compound (VOC) and Nitrogen Oxides (NO_X) forecast by common sources categories (i.e., Stationary, Area, and Mobile) and by detailed Emission Inventory Code (EIC) categories for Sacramento Federal Ozone Nonattainment Area (SFNA) in California Emission Projection Analysis Model (CEPAM): External Adjustment Reporting Tool – 2019 Sacramento SIP Ozone Nonattainment Ver 1.04.

Spreadsheet Name: App A-1-1.xlsx

Worksheet Tab Name	Worksheet Description
README	Table of Contents and the screen capture of the CEPAM downloading time
NOX	Nitrogen Oxides Emissions Inventory Summary from CEPAM 2019 V.1.04
VOC	Volatile Organic Compounds Emissions Inventory Summary from CEPAM 2019 Version 1.04
NOX ems details	Detailed NO_X emission forecast summary by EIC for SFNA in CEPAM 2019 V1.04
VOC ems details	Detailed VOC emission forecast summary by EIC for SFNA in CEPAM 2019 V1.04

A.2 CARB SFNA 70 ppb 8-Hour Ozone NAAQS Emissions Inventory Write-Up CEPAM2019 v1.04 (July 2022)

A.2.1 Emissions Inventory Background

Emissions inventories are required by the Clean Air Act (CAA) and the Ozone SIP Requirements Rule for the 2015 ozone National Ambient Air Quality Standards (NAAQS), also called the Ozone Implementation Rule.[1] Specifically, they are required for those areas that exceed the health-based NAAQS. These areas are designated as nonattainment based on monitored exceedances of these standards. These nonattainment areas must develop an emissions inventory as the basis of a State Implementation Plan (SIP) that demonstrates how they will attain the standards by specified dates. This document describes the emissions inventory included in the SFNA 70 ppb Ozone SIP.

A.2.2 Emissions Inventory Overview

Emissions inventories are estimates of the amount and type of pollutants emitted into the atmosphere by facilities, mobile sources, and areawide sources. They are fundamental components of an air quality plan and serve critical functions such as:

1. the primary input to air quality modeling used in attainment demonstrations;
2. the emissions data used for developing control strategies; and
3. a means to track progress in meeting the emission reduction commitments.

The California Air Resources Board (CARB) and in conjunction with five local air districts (Districts) – the Sacramento Metropolitan Air Quality Management District (AQMD), El Dorado County AQMD, Feather River AQMD, Placer County Air Pollution Control District, and Yolo-Solano AQMD – have developed a comprehensive current emissions inventory consistent with the requirements set forth in Section 182(a)-(f) of the federal Clean Air Act[2]. CARB and district staff conducted a thorough review of the inventory to ensure that the emission estimates reflect accurate emissions reports for point sources and that estimates for mobile and areawide sources are based on the most recent approved models and methodologies.

CARB also reviewed the growth profiles for point and areawide source categories and updated them as necessary to ensure that the emission projections are based on data that reflect historical trends, current conditions, and recent economic and demographic forecasts.

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[1] Implementation of the 2015 National Ambient Air Quality Standards for Ozone: State Implementation Plan Requirements; (40 CFR part 51 Subpart CC; see also https://www.ecfr.gov/current/title-40/chapter-I/subchapter-C/part-51#subpart-CC).

[2] Section 182(a)-(f) of the Act. *https://www.govinfo.gov/content/pkg/USCODE-2013-title42/html/USCODE-2013-title42-chap85-subchapI-partD-subpart2-sec7511a.htm*

The United States Environmental Protection Agency (EPA) regulations require that the emissions inventory for an Ozone SIP contain emissions data for the two precursors to ozone formation: NOx and VOC[3]. The inventory included in this plan substitutes VOC with reactive organic gases (ROG), which, in general, represent a slightly broader group of compounds than those in EPA's list of VOCs.

A.2.2.1 Inventory Base Year

40 CFR 51.1315(a) requires that the inventory year be selected consistent with the baseline year for the reasonable further progress (RFP) plan as required by 40 CFR 51.1310(b)[4], which states that the base year emissions inventory shall be the emissions inventory for the most recent calendar year of which a complete triennial inventory is required to be submitted to EPA under the provisions of subpart A of 40 CFR part 51, Air Emissions Reporting Requirements, 40 CFR 51.1– 50. States may also use an alternative baseline emissions inventory provided that the year selected corresponds with the year of the effective date of designation as nonattainment for that NAAQS[5].

CARB selected the base year 2017 because it is the most recent triennial inventory year conducted for the National Emissions Inventory (NEI) pursuant to the Air Emissions Reporting Requirements (AERR) rule.

A.2.2.2 Forecasted Inventories

In addition to base year emissions, emissions projections are needed for a variety of reasons, including redesignation maintenance plans, the attainment projected inventory for a nonattainment area (NAA), and air quality modeling for attainment plans[6].

For stationary and area sources, forecasted inventories are a projection of the base year inventory that reflects expected growth trends for each source category and emissions reductions due to adopted control measures. CARB develops emission forecasts by applying growth and control profiles to the base year inventory. The stationary and area source emissions inventory for the SFNA 70 ppb Ozone SIP is modeled by the California CEPAM External Adjustment Reporting Tool, 2019 Emission Projections, Version 1.04.

Growth profiles for point and areawide sources are derived from surrogates, such as economic activity, fuel usage, population, and housing units, that best reflect the expected growth trends for each specific source category. Growth projections were obtained primarily from government entities with expertise in developing forecasts for specific

[3] Section 182(a)(1) of the Act. https://www.govinfo.gov/content/pkg/USCODE-2013-title42/html/USCODE-2013-title42-chap85-subchapI-partD-subpart2-sec7511a.htm

[4] 40 CFR 51.1315(a). https://www.govinfo.gov/content/pkg/CFR-2021-title40-vol2/pdf/CFR-2021-title40-vol2-sec51-1315.pdf.

[5] 40 CFR 51.1310(b). https://www.govinfo.gov/content/pkg/CFR-2020-title40-vol2/pdf/CFR-2020-title40-vol2-sec51-1310.pdf.

[6] 40 CFR 51.114. https://www.govinfo.gov/content/pkg/CFR-2000-title40-vol2/pdf/CFR-2000-title40-vol2-sec51-114.pdf.

sectors, or, in some cases, from econometric models. Control profiles, which account for emission reductions resulting from adopted rules and regulations, are derived from data provided by the regulatory agencies responsible for the affected emission categories.

Projections for on-road mobile source emissions are generated by CARB's EMFAC2017 model, which predicts activity rates and vehicle fleet turnover by vehicle model year, along with activity inputs from the metropolitan planning organization (MPO). Off-road mobile sources are forecasted with category-specific model or, where not available, CARB's OFFROAD2007. CEPAM integrates the emission projections derived from these mobile source models to develop a comprehensive forecasted emission inventory. As with stationary sources, the mobile source models include control algorithms that account for adopted regulatory actions.

A.2.2.3 Temporal Resolution

40 CFR 51.1315(c) requires emissions values included in the base year inventory to be actual ozone season day emissions as defined by 40 CFR 51.1300(q)[7]. Since ozone concentrations tend to be highest during the summer months, the emissions inventory used in the SIP is based on the summer season (May through October).

A.2.2.4 Geographic Scope

The SFNA is comprised of the Sacramento Metropolitan AQMD and the Yolo-Solano AQMD, El Dorado and Placer Counties except the portion within the Lake Tahoe Air Basin, and the Southern portion of Sutter County. Since the Southern portion of Sutter County is split into a region not defined by county, air basin, or district boundaries, the air districts identified the facilities that fall in the sub-area; for on-road sources, a special EMFAC2017 run was executed based on MPO activity specific to this sub-region, and the area and off-road source emissions in South Sutter County were estimated using category-specific factors based on the spatial distribution of population and other activity parameters within the sub-region—these fractions were developed by the air districts. The special split allocation method of each subcategory within South Sutter County is shown in Table A-1 below.

[7] 40 CFR 51.1315(c). https://www.govinfo.gov/content/pkg/CFR-2021-title40-vol2/pdf/CFR-2021-title40-vol2-sec51-1315.pdf.

Table A-1 Allocation Method for South Sutter County Sub-Area

EICSUM	SOURCE CATEGORY	ALLOCATION METHOD
30	OIL AND GAS PRODUCTION (COMBUSTION)	OIL AND GAS ACTIVITY
50	MANUFACTURING AND INDUSTRIAL	HUMAN POPULATION
52	FOOD AND AGRICULTURAL PROCESSING	AG LAND RATIO
60	SERVICE AND COMMERCIAL	HUMAN POPULATION
99	OTHER (FUEL COMBUSTION)	HUMAN POPULATION
220	DEGREASING	HUMAN POPULATION
230	COATINGS AND RELATED PROCESS SOLVENTS	HUMAN POPULATION
250	ADHESIVES AND SEALANTS	HUMAN POPULATION
299	OTHER (CLEANING AND SURFACE COATINGS)	HUMAN POPULATION
310	OIL AND GAS PRODUCTION	OIL AND GAS ACTIVITY
330	PETROLEUM MARKETING	HUMAN POPULATION
420	FOOD AND AGRICULTURE	AG LAND RATIO
510	CONSUMER PRODUCTS	HUMAN POPULATION
520	ARCHITECTURAL COATINGS AND RELATED PROCESS SOLVENTS	HUMAN POPULATION
530	PESTICIDES/FERTILIZERS	AG LAND RATIO
540	ASPHALT PAVING / ROOFING	HUMAN POPULATION
610	RESIDENTIAL FUEL COMBUSTION	HUMAN POPULATION
620	FARMING OPERATIONS	AG LAND RATIO
660	FIRES	AG LAND RATIO
670	WASTE BURNING AND DISPOSAL	AG LAND RATIO
710	LIGHT DUTY PASSENGER (LDA)	EMFAC2017 run specific to South Sutter
722	LIGHT DUTY TRUCKS - 1 (LDT1)	EMFAC2017 run specific to South Sutter
723	LIGHT DUTY TRUCKS - 2 (LDT2)	EMFAC2017 run specific to South Sutter
724	MEDIUM DUTY TRUCKS (MDV)	EMFAC2017 run specific to South Sutter
732	LIGHT HEAVY DUTY GAS TRUCKS - 1 (LHDV1)	EMFAC2017 run specific to South Sutter
733	LIGHT HEAVY DUTY GAS TRUCKS - 2 (LHDV2)	EMFAC2017 run specific to South Sutter

EICSUM	SOURCE CATEGORY	ALLOCATION METHOD
734	MEDIUM HEAVY DUTY GAS TRUCKS (MHDV)	EMFAC2017 run specific to South Sutter
742	LIGHT HEAVY DUTY DIESEL TRUCKS - 1 (LHDV1)	EMFAC2017 run specific to South Sutter
743	LIGHT HEAVY DUTY DIESEL TRUCKS - 2 (LHDV2)	EMFAC2017 run specific to South Sutter
744	MEDIUM HEAVY DUTY DIESEL TRUCKS (MHDV)	EMFAC2017 run specific to South Sutter
746	HEAVY HEAVY DUTY DIESEL TRUCKS (HHDV)	EMFAC2017 run specific to South Sutter
750	MOTORCYCLES (MCY)	EMFAC2017 run specific to South Sutter
772	SCHOOL BUSES - DIESEL (SBD)	EMFAC2017 run specific to South Sutter
778	OTHER BUSES - MOTOR COACH - DIESEL (OBC)	EMFAC2017 run specific to South Sutter
780	MOTOR HOMES (MH)	EMFAC2017 run specific to South Sutter
810	AIRCRAFT	AG LAND RATIO (EMPHASIS: CROP DUSTING)
820	TRAINS	TRACK MILES
840	RECREATIONAL BOATS	PHYSICAL LAND MASS RATIO
850	OFF-ROAD RECREATIONAL VEHICLES	PHYSICAL LAND MASS RATIO
860	OFF-ROAD EQUIPMENT	HUMAN POPULATION
870	FARM EQUIPMENT	AG LAND RATIO
890	FUEL STORAGE AND HANDLING	HUMAN POPULATION

A.2.2.5 Quality Assurance and Quality Control

CARB has established a quality assurance and quality control (QA/QC) process to ensure the integrity and accuracy of the emission inventories used in the development of air quality plans. QA/QC occurs at the various stages of SIP emission inventory development. Base year emissions are assembled and maintained in the California Emission Inventory Development and Reporting System (CEIDARS). CARB inventory staff works with air districts, which are responsible for developing and reporting point source emission estimates, to verify these data are accurate. The locations of point sources, including stacks, are checked to ensure they are valid. Area-wide source emissions estimates are developed by both CARB and air district staff, and the methodologies are reviewed by both agencies before their inclusion in the emissions

inventory. Mobile categories are verified with CARB mobile source staff for consistency with the on-road and off-road emission models. Additionally, CEIDARS is designed with automatic system checks to prevent errors, such as double counting of emission sources. At the final stage, CEPAM is thoroughly reviewed to validate the accuracy of growth and control application, and the output emissions are compared against prior approved versions of CEPAM to identify data anomalies.

A.2.3 Emission Inventory Components

A summary of the components that make up SFNA's 70 ppb Ozone SIP emissions inventory is presented in the following sections. These include mobile (on- and off-road) sources, stationary point sources, and areawide sources. Natural sources are not included.

A.2.3.1 Mobile Source Emissions

CARB develops the emission inventory for the mobile sources using various modeling methods. These models account for the effects of various adopted regulations, technology types, fleet turnover, and seasonal conditions on emissions. Mobile sources in the emission inventory are composed of both on-road and off-road sources, described in the sections below.

A.2.3.1.1 On-Road Mobile Source Emissions

Emissions from on-road mobile sources, which include passenger vehicles, buses, and trucks, were estimated using outputs from CARB's EMFAC2017 model. The on-road emissions were calculated by applying EMFAC2017 emission factors to the transportation activity data provided by the local MPO.

EMFAC2017 includes data on California's car and truck fleets and travel activity. Light-duty motor vehicle fleet age, vehicle type, and vehicle population were updated based on 2016 Department of Motor Vehicles (DMV) data. The model also reflects the emissions benefits of CARB's recent rulemakings such as the Pavley Standards and Advanced Clean Cars Program and includes the emissions benefits of CARB's Truck and Bus Rule and previously adopted rules for other on-road diesel fleets.

EMFAC2017 utilizes a socio-econometric regression modeling approach to forecast new vehicle sales and to estimate future fleet mix. Light-duty passenger vehicle population includes 2016 DMV registration data along with updates to mileage accrual using Smog Check data. Updates to heavy-duty trucks include model year specific emission factors based on new test data, and population estimates using DMV data for in-state trucks and International Registration Plan (IRP) data for out-of-state trucks.

Additional information and documentation on the EMFAC2017 model is available at:

https://ww2.arb.ca.gov/our-work/programs/mobile-source-emissions-inventory/msei-road-documentation

A.2.3.1.1.1 EMFAC2017 SAFE Vehicles Rules Off-Model Adjustment Removal

On September 27, 2019, EPA and National Highway Traffic Safety Administration (NHTSA) published the "Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule Part One: One National Program" (SAFE-1).[8] SAFE-1 revoked California's authority to set its own greenhouse gas emissions standards and set zero-emission vehicle mandates in California. On April 28, 2021, EPA reconsidered the 2019 SAFE-1 by finding that the actions taken as a part of SAFE-1 were decided in error and are now entirely rescinded[9].

Therefore, any previously applied off-model adjustments as a result of SAFE-1 were removed from this inventory, resulting in a minor reduction in emissions.

A.2.3.1.1.2 EMFAC2017 ACT Off-Model Adjustment

The Advanced Clean Trucks (ACT) regulation was approved on June 25, 2020, and has two main components, a manufacturers zero-emission vehicle (ZEV) sales requirement and a one-time reporting requirement for large entities and fleets. The first component requires manufacturers to sell ZEVs as a percentage of annual truck and bus sales in California for vehicle model years 2024 and newer.

The ACT regulation impacts some of the underlying assumptions in CARB's EMFAC2017 model, which was used to assess emissions from on-road mobile sources. Therefore, CARB developed off-model adjustment factors in order to reflect the regulation. Adjustment factors were based on calculations in *EMFAC2021*, which models a percentage of California-certified ZEV sales for each EMFAC category and model year. More information on inventory modelling methods can be found in the ACT Initial Statement of Reasons (ISOR) *Appendix F*[10]. These adjustment factors were calculated based on emission estimates using *EMFAC2021* under two scenarios: (1) controlled scenario -estimated emissions with adopted regulations (EMFAC2021 default) and (2) uncontrolled scenario - estimated emissions without accounting for the benefits of adopted regulations, including ACT and other regulations Heavy-Duty Omnibus, Opacity, and ICT (described below). These adjustments, provided in the form of multipliers, were applied to emissions outputs from the EMFAC2017 model by the CEPAM external adjustment module to account for the impact of the ACT regulation. The ACT off-model adjustment factors were only applied to the medium-and heavy-duty truck sectors.

Additional information on ACT is available at:

https://ww2.arb.ca.gov/our-work/programs/advanced-clean-trucks

Additional information on EMFAC2021 technical details is available at:

8 84 FR 51310. *https://www.govinfo.gov/content/pkg/FR-2019-09-27/pdf/2019-20672.pdf*.
9 87 FR 14332. *https://www.govinfo.gov/content/pkg/FR-2022-03-14/pdf/2022-05227.pdf*.
10 https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2019/act2019/appf.pdf

https://ww2.arb.ca.gov/sites/default/files/2021-08/emfac2021_technical_documentation_april2021.pdf

A.2.3.1.1.3 EMFAC2017 Heavy-Duty Omnibus Off-Model Adjustment

On August 27, 2020, CARB adopted the Heavy-Duty (HD) Omnibus regulation, which would establish NO_X engine emission standards 90 percent lower than today's technology. The Omnibus Regulation will dramatically reduce NOx emissions by comprehensively overhauling exhaust emission standards, test procedures, and other emissions-related requirements for California-certified heavy-duty engines with engine model years 2024 and newer.

The HD Omnibus regulation impacts some of the underlying assumptions in CARB's EMFAC2017 model, which was used to assess emissions from on-road mobile sources. Therefore, CARB developed off-model adjustment factors based on *EMFAC2021* (described above) in order to reflect the regulation. These adjustments, provided in the form of multipliers, were applied to emissions outputs from the EMFAC2017 model by the CEPAM external adjustment module to account for the impact of the HD Omnibus regulation. The adjustment factors reflect the impact of all components of the HD Omnibus regulation on in-use (i.e. real-world) NO_X emissions and deterioration-related emissions. More details on the inventory analysis for this regulation can be found in *Appendix D*[11] of the HD Omnibus staff report.

The HD Omnibus off-model adjustment factors were only applied to on-road heavy-duty vehicles.

Additional information on the HD Omnibus regulation is available at:

https://ww2.arb.ca.gov/our-work/programs/heavy-duty-low-nox

A.2.3.1.1.4 EMFAC2017 Innovative Clean Transit Off-Model Adjustment

The Innovative Clean Transit (ICT) regulation was adopted by CARB in 2019 and targets reductions in transit fleets by requiring transit agencies to gradually transition their buses to zero-emission technologies. ICT has helped to advance heavy-duty ZEV deployment, with buses acting as a beachhead in the heavy-duty sector. Based on the size of the transit agencies, they are categorized as small and large agencies. Starting calendar year 2023, large agencies follow the phase-in schedule to have a certain percentage of their new purchases as zero emission buses (ZEB). For the small agencies, the start calendar year will be 2025. By 2030, all the agencies need to have 100% of their new purchases as ZEB.

The ICT regulation impacts some of the underlying assumptions in CARB's EMFAC2017 model, which was used to assess emissions from on-road mobile sources. Therefore,

[11] https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2020/hdomnibuslownox/appd.pdf

CARB developed off-model adjustment factors based on EMFAC2021 (described above) in order to reflect the regulation. These adjustments, provided in the form of multipliers, were applied to emissions outputs from the EMFAC2017 model by the CEPAM external adjustment module to account for the impact of ICT. More details on the inventory analysis for this regulation can be found in *Appendix L*[12] of the ICT staff report. The ICT off-model adjustment factors were only applied to the urban buses (UBUS) category.

Additional information on the ICT regulation is available at:

https://ww2.arb.ca.gov/our-work/programs/innovative-clean-transit/ict-regulation

A.2.3.1.1.5 EMFAC2017 Heavy-Duty Inspection and Maintenance Off-Model Adjustment

On Dec. 9th, 2021, CARB adopted Heavy-Duty Inspection and Maintenance (HD I/M) program, which controls emissions effectively from non-gasoline on-road heavy-duty vehicles with a gross vehicle weight rating (GVWR) greater than 14,000 pounds. Starting from calendar year 2023, the program drastically reduces NO_X and $PM_{2.5}$ emissions by enforcing periodic testing and inspections for heavy-duty trucks operating in California.

The Heavy-Duty Inspection and Maintenance (HD I/M) regulation impacts some of the underlying assumptions in CARB's EMFAC2017 model, which was used to assess emissions from on-road mobile sources. Therefore, CARB developed off-model adjustment factors based on off-model analysis with EMFAC2021 in order to reflect the regulation. More information on this analysis is provided in *Appendix D*[13] of the HD I/M staff report. Since this regulation was adopted after the release of EMFAC2021, these adjustment factors were calculated based on emission estimates under two scenarios: (1) EMFAC2021 with HD I/M analysis incorporated and (2) EMFAC2021 default, which does not include HD I/M. These adjustments, provided in the form of multipliers, were applied to emissions outputs from the EMFAC2017 model by the CEPAM external adjustment module to account for the impact of HD I/M. These off-model adjustment factors were applied to all diesel heavy-duty diesel categories.

A.2.3.1.2 Off-Road Mobile Source Emissions

Emissions from off-road sources are estimated using a suite of category-specific models or, where a new model was not available, the OFFROAD2007 model. Many of the newer models were developed to support recent regulations, including in-use off-road equipment, ocean-going vessels, and others. The sections below summarize the updates made by CARB to specific off-road categories.

12 https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2018/ict2018/appl.pdf
13 https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2021/hdim2021/appd.pdf

A.2.3.1.2.1 Recreational Marine Vessels

Pleasure craft or recreational marine vessel (RMV) is a broad category of marine vessel that includes gasoline-powered spark-ignition marine watercraft (SIMW) and diesel-powered marine watercraft. It includes outboards, sterndrives, personal watercraft, jet boats, and sailboats with auxiliary engines. This emissions inventory was last updated in 2014 to support the evaporative control measures. The population, activity, and emission factors were revised using new surveys, DMV registration information, and emissions testing.

Staff used economic data from a 2014 UCLA Economic Forecast to estimate the near-term annual sales of RMV (2014 to 2019). To forecast long-term annual sales (2020 and later), staff used an estimate of California's annual population growth as a surrogate.

Additional information is available at:

https://ww2.arb.ca.gov/our-work/programs/mobile-source-emissions-inventory/road-documentation/msei-documentation-offroad

A.2.3.1.2.2 Recreational Vehicles

Off-highway recreational vehicles include off-highway motorcycles (OHMC), all-terrain vehicles (ATV), off-road sport vehicles, off-road utility vehicles, sand cars, golf carts, and snowmobiles. A new model was developed in 2018 to update emissions from recreational vehicles. Input factors such as population, activity, and emission factors were re-assessed using new surveys, DMV registration information, and emissions testing. OHMC population growth is determined from two factors: incoming population as estimated by future annual sales and the scrapped vehicle population as estimated by the survival rate.

Additional information is available at:

https://ww2.arb.ca.gov/our-work/programs/mobile-source-emissions-inventory/road-documentation/msei-documentation-offroad

A.2.3.1.2.3 Fuel Storage and Handling

Emissions from portable fuel containers (gas cans) were estimated based on past surveys and CARB in-house testing. This inventory uses a composite growth rate that depends on occupied household (or business units), percent of households (or businesses) with gas cans, and average number of gas cans per household (or business) units.

Additional information is available at:

https://ww2.arb.ca.gov/our-work/programs/mobile-source-emissions-inventory/road-documentation/msei-documentation-offroad

A.2.3.1.2.4 Small Off-Road Engines (SORE)

SORE are spark-ignition engines rated at or below 19 kilowatts (i.e., 25 horsepower). Typical engines in this category are used in lawn and garden equipment as well as other outdoor power equipment and cover a broad range of equipment. The majority of this equipment belongs to the Lawn & Garden (e.g., lawnmower, leaf blower, trimmer) and Light Commercial (e.g., compressor, pressure washer, generator) categories of CARB's SORE emissions inventory model.

The newly developed, stand-alone SORE2020 Model reflects the recovering California economy from the 2008 economic recession and incorporates emission results from CARB's recent in-house testing as well as CARB's most recent Certification Database. CARB also has conducted an extensive survey of SORE operating within California through the Social Science Research Center (SSRC) at the California State University, Fullerton (CSUF). Data collected through this survey provides the most up-to-date information regarding the population and activity of SORE equipment in California. The final SORE emissions included the adopted SORE rule in December 2021 as well as the 15-day changes after the Board hearing which allowed the pressure washers (greater than 5 hp) extra time for meeting the regulation. The SORE annual sales were forecasted using historic growth of the number of California households (DOF[14] household forecasts, 2000 – 2008 and 2009 - 2018).

Additional information on SORE baseline emissions (without the adopted rule and 15-day changes) is available at:

https://ww2.arb.ca.gov/sites/default/files/2020-09/SORE2020_Technical_Documentation_2020_09_09_Final_Cleaned_ADA.pdf

A.2.3.1.2.5 Ocean Going Vessels

Ocean going vessels (OGVs) were updated in 2021 based on Automatic Identification System (AIS) (transponder) data. This data, along with vessel information supplied by South Coast AQMD and IHS Fairplay provides vessel visit counts, speed, engine size, and other vessel characteristics. The inventory adopts EPA's methodology for emissions based on vessel speed, engine model year and horsepower. The inventory includes transit, maneuvering, anchorage, and at-berth emissions, updating the 2019 at-berth-only inventory. The comprehensive national model Freight Analysis Framework (FAF) was used to develop growth rates for forecasting.

Additional information on CARB's general OGV update is available at: *https://ww2.arb.ca.gov/sites/default/files/2022-03/CARB_2021_OGV_Documentation_ADA.pdf*

[14] California Department of Finance

A.2.3.1.2.6 Commercial Harbor Craft

Commercial Harbor Crafts (CHC) are grouped into 18 vessel types: articulated tug barge (ATB), bunker barge, towed petrochemical barge, other barge, dredge, commercial passenger fishing, commercial fishing, crew and supply, catamaran ferry, monohull ferry, short run ferry, excursion, ATB tug, push and tow tug, escort/ship assist tug, pilot boat, research boat, and work boat.

The CHC inventory was updated in 2021 and includes vessels used around harbors such as tug and tow boats, fishing vessels, research vessels, barges, and similar. The inventory was updated based on CARB's reporting data for these vessels, as well as inventories from the Ports of Los Angeles and Long Beach and Oakland and Richmond. This supplied vessel characteristics, and the population was scaled up to match U.S. Coast Guard data on the annual number of vessels in California waters. Activity and load factors were based on a mix of reporting data and port-specific inventories. Emission factors were based on certification data for harbor craft engines. Population and activity growth factors were estimated based on historical trends in the past decade.

Additional information on this methodology is available at:

https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2021/chc2021/apph.pdf

A.2.3.1.2.7 Locomotives

All locomotive inventories were updated in 2020 and include linehaul (large national companies), switchers (used in railyards), passenger, and Class 3 locomotives (smaller regional companies). Data for each sector was supplied by rail operations, including Union Pacific and Burlington Northern, and Santa Fe Railway (BNSF) for linehaul and switcher operations. Data for other categories was supplied by the locomotive owners. Emission factors for all categories were based on EPA emission factors for locomotives. The inventory reflects the 2005 memorandum of understanding (MOU) with Union Pacific and BNSF. Growth rates were primarily developed from the FAF.

More information is available at:

https://ww2.arb.ca.gov/our-work/programs/mobile-source-emissions-inventory/road-documentation/msei-documentation-road

A.2.3.1.2.8 Diesel Agricultural Equipment

The agricultural equipment inventory covers all off-road vehicles used on farms or first processing facilities (of all fuel types). It was updated in 2021 using a 2019 survey of California farmers and rental facilities, and the 2017 U.S. Department of Agriculture (USDA) agricultural census. Emission factors are based on the 2017 off-road diesel emission factor update. The inventory reflects incentive programs for agricultural equipment that were implemented earlier than August 2019. Agricultural growth rates

were developed using historical data from the County Agricultural Commissioners' reports.

Additional information is available at:

https://ww2.arb.ca.gov/sites/default/files/2021-08/AG2021_Technical_Documentation_0.pdf

A.2.3.1.2.9 In-Use Off-Road Equipment

This category covers off-road diesel vehicles over 25 horsepower in construction, mining, industrial, and oiling drilling categories. The inventory was updated in 2022 based on the DOORS registration program. Activity was updated based on a 2021 survey of registered equipment owners, and emission factors were based on the 2017 off-road diesel emission factor update. The inventory reflects the In-Use Off-Road Equipment Regulations, as amended in 2011.

The updated methodology is currently in the process of being posted online. When it is completed, the methodology will be available at:

https://ww2.arb.ca.gov/our-work/programs/mobile-source-emissions-inventory/road-documentation/msei-documentation-road

A.2.3.1.2.10 Cargo Handling Equipment

The Cargo Handling Equipment (CHE) inventory covers equipment (of all fuels) used at California ports and intermodal railyards, such as cranes, forklifts, container handling equipment, and more. The inventory population and activity were updated in 2021 based on the port inventories for the Ports of Los Angeles and Long Beach and Richmond, and the CARB reporting data for other ports and railyards, which had a more comprehensive inventory than available through reporting. Load factors were based on the previous inventory in 2007, and emission factors were based on the 2017 off-road diesel emission factor update. The inventory reflects the CHE Airborne Toxic Control Measures (ATCM), adopted in 2005 and completed in 2017.

The updated methodology is currently in the process of being posted online. When it is completed, the methodology will be available at:

https://ww2.arb.ca.gov/our-work/programs/mobile-source-emissions-inventory/road-documentation/msei-documentation-road

A.2.3.1.2.11 Transportation Refrigeration Units - Diesel

The Transportation Refrigeration Units (TRU) inventory was updated in 2020 based on the TRU reporting program at CARB. The activity was developed based on 2010 surveys of facilities served by TRUs and 2017 to 2019 telematics data purchased from TRU manufacturers. Emission factors were developed specifically for TRUs based on TRU engine certification data reported to EPA as of 2018. The inventory reflects the TRU

ATCM and 2021 amendments. The forecasting was based on IBISWorld reports forecast for related industries, and turnover forecasting was based on the past 20 years equipment population trends.

Additional information is available at:

https://ww2.arb.ca.gov/sites/default/files/barcu/board/rulemaking/tru2021/apph.pdf

A.2.3.1.2.12 Portable Equipment

Portable equipment inventory includes non-mobile diesel, such as generators, pumps, air compressors, chippers, and other miscellaneous equipment over 50 horsepower. This inventory was developed in 2017 based on CARB's registration program, 2017 survey of registered owners for activity and fuel, and the 2017 off-road diesel emission factor update. The inventory also reflects the Portable ATCM and 2017 amendments.

Because registration in the Portable Engine Registration Program (PERP) is voluntary, the PERP registration data was used as the basis for equipment population, with an adjustment factor used to represent the remaining portable equipment in the state. Estimates of future emissions beyond the base year were made by adjusting base year estimates for population growth, activity growth, and the purchases of new equipment (i.e. natural and accelerated turnover).

Additional information is available at:

https://ww3.arb.ca.gov/msei/ordiesel/perp2017report.pdf

A.2.3.1.2.13 Large Spark Ignition/Forklifts

The large spark ignition (LSI) inventory includes gasoline and propane forklifts, sweeper/scrubbers, and tow tractors. The inventory was updated in 2020 based on the LSI/forklift registration in the DOORS reporting system at CARB, and the sales data was provided by the Industrial Truck Association (ITA). Activity was based on a survey of equipment owners in the DOORS system, and emission factors were based on EPA's latest guidance for gasoline and propane engines. The inventory reflects the LSI regulation requirements and 2016 amendments.

The updated methodology is currently in the process of being posted online. When it is completed, the methodology will be available at:

https://ww2.arb.ca.gov/our-work/programs/mobile-source-emissions-inventory/road-documentation/msei-documentation-road

A.2.3.1.2.14 Forestry Equipment

The new 2021 forestry diesel equipment emissions inventory was developed to replace the previous emissions inventory for diesel forestry equipment based on OFFROAD2007. This inventory includes equipment used in forestry and in milling. This includes foresting operations, such as feller/bunchers and dragline operations, equipment used to build

roads to reach forested areas, and forklifts or loaders used in milling operations. The inventory was based on a 2019 survey of forestry operations and mills (for calendar year 2017), as well as the 2019 California Department of Tax and Fee Administration data on the annual timber harvest, with emission factors from the 2017 off-road diesel emission factor update. This sector does not include any emission reduction measures or strategies. The model projects forestry equipment population and emissions in future years by predicting the retirement and purchasing habits of forestry equipment. The model attempts to predict a business-as-usual (BAU) behavior based on the 2017 survey data.

Additional information is available at:

https://ww2.arb.ca.gov/sites/default/files/2021-10/2021_Forestry_Inventory_Technical_Document_FINAL_09302021.pdf

A.2.4 Stationary Point Sources

The stationary source inventory is composed of point sources and area-wide sources. The data elements in the inventory are consistent with the data elements required by the AERR. The inventory reflects actual emissions from industrial point sources reported to the air districts by the facility operators through calendar year 2017.

Stationary point sources also include smaller point sources, such as gasoline dispensing facilities and laundering, that are not inventoried individually, but are estimated as a group and reported as a single source category. Emissions from these sources are estimated using various models and methodologies. Estimation methods include source testing, direct measurement by continuous emissions monitoring systems, or engineering calculations. Emissions for these categories are estimated by both CARB and the air districts.

Estimates for the categories below were developed by CARB and have been reviewed by CARB staff to reflect the most up-to-date information.

A.2.4.1.1.1 Stationary Nonagricultural Diesel Engines

This category includes emissions from backup and prime generators and pumps, air compressors, and other miscellaneous stationary diesel engines that are widely used throughout the industrial, service, institutional, and commercial sectors. The emission estimates, including emission forecasts, are based on a 2003 CARB methodology derived from the OFFROAD2007 model.

Additional information on this methodology is available at:

https://ww3.arb.ca.gov/ei/areasrc/arbfuelcombother.htm

A.2.4.1.1.2 Agricultural Diesel Irrigation Pumps

This category includes emissions from the operation of diesel-fueled stationary and mobile agricultural irrigation pumps. The emission estimates are based on a 2003 CARB methodology using statewide population and include replacements due to the Carl Moyer Program. Emissions are grown based on projected acreage for irrigated farmland from the California Department of Conservation's Farmland Mapping and Monitoring Program (FMMP), 2008.

Additional information on this category is available at: *https://ww3.arb.ca.gov/ei/areasrc/fullpdf/full1-1.pdf*

A.2.4.1.1.3 Laundering

This category includes emissions from perchloroethylene (perc) dry cleaning establishments. The emission estimates are based on a 2002 CARB methodology that used nationwide perc consumption rates allocated to the county level based on population and an emission factor of 10.125 pounds per gallon used. Emissions were grown based on the DOF population forecasts, 2020.

Additional information on this methodology is available at: *https://ww3.arb.ca.gov/ei/areasrc/arbcleanlaund.htm*

A.2.4.1.1.4 Degreasing

This category includes emissions from solvents in degreasing operations in the manufacturing and maintenance industries. The emissions estimates are based on a 2000 CARB methodology using survey and industry data, activity factors, emission factors and a user's fraction. Emissions were grown based on CARB/REMI[15] industry-specific economic output, version 2.4.5.

Additional information on this methodology is available at: *https://ww3.arb.ca.gov/ei/areasrc/arbcleandegreas.htm*

A.2.4.1.1.5 Coatings and Thinners

This category includes emissions from coatings and related process solvents. Auto refinishing emissions estimates are based on a CARB methodology using production data and a composite emission factor derived from a 2002 survey. These estimates were grown based on CARB's on-road mobile sources model (EMFAC2017). Estimates for industrial coatings emissions are based on a 1990 CARB methodology using production and survey data, and emission factors derived from surveys. Estimates for thinning and cleaning solvents are based on a 1991 CARB methodology, census data and a default

[15] Regional Economic Models, Inc

emission factor developed by CARB. These estimates were grown based on REMI county economic forecasts, version 2.4.5.

Additional information on these methodologies is available at: *https://ww3.arb.ca.gov/ei/areasrc/arbcleancoatreproc.htm*

A.2.4.1.1.6 Adhesives and Sealants

This category includes emissions from solvent-based and water-based solvents contained in adhesives and sealants. Emissions are estimated based on a 1990 CARB methodology using production data and default emission factors. Estimates were grown based on REMI county economic forecasts, version 2.4.5.

Additional information on this methodology is available at: *https://ww2.arb.ca.gov/carb-cleaning-and-surface-coating-methodologies-adhesives-and-sealants*

A.2.4.1.1.7 Gasoline Dispensing Facilities (GDFs)

This category uses the 2015 CARB methodology to estimate emissions from fuel transfer and storage operations at GDFs. The methodology addresses emissions from underground storage tanks, vapor displacement during vehicle refueling, customer spillage, and hose permeation. The updated methodology uses emission factors developed by CARB staff that reflect more current in-use test data and also accounts for the emission reduction benefits of onboard refueling vapor recovery (ORVR) systems. The emission estimates are based on 2012 statewide gasoline sales data from the California Board of Equalization that were apportioned to the county level using fuel consumption estimates from EMFAC 2014. Emissions were grown based on EMFAC2017.

Additional information on this category is available at:

https://ww2.arb.ca.gov/arb-petroleum-production-and-marketing-methodologies-petroleum-marketing

A.2.4.1.1.8 Gasoline Cargo Tank

This category uses the 2002 CARB methodology to estimate emissions from gasoline cargo tanks. These emissions do not include the emissions from loading and unloading of gasoline cargo tank product; they are included in the gasoline terminal inventory and gasoline service station inventory. Pressure-related fugitive emissions are volatile organic vapors leaking from three points: fittings, valves, and other connecting points in the vapor collection system on a cargo tank. 1997 total gasoline sales were obtained from the California Department of Transportation. The emission factors are derived from the data in the report, "Emissions from Gasoline Cargo Tanks, First Edition," published by the Air and Waste Management Association in 2002.

The initial emission estimates for 1997 were grown to 2012 using a growth parameter developed by Pechan based on gasoline and oil expenditures data. Emissions were grown according to fuel consumption from CARB's EMFAC 2017 mobile sources emission factors model.

Additional information on this methodology is available at:

https://ww2.arb.ca.gov/arb-petroleum-production-and-marketing-methodologies-petroleum-marketing

A.2.4.1.1.9 Oil and Gas Production

The oil and natural gas production inventory is estimated by the 2015 CARB methodology. This category is related to fugitive emissions from production-related fuel consumption, fugitive losses (sumps, pits, pumps, compressors, well heads, separators, valves, and fittings), vapor recovery and flares, tank and truck working and breathing losses, wastewater treatment, tertiary production, and wet and dry gas stripping. Emissions were calculated using EPA's Oil and Natural Gas Tool v1.4 with default emissions factors from ENVIRON Int'l Corp's 2012 report, "2011 Oil and Gas Emission Inventory Enhancement Project for CenSARA[16] States," and activity data taken from California's Division of Oil, Gas, and Geothermal Resources (DOGGR) (which was renamed to Geologic Energy Management Division (CalGEM) in 2020). CARB also incorporated data from the 2007 Oil and Gas Industry Survey (e.g., typical component counts) and feedback from individual air districts (e.g., minimum controls required to operate in a certain district, with associated control factors) to improve these parameters and further adjust the tool's output. Emissions were grown to 2017 based on CalGEM historical statewide production. Growth in future years an assumed 2.9% annual decline, which reflects the statewide CalGEM trend from 2000 through 2016.

Additional information on this methodology is available at:

https://ww2.arb.ca.gov/resources/documents/oil-and-gas-industry-survey

https://ww3.arb.ca.gov/ei/areasrc/oilandgaseifinalreport.pdf

A.2.4.1.1.10 Wine Fermentation and Aging

This category includes emissions from the fermentation and aging of wine. Wine fermentation volumes in California are reported by the U.S. Alcohol and Tobacco Tax and Trade Bureau. CARB staff derived the emission factors from a computer model developed by Williams and Boulton. Emissions were initially estimated for 2002 and grown to later years using beverage manufacturing (Alcoholic & Non-Alcoholic) economic output.

An emission factor for brandy was derived by Hugh Cook of the Wine Institute. Emissions were initially estimated for 1992 then grown to 2012 using economic output for food

[16] Central States Air Resource Agencies

manufacturing. Emissions were grown from 2012 to 2017 using beverage manufacturing economic output per REMI. Growth for future years is based on REMI forecast version 2.4.5.

Additional information on this methodology is available at: *http://www.arb.ca.gov/ei/areasrc/arbindprofandag.htm*

A.2.5 Area-Wide Sources

Area-wide sources include categories where emissions take place over a wide geographic area, such as consumer products. Emissions from these sources are estimated using various models and methodologies. Estimation methods include source testing, direct measurement by continuous emissions monitoring systems, or engineering calculations. Emissions for these categories are estimated by both CARB and the air districts.

Estimates for the categories below were developed by CARB and had been reviewed by CARB staff to reflect the most up-to-date information:

A.2.5.1.1.1 Consumer Products and Aerosol Coatings

The Consumer Product emission estimates utilized sales and formulation data from the CARB's mandatory survey of all consumer products sold in California for calendar years 2013 through 2015 (2015 Consumer Product Survey). The aerosol coatings estimates utilized sales and formulation data from a survey conducted by CARB in 2010. Based on the survey data, CARB staff determined the total product sales and total VOC emissions for the various product categories. Growth for personal care products is based on real disposable personal income projections per REMI version 2.4.5. No growth is assumed for aerosol coatings. Growth for all other consumer products is based on DOF population projections, 2020.

Additional information on CARB's consumer products surveys is available at:

https://ww2.arb.ca.gov/our-work/programs/consumer-products-program/consumer-commercial-product-surveys

A.2.5.1.1.2 Architectural Coatings

Architectural coatings are coatings applied to stationary structures and their accessories. They include house paints, stains, industrial maintenance coatings, traffic coatings, and many other products. Industrial maintenance coatings are high performance architectural coatings formulated for application to substrates, including floors, exposed to extreme environmental conditions (e.g., immersion in water, chronic exposure to corrosive agents, frequent exposure to temperatures above 121°C, repeated heavy abrasion). The architectural coatings category reflects emission estimates based on a 2014 comprehensive CARB survey for the 2013 calendar year. The emission estimates include

benefits of the 2007 CARB Suggested Control Measures. These emissions are grown based on DOF households forecast, 2020.

Additional information about CARB's architectural coatings program is available at:

https://ww2.arb.ca.gov/carb-solvent-evaporation-methodologies-architectural-coatings-and-cleaningthinning-solvents

A.2.5.1.1.3 Pesticides

The California Department of Pesticide Regulation (DPR) develops month-specific emission estimates for agricultural and structural pesticides. Each calendar year, DPR updates the inventory based on the Pesticides Use Report, which provides updated information from 1990 through the 2018 calendar year. Agricultural pesticide emission forecasts for 2019 and beyond are based on the average of the most recent five years. Growth for agricultural pesticides is based on CARB projections of farmland acres per FMMP, 2016. Growth for structural pesticides is based on DOF households growth projections, 2020.

Additional information about CARB's pesticides program is available at:

https://ww2.arb.ca.gov/carb-solvent-evaporation-methodologies-agricultural-and-non-agricultural-pesticides

A.2.5.1.1.4 Residential Wood Combustion

Residential Wood Combustion estimates are based on the 2011 CARB methodology. It reflects survey data on types of wood burning devices and wood consumption rates, updates to the 2002 EPA NEI emission factors, and improved calculation approaches.

CARB assumes no growth for this category based on the relatively stagnant residential wood fuel use over the past decade (according to the American Community Survey and US Energy Information Administration).

Additional information on this methodology is available at:

https://ww2.arb.ca.gov/carb-miscellaneous-process-methodologies-residential-fuel-combustion

A.2.5.1.1.5 Residential Natural Gas Combustion

CARB staff updated the methodology to reflect 2017 fuel use from the California Energy Consumption Database. Residential natural gas consumption by county was obtained from the 2019 California Energy Commission (CEC) California Energy Consumption Database. the heat content of natural gas to reflect 2017 values per the U.S. Energy Information Administration (EIA) State Energy Consumption, Price, and Expenditure Estimates. The emissions estimates reflect the most recent emissions factors from EPA's AP-42 for residential natural gas combustion. Growth is based on CEC projections for natural gas consumption, 2019.

Additional information on this methodology is available at:

https://ww2.arb.ca.gov/carb-miscellaneous-process-methodologies-residential-fuel-combustion

A.2.5.1.1.6 Residential Distillate Oil and Liquefied Petroleum Gas

The residential distillate oil/liquefied petroleum gas (LPG) category includes emissions occurring in the residential sector. Distillate oil for heating is generally used in older homes and remote areas where natural gas lines are not available.

Activity is based on the number of housing units, population, and LPG and distillate oil capacities. The 1991 Fuels Report Working Paper published by the CEC was used to determine energy demand by fuel type in terms of the number of houses heated by a specific fuel in a particular area. Heating degree days (HDD) are used to estimate how many heating days are likely to occur in a particular area.

This category uses emission factors from EPA's AP-42. The emissions were initially calculated in 1993 then grown to 2012 using housing unit data from the DOF, 2013. Emissions were grown from 2012 to 2017 using a 'no growth' profile developed by Pechan (2012). Emissions post-2017 were grown based on EIA – SEDS[17], and no growth was assumed.

Additional information on this methodology is available at:

https://ww2.arb.ca.gov/carb-miscellaneous-process-methodologies-residential-fuel-combustion

A.2.5.1.1.7 Farming Operations

CARB staff updated the non-cattle Livestock Husbandry methodology to reflect livestock population data based on the USDA's 2017 Census of Agriculture. Cattle emissions are primarily based on the 2012 Census of Agriculture. A seasonal adjustment was added to account for the suppression of dust emissions in months in which rainfall occurs. Growth profiles are based on CARB's projections of Census of Agriculture's historical livestock population trends, 2012. No growth is assumed for dairy and feedlots.

Additional information on CARB's methodology is available at:

https://ww2.arb.ca.gov/carb-miscellaneous-process-methodologies-farming-operations

A.2.5.1.1.8 Fires

Emissions from structural and automobile fires were estimated based on a 1999 CARB methodology using the number of fires and the associated emission factors. Estimates for structural fires are calculated using the amount of the structure that is burned, the amount and content of the material burned, and emission factors derived from test data.

[17] State Energy Data System

Estimates for automobile fires are calculated using the weight of the car and components and composite emission factors derived from AP-42 emission factors. Structural fire growth is based on DOF households forecasts, 2020, and automobile fire growth is based on DOF population forecasts, 2020.

Additional information on this methodology is available at:

https://ww2.arb.ca.gov/carb-miscellaneous-process-methodologies-fires

A.2.5.1.1.9 Managed Burning & Disposal – Forest Management

Forest Management Managed Burning and Disposal category provides emission estimates from prescribed burning performed in natural vegetation types such as forests and woodlands.

Burn project perimeters and ignition dates are provided by the 2019 California Department of Forestry and Fire Protection (FRAP) geodatabase. Forest management prescribed burning emissions are estimated using the First Order Fire Effects Model (FOFEM 6.0) and a custom geoprocessing tool (Emission Estimation System, EES) developed for CARB by researchers at UC Berkeley. Future year estimates are based on a 10-year average, held flat in the forecast.

Additional information on this methodology is available at: *https://ww2.arb.ca.gov/district-miscellaneous-process-methodologies-managed-burning-and-disposal*

A.2.5.1.1.10 Managed Burning & Disposal – Agricultural Burning

The Agricultural Burning Managed Burning and Disposal category includes the open burning of agricultural residues (such as crop stubble and orchard pruning), weed abatement (such as ditch and canal bank burning), and other materials. CARB updated the emissions inventory to reflect burn data reported by air district staff for 2017. Emissions are calculated using crop specific emission factors and fuel loadings. Temporal profiles reflect monthly burn activity. Growth for agricultural burning is based on CARB projections of FMMP farmland acres, 2016. No growth is assumed for burning associated with weed abatement.

Additional information on this methodology is available at:

https://ww2.arb.ca.gov/district-miscellaneous-process-methodologies-managed-burning-and-disposal

A.2.6 Point and Area-Wide Source Emissions Forecasting

Emission forecasts (2018 and subsequent years) are based on growth profiles that in many cases incorporate historical trends up to the base year or beyond. The growth surrogates used to forecast the emissions from these categories are presented below in Table A-2. The emissions inventory also reflects emission reductions from point and

areawide sources subject to District rules and CARB regulations. The rules and regulations reflected in the inventory are listed below in Table A-3.

Table A-2 Growth Surrogates for Point and Areawide Sources

Source Category	Subcategory	Growth Surrogate
Electric Utilities	Natural Gas	CEC Integrated Energy Policy Report forecast, 2019
	Other Fuels	EIA Annual Energy Outlook, 2019
Cogeneration	All	CEC forecast, 2019
Oil and Gas Production (Combustion)	All	DOGGR statewide total oil production. Assumed 2.9% annual decline reflecting CalGEM historical trend, 2000 through 2016
Petroleum Refining (Combustion)	All	No growth assumption
Manufacturing and Industrial	Natural Gas	CEC forecast, 2019
	Other Fuels	EIA forecast, 2018
Food and Agricultural Processing	Ag Irrigation I. C. Engines	FMMP irrigated farmland acreage, 2008
	Natural Gas	CEC forecast, 2019
	Others	REMI economic forecast, version 2.4.5; EIA forecast, 2018
Service and Commercial	Natural Gas	CEC forecast, 2019
	Other Fuels	EIA forecast, 2018
Other (Fuel Combustion)	Diesel	Modeled estimate, 2003
	Other Fuels	EIA forecast, 2018
Waste Disposal	All	DOF population forecast, 2020
Laundering	Dry Cleaning	DOF population forecast, 2020
Degreasing	All	CARB/REMI economic forecast, version 2.4.5
Coatings & Thinners	Auto Refinishing	Vehicles from CARB EMFAC2017 model
	Others	REMI economic forecast, version 2.4.5
Printing	All	REMI economic forecast, version 2.4.5
Adhesives & Sealants	All	REMI economic forecast, version 2.4.5
Oil and Gas Production	All	Assumed 2.9% annual decline reflecting CalGEM historical trend, 2000 through 2016
Petroleum Refining	All	No growth assumption
Petroleum Marketing	Natural Gas Transmission	CEC forecast, 2019
	Gas Dispensing Facilities and Cargo Tanks	Fuel use from CARB EMFAC2017 model
	Other Point Sources	REMI economic forecast, version 2.4.5
Chemical	All	REMI economic forecast, version 2.4.5
Mineral Processes	All	REMI version 2.4.5; EIA forecast, 2018
Metal Processes	All	REMI economic forecast, version 2.4.5
Other Industrial Processes	All	REMI economic forecast, version 2.4.5
Consumer Products	Personal Care Products	Real Disposable Personal Income per REMI, version 2.4.5

Source Category	Subcategory	Growth Surrogate
	Other Consumer Products	DOF population forecast, 2020
	Aerosol Coatings	No growth
Architectural Coatings & Related Process Solvents	All	DOF households forecast, 2020
Pesticides & Fertilizers	Agricultural Pesticides	CARB projection of farmland acres per FMMP, 2016
	Structural Pesticides	DOF households forecast, 2020
Asphalt Paving & Roofing	All	DOF construction jobs forecast, 2020; CARB projection
Residential Fuel Combustion	Natural Gas	CEC forecast, 2019
	Other Fuels	EIA – SEDS – No growth
Farming Operations	Dairy / Feedlots	No growth
	Other Livestock	CARB projection of livestock population per Census of Agriculture, 2012
Fires	Structural	DOF households forecast, 2020
	Automobile	DOF population forecast, 2020
Managed Burning and Disposal	Forest Management	10-year average, held flat
	Agricultural Burning, Weed Abatement	FMMP farmland acreage projection, 2016
	Non-Agricultural Open Burning	Rural counties: DOF population forecast, 2020. Urban counties: no growth.
Cooking	All	DOF population forecast, 2020

Table A-3 District and CARB Control Rules and Regulations Included in the Inventory

Agency	Rule/Reg No.	Rule Title	Source Categories Impacted
EDCAQMD	225&235	Solvent Cleaning and Degreasing Operations, Surface Cleaning	Degreasing; coating and related processes; surface cleaning
EDCAQMD	229	Boilers, Steam Generators and Process Heaters	Fuel combustion - boilers, process heaters and steam generators
EDCAQMD	230	Automotive Refinishing Operations	Coatings and related process solvents - auto refinishing
EDCAQMD	231	Graphic Arts Operations	Printing
EDCAQMD	236	Adhesives	Adhesives and sealants
EDCAQMD	237	Wood Products Coatings	Coatings and related process solvents - wood furniture and fabricated products
EDCAQMD	238	Gasoline Transfer and Dispensing	Petroleum marketing - fuel dispensing tanks
EDCAQMD	239	Residential Water Heaters	Residential fuel combustion - water heating

Agency	Rule/Reg No.	Rule Title	Source Categories Impacted
EDCAQMD	240	Polyester Resin Operations	Fiberglass and fiberglass products manufacturing
FRAQMD	3-17	Wood Heating Devices	Residential fuel combustion - wood stoves and fireplaces
PCAPCD	216&240	Organic Solvent & Surface Cleaning and Degreasing	Organic solvent & surface cleaning and degreasing
PCAPCD	223	Metal Can Coating	Prining, petroleum marketing
PCAPCD	231	Boilers, Steam Generators and Process Heaters	Fuel combustion - boilers, process heaters and steam generators
PCAPCD	233	Biomass Boilers	Wood/bark boilers
PCAPCD	234	Automotive Refinishing Operations	Coatings and related process solvents - auto refinishing
PCAPCD	235	Adhesives	Adhesives and sealants
PCAPCD	236&238	Wood Products Coatings & Factory Coating of Flat Wood Paneling	Coatings and related process solvents - wood furniture and fabricated products
PCAPCD	237	Municipal Landfills	Landfills - waste disposal
PCAPCD	239	Graphic Arts Operations	Printing
PCAPCD	245	Metal Parts and Products Coating Operations	Coatings and related process solvents
PCAPCD	246	Natural Gas-Fired Water Heaters	Residential fuel combustion - water heating
SMAQMD	411	Boilers, Process Heaters, and Steam Generators	Fuel combustion - boilers, process heaters and steam generators
SMAQMD	412	Stationary Internal Combustion Engines	Stationary internal combustion engines
SMAQMD	413	Stationary Gas Turbines	Internal combustion turbines
SMAQMD	414/414A	Natural Gas-Fired Water Heaters	Residential fuel combustion - water heating
SMAQMD	417	Wood Burning Appliances	Residential wood combustion - wood stoves and fireplaces
SMAQMD	419	NOx from Miscellaneous Combustion Units	Miscellaneous combustion such as incineration and asphaltic concrete production
SMAQMD	421	Mandatory Episodic Curtailment of Wood and Other Solid Fuel Burning	Residential wood combustion

Agency	Rule/Reg No.	Rule Title	Source Categories Impacted
SMAQMD	442	Architectural Coatings	Thinning solvents
SMAQMD	443	Leaks From Synthetic Organic Chemical and Polymer Operations	Oil and gas production; chemical
SMAQMD	448	Gasoline Transfer Into Stationary Storage Containers	Petroleum marketing - fuel dispensing tanks
SMAQMD	450	Graphic Arts Operations	Printing
SMAQMD	451	Surface Coating of Miscellaneous Metal Parts & Products Coatings	Coatings and related process solvents - metal parts and products
SMAQMD	456	Aerospace Coating Operations	Coatings and related process solvents - aircraft and aerospace
SMAQMD	458	Large Commercial Bread Bakeries	Bakeries
SMAQMD	459	Auto, Truck & Heavy Equipment Refinishing Operations	Coatings and related process solvents - auto refinishing
SMAQMD	460	Adhesives & Sealants	Adhesives and sealants
SMAQMD	463	Wood Products Coatings	Coatings and related process solvents - wood furniture and fabricated products
SMAQMD	464	Organic Chemical Manufacturing Operations	Chemical manufacturing
SMAQMD	465	Polyester Resin Operations	Fiberglass and fiberglass products manufacturing
SMAQMD	466N454	Solvent Cleaning and Degreasing Operations	Degreasing; coating and related processes; printing
SMAQMD	485	Municipal Landfill Gas	Landfills - waste disposal
SMAQMD	496	Large Confined Animal Facilities	Livestock operations
SMAQMD	RWC_CHANGE	Wood Stove and Fireplace Changeout Incentive Program	Residential wood combustion
YSAQMD	2.21	Organic Liquid Storage and Transfer	Petroleum marketing - organic liquid storage and transfer
YSAQMD	2.22	Gasoline Dispensing Facilities	Petroleum marketing - fuel dispensing tanks
YSAQMD	2.23	Fugitive Hydrocarbon Emissions	Oil and gas production - fugitive losses
YSAQMD	2.25	Metal Parts and Products Coating Operations	Coating and related process solvents

Agency	Rule/Reg No.	Rule Title	Source Categories Impacted
YSAQMD	2.26	Motor Vehicle and Mobile Equipment Coating Operation	Coating and related process solvents
YSAQMD	2.27	Boilers, Steam Generators and Process Heaters	Fuel combustion - boilers, process heaters and steam generators
YSAQMD	2.29	Graphic Arts Printing Operations	Printing
YSAQMD	2.3	Polyester Resin Operations	Fiberglass and fiberglass products manufacturing
YSAQMD	2.31	Solvent Cleaning and Degreasing Operations, Surface Cleaning	Degreasing; coating and related processes; surface cleaning
YSAQMD	2.33	Adhesives Operations	Adhesives and sealants
YSAQMD	2.37	Natural Gas-Fired Water Heaters	Residential fuel combustion - water heating
YSAQMD	2.38	Municipal Landfills	Landfills - waste disposal
YSAQMD	2.39	Wood Products Coating Operations	Coatings and related process solvents - wood furniture and fabricated products
YSAQMD	2.44	Central Furnaces	Residential fuel combustion - space heating
CARB	ARCH_SCM	Architectural Coatings 2000 Suggested Control Measures (SCM)	Architectural coatings
CARB	AC_SCM2007	Architectural Coatings 2007 SCM	Architectural coatings
CARB	ARB_R003 & ARB_R003_A	Consumer Product Regulations & Amendments	Consumer products
CARB	ARB_R007	Aerosol Coating Regulations	Aerosol coatings
CARB	GDF_HOSREG	Gasoline Dispensing Facility Hose Emission Regulation	Petroleum marketing
CARB	ORVR	Fueling Emissions from ORVR Vehicles	Petroleum marketing
CARB	AG_IC_ENG	Ag IC Engine Emission Scalers	Agricultural irrigation internal combustion engines
CARB	NONAGICENG	Non-Ag IC Engine Scalers	Non-agricultural internal combustion reciprocating engines

A.2.7 External Adjustments

External adjustments were made in CEPAM to account for military growth and other unaccounted regulatory factors. The external adjustments reflected in the CEPAM2019v1.04 SFNA SIP inventory are listed below in Table A-4.

Table A-4 External Adjustment IDs and Descriptions

Adjustment ID	Adjustment Description
HD_I/M	HD I/M Regulation adopted by CARB Dec 2021
NonAg_ICE	Update non-ag internal comb. engines to reflect 2003 ATCM and 2010 rule amend
TRUCK_REGS	Advanced clean trucks Omnibus Low NOx_Opacity ICT_UBUS adjustments