

2022 Annual Report to the Governor and
Legislature on the California Air Resources
Board's Expenditure of Fees of Nonvehicular
Sources, Consumer Products, and Architectural
Coatings for Fiscal Year 2021-2022

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Introduction

The California Clean Air Act, Assembly Bill (AB) 2595 (Sher, Chapter 1568, Statutes of 1988), requires attainment of State ambient air quality standards by the earliest practicable date (Health and Safety Code Section 41503.5). As part of that mandate, the California Air Resources Board (CARB or the Board) and the local air quality management and air pollution control districts (air districts) are directed to reduce air pollution from motor vehicles, industrial facilities, and other sources of emissions. CARB has primary responsibility for control of air pollution from vehicular sources and consumer products, while air districts generally have primary responsibility for control of nonvehicular sources of pollution, such as stationary sources (Health and Safety Code Section 39002).

One type of pollution subject to ambient air quality standards is volatile organic compounds (VOCs), which contribute to the formation of ground-level ozone and are precursors to the formation of fine particulate matter (PM), both of which can result in adverse health impacts. The California Clean Air Act requires CARB to adopt regulations to achieve the "maximum feasible reduction in VOCs emitted by consumer products" (Health and Safety Code Section 41712(b)) and authorizes CARB to recommend "control measures" to air districts to achieve feasible reductions in VOC emissions related to architectural paints or coatings (Health and Safety Code Section 40916(d)(1)).

Health and Safety Code Sections 39612 and 39613 further authorize CARB to assess fees on stationary sources and manufacturers of consumer products and architectural coatings (collectively, "nonvehicular sources") in order to recover the costs of CARB programs related to these sources¹. These fees are collectively described by the name of the legislation that established them, AB 10X (Oropeza, Chapter 1, Statutes of 2003), as "AB 10X fees". The facilities subject to the nonvehicular fees are those that emit 250 tons or more annually of any nonattainment pollutant or precursor, as provided in Health and Safety Code Section 39612(d). The fees for consumer products and architectural coatings apply to manufacturers with total California sales that result in 250 tons per year or more of VOC emissions in the State (Health and Safety Code Section 39613). Section 39612(g) of the Health and Safety Code also requires CARB to report to the Governor and the Legislature annually on the expenditure of the fees collected, which is the topic of this report.

¹ Health and Safety Code Section 39612 authorizes CARB to impose permit fees on nonvehicular sources, which "shall be expended only for the purposes of recovering costs of additional state programs related to nonvehicular sources." Health and Safety Code Section 39613 requires CARB to impose a fee for consumer products and architectural coatings sold in California, which "shall be used to mitigate or reduce air pollution in the state created by consumer products and architectural coatings, as determined by the state board, and shall be expended solely for those programs."

For Fiscal Year (FY) 2021-2022, CARB staff collected \$23.7 million in consumer product, architectural coating, and stationary source fees to partially fund program expenditures. This report provides information on program activities that were funded by FY 2021-2022 fees authorized by Health and Safety Code Sections 39612 and 39613.

History of the Fee Program

As originally enacted in 1988, Health and Safety Code Section 39612 authorized CARB to assess fees on nonvehicular sources that were allowed by air district permits to emit 500 tons or more per year of any air pollutant that forms ozone or particulate matter. In 1989, the Board approved the California Clean Air Act Nonvehicular Source Fee Regulation (California Code of Regulations, title 17, sec. 90800 et seq.). The original regulation included the fee rate and amounts to be remitted to CARB by the air districts for the first year of the program, FY 1989-1990. In subsequent years, the Board approved amendments to the Fee Regulation identifying the amount of fees to be collected by each air district for the following fiscal year. To streamline the process, in 1998 the Board approved amendments that established a process whereby CARB's Executive Officer assesses the fees administratively.

In 2003, the Legislature enacted AB 10X, which amended Health and Safety Code Section 39612 and added Health and Safety Code Section 39613. The changes to Health and Safety Code Section 39612, included: (1) increasing the cap on facilities fees from \$3 million to \$13 million, and allowing the fees to be adjusted annually thereafter for inflation; (2) expanding the universe of facilities subject to the fees such that the fees are to be collected from facilities authorized by air district permits to emit 250 tons (instead of the previous 500 tons) or more per year of any air pollutant that forms ozone or particulate matter; and (3) authorizing CARB to collect the fees directly from all sources subject to the fees. In addition, Health and Safety Code Section 39613 required CARB to assess fees on manufacturers of consumer products and architectural coatings sold in California, whose total California sales of consumer products or architectural coatings result in VOC emissions of 250 tons or more per year. CARB must use the fees collected pursuant to Health and Safety Code Section 39613 solely to mitigate or reduce air pollution in the State created by consumer products and architectural coatings. In July 2003, the Board approved amendments to the Nonvehicular Source Fee Regulation to collect the fees authorized by AB 10X.

In 2004, the Legislature authorized CARB to assess an additional \$2.6 million on facilities for a total of \$20 million. In November 2004, the Board approved amendments to the Fee Regulation, renamed Nonvehicular Source, Consumer Products, and Architectural Coatings Fee Regulation, to establish a procedure to collect additional \$2.6 million for FY 2004-2005 and onward from facilities. The amendments also provided for collection from facilities of any legislatively approved fees in fiscal years beyond FY 2004-2005 that are in excess of \$17.4 million. The full text version of the Nonvehicular Source Fee Regulation can be found on CARB's website at: http://www.arb.ca.gov/ei/nscpac_fees/comprehensive_fee_reg.pdf

Fiscal Year 2021-2022 Fee Collections

As mentioned in the previous section, total fees collected in a given fiscal year reflect a base fee amount of \$17.4 million collected from architectural coating and consumer product manufacturers, and stationary sources, plus a \$2.6 million supplemental fee assessed on stationary sources only, pursuant to the Nonvehicular Source, Consumer Products, and Architectural Coatings Fee Regulations (California Code of Regulations, title 17, Sections 90800.8-90806) (hereinafter "Fee Regulation").

Fees collected incorporate two additional adjustments. The first is a three percent increase of the base and supplemental fee amount to allow for recovery of unforeseen reductions in funds collected due to business closures and bankruptcies (Fee Regulation, Section 90800.8(c)(2)). Regular and supplemental fees for facilities have been increased by the consumer price index (CPI) (Fee Regulation, Section 90800.8(c)(1)). CARB staff have determined from experience that this three percent upward adjustment is needed to account for this potential collection shortfall. Secondly, a carry-over balance from the previous fiscal year typically occurs, due to business closures and bankruptcies, loss of fee payers when emissions fall below applicable thresholds, addition of newly identified fee payers, or other factors. Any excess funds collected are carried over to reduce the total fee determinations for the next fiscal year. Similarly, any amount of funds under-collected will be added to increase the total fee determinations for the next fiscal year (Fee Regulation, Section 90800.8(d)).

Fiscal Year 2021-2022 Fee Determinations

Each manufacturer of consumer products or architectural coatings with more than 250 tons per year of VOC emissions in 2019 was subject to an AB 10X fee on each ton of VOC emissions. The \$17.4 million base fee for consumer products, architectural coatings, and stationary sources, adjusted as described above, was divided by the total VOC emissions (and, for stationary sources, other nonattainment pollutant and their precursor emissions) subject to the fee to determine the dollar per ton fee rate for the fiscal year. This is an iterative process in which CARB provides each fee payer with its preliminary fee amount and calculation methodology, with an opportunity for fee payer input before the fee is finalized (as described below). The final base fee rate for FY 2021-2022 was \$216.17/ton of emissions for all fee payers. An additional supplemental fee of approximately \$146.36 per ton of emissions was assessed on stationary sources. Table 1 below identifies the total fees paid by stationary sources and consumer product and architectural coatings manufacturers in FY 2021-2022.

Table 1: Fees Collected for Fiscal Year 2021-2022

Activities	Fees Collected
Stationary Sources	\$12,621,119
Consumer Product and Architectural Coatings	\$11,046,503
Total	\$23,667,622

CARB determined each individual fee payer's FY 2021-2022 preliminary fee amount and provided an opportunity for fee payer and air district feedback. CARB's protocol for soliciting feedback and finalizing each party's FY 2021-2022 AB 10X fees, as required by Section 90800.8(c) of the Fee Regulation, is described below:

1. Preliminary Fee Determination. By May 1, 2021, CARB sent stationary source and consumer product or architectural coatings manufacturers a letter indicating their preliminary fee and fee calculation methodology pursuant to Section 90800.8(c)(6) of the Fee Regulation. Each air district that has a stationary source subject to the fee reviewed the identified facility or facilities and their emissions prior to the preliminary fee determination. After the preliminary fee is determined, air districts also receive a copy of the letter sent to their stationary source facilities indicating each of its source's preliminary fees and fee calculation methodology.
2. Stakeholder Feedback. Each letter recipient had sixty days to provide written comments to CARB. Stakeholder comments typically involve refining of estimated emissions subject to fees.
3. Final Fee Determination. By August 1, 2021, CARB provided each stationary facility and consumer product or architectural coatings manufacturer with its final fee determination letter. Each air district with a stationary facility subject to the fee also received a final fee determination letter.

Additional information and details regarding FY 2021-2022 fee payers, and emission and fee determination methodologies can be found at: <https://ww2.arb.ca.gov/our-work/programs/consumer-products-program/fee-regulation-activity> and www.arb.ca.gov/ei/nscpac_fees/nscpac_fees.htm.

Major Activities Supported by the Fees

The federal Clean Air Act (42 U.S.C. sec. 7401 et seq.), administered by the United States Environmental Protection Agency (U.S. EPA), sets national ambient air quality standards (NAAQS). To demonstrate attainment of federal air quality standards, CARB must develop, maintain and update emission inventories; evaluate air quality trends and indicators; conduct sophisticated air quality modeling; and work with air districts to develop Air Quality Management Plans and State Implementation Plans (SIPs), which commit to the achievement of emission reductions needed to demonstrate attainment. The planning effort culminates with the adoption of State and local measures.

AB 10X fees help implement requirements related to the attainment of State and federal air quality standards for pollutants emitted by fee payers. The success of these efforts is evident in the air quality progress seen across the State. Today, more than 20 million people live in communities where air quality meets current federal standards. Improved air quality provides significant health and economic benefits, including fewer premature deaths for people with preexisting heart and lung disease, reduced hospital admissions, and reduced emergency room visits. AB 10X fees also support the implementation of CARB's stationary source, consumer product, and architectural coatings programs. This report provides an overview of key CARB programs supported by AB 10X funding in FY 2021-2022.

Program Implementation

Nonvehicular Sources

California Health and Safety Code establishes local air district authority over stationary source permitting and air quality planning commitments. Air district responsibilities include regional air quality planning, air monitoring, stationary source and facility permitting, and enforcement. Districts vary by attainment status, population, population density, demographics, area, topography, meteorology, and industry. Hence, each air district establishes programs that are designed to best address unique conditions of its jurisdiction.

State law also defines CARB's important oversight role in reviewing district attainment plans, rules, regulations, and enforcement practices. CARB's role includes programmatic reviews as well as day-to-day review of individual district actions, such as permits for major sources and major modifications, issuance of emission reduction credits (ERCs), adoption of rules, and granting of variances. Below are examples of stationary source reviews undertaken by CARB's Enforcement Division staff.

RACT SIPs. The federal Clean Air Act requires implementation of Reasonably Available Control Technology (RACT) for stationary sources in all particulate matter nonattainment areas and all ozone nonattainment areas classified as Moderate or above. For particulate matter nonattainment areas, additional levels of review and control, including Best Available Control Technology and Most Stringent Measures, are required for areas classified as Serious. For ozone areas, evaluations of RACT in applicable nonattainment areas are due to U.S. EPA within 2 years after U.S. EPA finalizes designations for a given standard. For the most recent federal 8-hour ozone standard of 70 parts per billion (ppb), RACT SIPs were due to U.S. EPA on August 3, 2020. CARB worked with local air districts across the State to support and review their RACT SIP analyses of stationary sources within their nonattainment areas and jurisdictions. As a result of RACT SIP evaluations, local air districts must adopt or revise rules to strengthen controls for sources within their jurisdictions, to reduce emissions to attain federal standards and meet other SIP needs. Local air districts revise their rules through independent public processes, and then submit them to CARB for review and submittal to U.S. EPA. In FY 2021-22, districts revised, and CARB reviewed and submitted to U.S. EPA many rules to support SIP actions related to the 70 ppb and 75 ppb ozone standards, as well as multiple PM2.5 standards.

RECLAIM Unwind. CARB Enforcement Division staff worked closely with the South Coast Air Quality Management District (SCAQMD) as it transitions away from its Regional Clean Air Incentives Market (RECLAIM) program. The RECLAIM program was designed to reduce NO_x and oxides of sulfur (SO_x) emissions through a market-based program. Control Measure CMB-05 of the South Coast [2016 Final Air Quality Management Plan](#) identified an orderly sunset of the RECLAIM program as a way to maximize emissions reductions, create more regulatory certainty, and potentially reduce compliance burdens for RECLAIM facilities. The resulting transition of facilities in RECLAIM to command-and-control is a complex process with a number of policy items and rule amendments that are being addressed through an ongoing rulemaking process. RECLAIM facilities are now subject to an expedited implementation schedule to install additional Best Available Retrofit Control Technology (BARCT).

To help assure program stringency, CARB staff participated in working groups for key rules, and in particular, review of New Source Review (NSR) and ERC rules changes. Staff met with the SCAQMD and U.S. EPA prior to monthly working group meeting to review and give input on SCAQMD proposals or concepts. CARB staff also attended the working group meetings as panelists to answer questions as needed. In part, this process ensures that NSR changes will comply with SB 288, the anti-backsliding program that CARB administers. CARB staff also worked closely with the SCAQMD in support of the rule development processes for various prohibitory rules.

San Joaquin Valley Air Pollution Control District Permitting. In January 2019, CARB staff were directed by the Board to conduct a review of the San Joaquin Valley Air Pollution Control District (SJVAPCD) ERC program. The goal of this project was to review the SJVAPCD ERC system, including the equivalency determination, and explain it in the context of the broader District program for reducing emissions from stationary sources including NSR, permitting, and regulatory requirements.

CARB staff worked extensively with the SJVAPCD to conduct the review. To ensure the review was an open, public process, CARB staff held three workshops from mid-2019 to mid-2020. By June 2020, CARB staff had shared findings of its review with SJVAPCD management and discussed their need to update programs. In response to these overarching findings, the SJVAPCD committed to take specific steps, beginning immediately.

In 2021 and 2022 enforcement staff continued to work cooperatively with the District on the implementation of various ERC program improvements. This work included attending and participating in public meetings and workshops related to the district's ERC equivalency program and working directly with the district and U.S. EPA to provide feedback on changes to the equivalency demonstration and report. Enforcement staff will continue to evaluate and support District efforts to ensure their programs are enforceable and achieve their intended goals.

Issues identified in CARB's report are substantial and complex, potentially impacting many stakeholders in the San Joaquin Valley including residents of the Valley, industries that rely on offsets and ERCs in order to expand or build new business, environmental organizations who advocate for cleaner air, and community groups representing those living near stationary and mobile sources who are impacted the most by emissions at the local level.

San Diego Program Review. AB 423 (Gloria, Chapter 744, Statutes of 2019) requires CARB to perform a review of the San Diego Air Pollution Control District (SDAPCD). The goal of CARB's District program review is to meet the requirements of AB 423 by evaluating key District programs (permitting, regulatory, compliance, planning, monitoring, and incentives), and identifying potential program improvements. To accomplish this goal, CARB staff are assessing SDAPCD rules, policies, and practices; documenting findings; and preparing recommendations to increase SDAPCD effectiveness. As required by AB 423, the review is focused on, but not limited to, calendar years 2013-2018.

One of the major components of the review required travel to the SDAPCD to perform facility inspections, and review physical files, both of which were significantly impacted by the COVID-19 pandemic. Therefore, CARB staff were not able to perform a complete and comprehensive review by the original legislative deadline of June 2021. Instead, CARB staff prepared an interim report with a status of the review and an updated review schedule. While this interim report provides an update on the status of the ongoing review, the final report will provide CARB staff's complete analysis, results, findings, and recommendations for improvement. CARB staff's multi-disciplinary review includes evaluations of specific data and actions related to approximately 50 facilities. CARB staff carefully selected the facilities to gain an understanding of how the SDAPCD implements various key programs over a variety of facilities.

The Vapor Recovery Program. This program controls vapor emissions from gasoline marketing operations (gasoline dispensing facilities or service stations, bulk plants, and terminals), where gasoline vapor is a precursor to the formation of ozone and contains benzene, a constituent of gasoline vapor that has been identified as a toxic air contaminant.

Consumer Products

Chemically formulated consumer products such as personal care products, household care products, and automotive care products are a significant source of VOC emissions and have been regulated as a source of VOC in numerous rulemakings since 1989. Consumer products are one of the largest source categories of VOC emissions in the South Coast and statewide². The magnitude of emissions from this sector indicates that additional approaches to reduce emissions from this sector remain important.

²California Air Resources Board; *Revised Proposed 2016 State Strategy for the State Implementation Plan*; March 7, 2017; <https://www.arb.ca.gov/planning/sip/2016sip/rev2016statesip.pdf>.

In FY 2021-2022, CARB staff continued implementation of flexibility provisions within consumer product regulations geared to drive development of innovative, lower-emitting consumer products³. CARB's Alternative Control Plan (ACP) Regulation for Consumer Products and Aerosol Coating Products (California Code of Regulations, title 17, Sections 94540 - 94555) provides participating manufacturers with regulatory flexibility by allowing a product with VOC content above the VOC standard to be offset by a product with emissions below the standard. There are currently four companies with active ACPs, four inactive ACPs, and one cancelled ACP for a total of nine companies who have participated in the program.

CARB's Innovative Product Exemption (IPE) provisions, on the other hand, allow for a product that exceeds the applicable VOC limit, yet results in fewer VOC emissions compared to a "representative consumer product" of the same product category (California Code of Regulations, title 17, Section 94511). Such a product may result in lower emissions than a representative product due to special features such as a more efficient application technique, a greater percentage of active ingredients, or more effective active ingredients. There are currently 52 IPEs, primarily for air freshener products. Both the ACP and IPE programs provide manufacturer flexibility, while encouraging innovation to develop products that emit significantly lower VOC than currently required.

Through 2021 Consumer Product Amendments, CARB expanded the IPE provision to include "Innovative Compressed Gas Products" and "Innovative Liquefied Propellant Products." New amendments provide manufacturers with the opportunity to market otherwise noncomplying innovative products, if they can demonstrate the special features of their product result in lower greenhouse gas (GHG) emissions than a product that complies with applicable VOC standards while at least maintaining the equivalent ozone-forming potential (OFP). This should encourage the development and marketing of aerosol products that utilize these types of propellants (which have virtually no carbon footprint).

CARB continued to respond to manufacturer requests for product determinations. Manufacturers often request an official CARB product determination for products with multiple, vague, or unclear potential uses in order to clarify how the product is defined for regulatory purposes, and the applicable VOC limit. CARB consumer product implementation, enforcement, legal, and laboratory personnel evaluate the product label, formulation, and applicable regulatory definitions in making these determinations. CARB also annually certifies dozens of charcoal lighter materials, including lighter fluids and charcoal briquettes, to ensure these products meet applicable VOC emissions per start standard pursuant to California Code of Regulations, title 17, Section 94509(h).

³ California's consumer product regulations are comprised of: California Code of Regulations, title 17, Sections 94500-94506.5, 94507-94517, 94540-94555 and 94700-94701.

The 2016 State Strategy for the SIP requires CARB to develop measures to reduce consumer product VOC emissions by 1-2 tons per day (tpd) by 2023 and 4-5 tpd by 2031, respectively, in the South Coast Air Basin, and 8-10 tpd by 2031 statewide. In Fiscal Year 2021-2022 staff conducted two additional public workshops to present the draft amendments and any refinements based on stakeholder feedback to the Consumer Products Regulation. On February 2, 2021, CARB staff posted the *Formal Rulemaking Documents for the Proposed Amendments* (https://ww2.arb.ca.gov/rulemaking/2021/consumerproducts2021?utm_medium=email&utm_source=govdelivery).

On March 25, 2021, staff presented the Board with amendments to the Consumer Products Regulation and Method 310. The proposed amendments would set or lower VOC standards for seven consumer products categories, as well as the prohibition on the use of several chlorinated toxic air contaminants (TAC) and the use of compounds with a global warming potential (GWP) of 150 or above in these categories. The proposed amendments would also sunset a longstanding exemption for fragrance ingredients (the Two Percent Fragrance Exemption) for most consumer product categories by January 1, 2031. Additionally, the Proposed Amendments will encourage the development and sale of products using compressed gas propellants, reduce excess VOC and TAC emissions from the sale of "Energized Electrical Cleaner" to automotive maintenance and repair facilities, and update other regulatory provisions to improve program transparency and effectiveness. Staff analyzed the economic impacts of the regulatory amendments on manufacturers of affected products, State and local agencies, and evaluated regulatory alternatives.

At the hearing, the Board directed staff to modify the proposed regulation based on public comments received during the formal comment period and the hearing. These modifications and supporting documents were made available for a 15-day comment period on August 19, 2021. CARB staff prepared a Final Statement of Reasons (FSOR) for the 2021 rulemaking action, explaining the changes and summarizing comments and responses. On February 16, 2022, CARB submitted the FSOR to Office of Administrative Law (OAL) for its review and approval. On May 23, 2022, CARB released a Second 15-Day Notice to announce additional proposed modifications to the regulatory language.

CARB conducted the 2018 Aerosol Coating and Aerosol Adhesive Products Survey (2018 Survey) to gather data about aerosol coating and aerosol adhesive products sold or supplied for use in California during calendar year 2018. The original deadline to report for the 2018 Survey was March 1, 2020, but CARB provided extensions to some respondents who faced challenges due to the COVID-19 pandemic. During FY 2021-2022, CARB staff diligently analyzed the data and prepared it for public release. On June 9, 2022, CARB posted a preliminary data summary for the survey on the program website. The survey data provides valuable insights into how products were reformulated to meet new VOC standards and reactivity limits that became effective in 2017. The 2018 Survey represents part of CARB's ongoing effort to evaluate the feasibility of further reducing VOC, TAC, and GHG emissions from aerosol coating and aerosol adhesive products while updating the emission inventory.

Architectural Coatings

Architectural coatings are products, such as house paints, stains, industrial maintenance coatings, and traffic coatings, which are applied to stationary structures and their accessories. VOCs are emitted from the coatings and from solvents that are used for thinning and clean-up. Control of VOC emissions from architectural coatings is primarily the responsibility of the air districts, with CARB serving as an oversight agency and providing assistance to the air districts, such as conducting surveys of architectural coating product sales and formulations to estimate emissions and air quality impacts from this source category; and developing architectural coatings suggested control measures (SCM), which serve as model rules for the air districts and provide for consistent requirements across district lines. CARB provided regulatory and policy guidance to air districts through the development and implementation of SCMs for Architectural Coatings in 1977, 1985, 1989, 2000, 2007, 2019, and 2020.

The 2019 SCM lowered VOC limits for nine existing coating categories and set VOC limits for three new categories. It also established VOC limits for colorants. Further, it included an “anti-bundling” provision to prevent marketing of multiple exempt small containers in a single package to circumvent coating category limits applicable to larger containers. The 2020 SCM added a new coating category for Photovoltaic Coatings with a 600 grams per liter (g/l) VOC limit.

During Fiscal Year 2021-2022, CARB staff reviewed architectural coatings rules and advised industry representatives on applicable VOC limits. CARB staff also updated the emissions inventory and organic speciation profiles for architectural coatings with survey data collected for calendar year 2014. For more information on the Architectural Coatings SCM, visit: <https://ww2.arb.ca.gov/our-work/programs/coatings/architectural-coatings/suggested-control-measure>.

Research

CARB conducts research to improve understanding of the causes and effects of air pollution, enabling staff to identify emerging air quality challenges and develop cost-effective, science-based strategies for reducing air pollution and protecting public health. This research supports intelligent and efficient implementation of CARB’s stationary source, consumer products and architectural coatings programs by identifying potential health and atmospheric impacts of common air pollutants. In addition, CARB research is evaluating the interaction between criteria pollutants, greenhouse gases, and air toxics which enables CARB to maximize co-benefits of regulations that target a diversity of pollutants.

Below are some examples of VOC-related research projects conducted or funded by CARB in FY 2021-2022:

- CARB staff utilized satellite remote sensing data to evaluate ozone formation regimes across California. This study started in early 2018 using measurements from two satellites to understand spatiotemporal changes in ozone formation regimes over the past decade, and led to an improved understanding of VOC and NOx source impacts and the long-term effectiveness of various emission control strategies throughout California. First set of results were presented at American Geophysical Union Conference in 2019. This project was completed in 2021 and the work was published in the Journal of Remote Sensing of Environment in January 2023 and can be found at: [*Trends of ambient O3 levels associated with O3 precursor gases and meteorology in California: Synergies from ground and satellite observations - ScienceDirect*](#)
- CARB staff operated a formaldehyde analyzer at Fresno since 2019 to study its diurnal, seasonal, and annual variabilities. The long-term monitoring of formaldehyde in our atmosphere will improve our understanding of the ozone sensitivities to ambient VOC and NOx, thus informing the 2022 ozone SIP development process. The ground-level formaldehyde data will also be used to evaluate the performance of TROPOspheric Monitoring Instrument satellite formaldehyde product to improve its inference on tropospheric chemistry relevant for ambient air pollution management. The project began in 2019 and will continue into 2024, with evolving objectives of the general project, which includes evaluation of ozone climate penalties.
- In January 2022, a staff report titled "Combined Exposure to Ultrafine Particulate Matter and Ozone: Characterization of Particulate Deposition, Pulmonary Oxidant Stress and Myocardial Injury" was published. The report was based on a research contract aimed at assessing adverse health effects of exposure to ultrafine particulate matter and ozone on lung and heart tissue. The animal study revealed that a combination of ultrafine particulate matter and ozone caused more significant health impacts than exposure to either pollutant alone. Additionally, individuals with cardiovascular diseases were more susceptible to pollutant-induced issues. This study advances scientific understanding of the adverse health effect of simultaneous combined-pollutant exposure and will support CARB in establishing health-protective ambient air quality standards.
- In May 2022, a staff report titled "Characterizing the Potential Health and Equity Impacts of Oil and Gas Extraction and Production Activities in California" was published, finalizing the findings from a research contract with UC Berkeley. The study revealed links between oil and gas development exposure to adverse birth outcomes, as well as potential groundwater threats in the San Joaquin Valley, disproportionately affecting Latino communities. Additionally, it showed that high methane emitting facilities are located more in communities of color and that migraine cases are associated with their emissions. These findings indicate the importance of characterizing the potential human health and equity implications of oil and gas development and high methane emitting facilities.

These and other projects funded in FY 2021-2022 provide CARB with the technical foundation to identify potential air pollutant health risks and develop and implement cost-effective strategies to meet State and federal ambient air quality standards.

Air Quality Monitoring

In Fiscal Year 2021-2022, CARB's air monitoring field operations and laboratory continued to play critical roles in measuring progress towards attainment of criteria pollutant air quality standards and assessing and addressing potential community health risks. Field operations include real-time ambient air quality measurements of gaseous pollutants and PM. Analytical services provided by the laboratory support PM mass analysis, PM chemical speciation, toxic air contaminant, greenhouse gas analyses, community air protection monitoring, the Study of Neighborhood Air near Petroleum Sources program, and special studies and air district requests.

California's Air Monitoring Network

Accurately measuring air quality is the foundation of California's efforts to reduce air pollution. For over 50 years, California has maintained one of the world's most extensive air monitoring networks, collecting data on a wide range of pollutants. The information gathered from this network makes it possible to track progress in cleaning the air and identify the most effective actions needed to meet health-based air quality standards. California's air monitoring program is a partnership between government agencies at the federal, state, and local level, universities, and, more recently, with engaged community members and industry representatives.

California's air monitoring network is designed to meet a range of regulatory requirements, such as compliance with the federal Clean Air Act. In addition, the data provided by the air monitoring networks help address research and public health priorities and determine the attainment status of State and Federal ambient air quality standards. The majority of California's air monitoring resources, reflected in the current statewide network of approximately 250 regulatory monitoring stations, have been dedicated to measuring ambient concentrations of criteria pollutants. In FY 2021-2022, CARB staff engaged with air district staff to develop the 2022 Annual Monitoring Network Plan, which provides detailed information on California's regulatory monitoring network. The annual network plan also addresses changes that occurred to the regulatory monitoring network during the previous year and the changes that are expected to occur during the next year to 18 months. A public workshop was held on June 20, 2022, to provide federal requirements and an overview of the CARB 2022 Annual Monitoring Network Plan. The 2022 Annual Monitoring Network Plan was submitted to U.S. EPA on June 29, 2022.

In addition to continuous field measurements, twenty-four-hour daily samples are collected throughout the State's air quality monitoring network. Most air quality data generated by field and laboratory operations are submitted to U.S. EPA's Air Quality System database for public record. Combined, the field operation and laboratory annually generate several millions of measurement records.

CARB's Aerometric Data Analysis and Management System (ADAM) and Air Quality and Meteorological Information System (AQMIS)

ADAM and AQMIS provide air quality and meteorological data and statistics to the public via the Internet. Fee funding helps support the continued operation of these data systems, including in FY 2021-2022. Criteria pollutant and toxics information available through ADAM website (<https://www.arb.ca.gov/adam>) consists of official air quality data, trends, and regulatory statistics for the State. ADAM also supports federal and State air quality designations and planning and is the foundation from which air quality strategies are developed. Upon request, CARB provides data and monitoring site information for download through various zip files. In FY 2021-2022, work to enhance ADAM was performed.

AQMIS is a web-based data source (<https://www.arb.ca.gov/aqmis2/aqmis2.php>) which provides a hybrid of official and preliminary real-time data. AQMIS incorporates automated quality assurance and quality control routines to assess air quality and meteorological data in real-time to limit the display and use of potentially erroneous data. As official ADAM data become available, they replace the preliminary data in AQMIS. AQMIS provides a range of statistics for the various pollutants available, and the air quality and meteorological data can be downloaded on-demand. AQMIS is also used for air pollution forecasting and evaluating the year-to-date status of air quality within several key geographical regions of California for planning purposes. In addition, near real-time monitoring data for ozone and PM_{2.5} are publicly available on Breathewell, CARB's web site for mobile devices: <http://mobile.arb.ca.gov/breathewell/>.

CARB's Incident Air Monitoring Section

During FY 2021-2022, CARB's data collection efforts also supported air quality emergency response for events such as wildfires and industrial (including refinery) releases. The Incident Air Monitoring Section provides a wide selection of specialized equipment for use in emergency events. This equipment includes PM monitors, as well as gas analyzers, meteorological sensors, and plume modeling software. These are all utilized to aid both first responders and the surrounding community in the event of an air emergency.

Emissions Inventories

CARB compiles, maintains, and improves detailed and comprehensive inventories of air pollution sources and their emissions. This includes collecting and assuring the quality of emissions information, training CARB and air district staff on accessing the inventory, processing inventory requests, and developing improved inventory systems. CARB staff addresses data gaps in understanding air pollution, collects information, develops emission estimation methodologies, conducts pollutant emissions studies, develops research concepts, and coordinates with stakeholders on emission inventory methods to estimate and support community-level health assessments. CARB staff also investigates appropriate surrogates and growth factors to forecast future emissions and evaluates emission trends.

These inventories of criteria pollutants and their precursors provide technical foundation for air quality modeling of future year emissions needed to demonstrate attainment of health-based air quality standards and form the basis for air quality planning and regulatory development processes. In FY 2021-2022 CARB completed the emission inventory tasks identified below.

Annual Updates

CARB staff processes stationary source updates from air districts for approximately 35,000 individual facilities. This includes all criteria and toxic emissions data for the 2021 calendar year as well as any updates to stationary source data for previous years as requested by the air district. Staff load the data into the emission inventory system and perform quality assurance checks on the new data.

U.S. EPA National Emission Inventory (NEI) submittal

CARB staff is responsible for submitting criteria emissions data to the U.S. EPA on an annual basis. The NEI operates on a three-year cycle, requiring CARB staff to submit all stationary and area source criteria emission information to the U.S. EPA every three years. In the two intervening years between these comprehensive submissions, CARB is only required to submit information pertaining to major stationary sources. The most recent triennial submission covered the inventory year 2020. For the FY 2021-2022, CARB staff submitted data solely for major stationary sources to the U.S. EPA, in accordance with the NEI reporting requirements.

Forecasting

CARB staff, along with air districts and other stakeholders, refined the SIP base and future year emission estimates based upon the latest technical information. This included updating the air district rule-specific control profiles, evaluating and updating the growth factors to reflect the latest socioeconomic forecasts associated with specific source categories, and other emissions inventory improvements. In FY 2021-2022, CARB staff developed emission inventory forecasts to support attainment planning efforts for ozone and particulate matter.

The Emissions Inventories group staff also provide assistance with the economic impacts assessment for various regulatory proposals, such as the subsequent work done on the Consumer Products regulatory amendments, which were previously taken to the Board in March, 2021. Specifically, during FY 2021-2022 staff worked on the two 15-day changes. The first was posted on August 19, 2021, and the second was posted on May 23, 2022. The first of these 15-day changes broadened the Innovative Product Exemption provisions initially considered at the March 2021 Board Hearing. Staff of the Office of Economic and Policy Analysis assisted in the assessment of costs and benefits associated with these proposed 15-day regulatory changes.

Identifying, Assessing, and Mitigating the Transport of Air Pollutants

Understanding the nature and impact of air pollution transported within California (typically from coastal to inland regions) informs a broad spectrum of CARB activities, including updates to air district attainment designations, and development of attainment plans, control strategies, and mitigation requirements. The ability to address transport impacts has improved significantly in the last few years due to the use of new highly sophisticated photochemical models, new data analysis techniques, and state of the art air quality studies conducted by the National Aeronautics and Space Administration and other researchers. CARB uses these photochemical models combined with the latest air quality studies to develop comprehensive federal air quality plans.

Comprehensive photochemical modeling work conducted in FY 2021-2022 has further refined the understanding of transport and underlies SIP attainment demonstrations for the federal ozone standard. A related CARB study helped to characterize impacts of conditions aloft on surface air quality, further improving CARB's modeling of ozone concentrations in the San Joaquin Valley and expanding the technical ability to identify regional and international transport impacts from aloft conditions. As part of the comprehensive SIPs for the federal ozone standard, CARB staff conducted an in-depth evaluation of transport impacts of ozone and ozone precursors.

CARB is responsible for assessing the relative transport contribution of ozone and ozone precursors between air districts and for establishing mitigation requirements. VOCs, which react with oxygen molecules, such as NO_x, to form ground-level ozone, are one of these ozone precursors. CARB first adopted transport mitigation requirements for air districts in 1990 based on an analysis of transport relationships between air districts. These relationships have subsequently been updated several times. CARB regulations identify transport couples consisting of an upwind area (source of transported emissions), the corresponding downwind area (receptor of transported emissions), and the required mitigation requirements. Identified upwind air districts have been implementing mitigation requirements, identified in their State triennial ozone plan update submittals to CARB, for over two decades.

The federal Clean Air Act contains provisions to protect downwind states from pollution that may originate in upwind states. These provisions are known as the "good neighbor" or "interstate transport" provisions. During FY 2021-2022, as part of the California Infrastructure SIP development, staff carried out analysis on interstate transport of air pollutants based on modeling and ambient air quality and meteorological data analysis. States identified by U.S. EPA national air quality models to potentially be impacted by the transport of California ozone and ozone precursors were evaluated. CARB demonstrated that California has sufficient pollution control programs in place to limit interstate transport and that high ozone days driving the 8-hour average ozone design values in other states were the result of local emissions, terrain, and wind flow patterns within those states and not linked to transport from California. Additional discussion on these activities is included later in the State Implementation Plan portion of the report.

State Implementation Plans

8-hour Ozone SIPs

Ozone forms in the atmosphere through complex reactions between VOCs and NO_x directly emitted from vehicles, industrial/stationary sources, consumer products and many other sources. For the federal ozone standards, CARB must work with local air districts to develop SIPs to identify control measures and demonstrate attainment by the required deadlines, as well as meet other requirements. Ozone SIPs must describe the control measures being pursued by CARB to reduce VOC and NO_x emissions from mobile and non-mobile sources under our authority, and also include measures from the Districts where applicable to reduce emissions from the stationary and area sources under their jurisdictions.

During FY 2021-2022 CARB staff collaborated with air districts to provide additional information and clarifications as needed to support U.S. EPA's approval of SIP elements for the 75 ppb 8-hour ozone standard adopted by U.S. EPA in 2008. Staff also submitted district rules adopted as part of implementation of SIPs for many areas, and continued to collaborate with U.S. EPA, Region 9 staff to minimize the U.S. EPA backlog of SIPs.

Staff continued to collaborate with air districts and worked to develop and finalize SIP elements needed for plans to demonstrate attainment of the 70 ppb 8-hour ozone standard adopted by U.S. EPA in 2015. As a key part of the attainment plans for the 70 ppb ozone standard, during FY 2021-2022, CARB staff undertook the development, public process, and release of the Draft 2022 State Strategy for the State Implementation Plan to identify the potential State control measures needed to reduce emissions and support attainment. As outlined in the draft, CARB continues to maintain an aggregate emission reduction commitment which is a sum of emissions reductions from on-road and off-road mobile sources, consumer products, and other State-regulated sources. As part of the 2022 State SIP Strategy development, CARB conducted workshops and participated in local air district outreach efforts.

Additionally, staff submitted District rules and certifications adopted to meet Emissions Statement and New Source Review requirements for the 70 ppb 8-hour ozone standard. Staff also worked to submit certifications of existing District programs to meet the clean fuels for boilers requirements under the 70 ppb 8-hour ozone standard for the two nonattainment areas in California classified as extreme, the South Coast Air Basin and the San Joaquin Valley. In January 2022, CARB also adopted the Clean Fuels for Fleets Certification to certify that California's Low-Emission Vehicle Program continues to qualify as a substitute for the U.S. EPA Clean Fuel Vehicle Program and satisfies the requirements for the 70 ppb 8-hour ozone standard.

PM_{2.5} and PM₁₀ SIPs

CARB staff developed and refined emission inventories that, along with air quality monitoring and air quality modeling, provided technical foundation for the SIP attainment and maintenance demonstrations for the federal PM standards. The most common primary constituents of PM include sulfate, nitrate, ammonium, elemental carbon and organic mass. Secondary PM particles are formed from chemical reactions between PM precursors, including VOCs. For the federal PM standards, CARB must work with local air districts to develop SIPs to identify control measures and demonstrate attainment by the required deadlines, as well as meet other requirements. PM SIPs must describe the control measures to reduce PM and precursor emissions from mobile and non-mobile sources under our authority and include measures from Districts to reduce emissions from stationary and areawide sources under their jurisdictions. During FY 2021-2022, staff continued working with the districts and stakeholders on implementing the comprehensive PM_{2.5} SIP for the San Joaquin Valley for the 1997, 2006, and 2012 NAAQS. Staff also worked with the Feather River AQMD on developing their PM_{2.5} Yuba City-Marysville Second Maintenance Plan.

Looking forward, staff will be working closely with the Great Basin Unified APCD in the development of their Mammoth Lakes second PM₁₀ maintenance plan, and the Northern Sierra AQMD on the 2012 PM_{2.5} NAAQS SIP for the Plumas County nonattainment area. Staff will also be working with districts around the state to develop ozone plans.

Infrastructure SIP

Each time the U.S. EPA adopts a new or revises an existing standard, the federal Clean Air Act requires states to develop and submit an Infrastructure SIP. An Infrastructure SIP describes the authorities, resources, and programs a state has in place to implement, maintain, and enforce the federal standards, including California SIP-approved emission control measures for VOCs from vehicular, nonvehicular sources, consumer products, and architectural coatings. These revisions build on previous Infrastructure SIP submittals. When U.S. EPA approves an Infrastructure SIP revision⁴, it becomes part of the overall statewide SIP. U.S. EPA acted on California's 2018 Infrastructure SIP on March 30, 2021, except for deferred action on the interstate transport requirements. Litigants sued U.S. EPA as the statutory deadlines to act on the SIPs submitted by multiple states, including California, under the "good neighbor" or "interstate transport" provision of the Clean Air Act section 110(a)(2)(D)(i)(I) for the 2015 Ozone NAAQS had passed. In response, U.S. EPA proposed a transport Federal Implementation Plan (FIP) on April 6, 2022 (87 FR 20036) and proposed disapproval of the "interstate transport" portion of California's 2018 Infrastructure SIP on May 24, 2022 (87 FR 31443). There will be no sanctions associated with the SIP disapproval and FIP, but CARB is trying to work with U.S. EPA to resolve the issues.

⁴ 2018 California Infrastructure SIP Revision

Identifying Indicators to Assess Air Quality Progress

State law directs CARB to develop air quality indicators that can be used to measure progress towards the attainment of State ozone air quality standards (Health and Safety Code Section 39607). CARB develops indicators for assessing peak ozone concentration and exposure. These indicators are used for assessing progress in State triennial ozone plans proposed by air districts. Because 8-hour concentrations drive the State ozone standard attainment status, CARB developed a calculation procedure and continues to provide 8-hour ozone, population-weighted and area-weighted exposure indicators for State triennial ozone plan updates.

In Fiscal Year 2021-2022, data handling upgrades continued to increase the flexibility and efficiency of data processing. Planning, design, and initial programming also began for the incorporation of PM data into the new system platform and architecture implemented in the previous year. The ADAM air quality data can be viewed at <https://www.arb.ca.gov/adam/>. The AQMIS real-time air quality database is also available online at <https://www.arb.ca.gov/aqmis2/aqmis2.php>, allowing the public, air districts, and any other users to continually track and assess air quality progress. Additionally, AQMIS uses special quality control procedures to review the preliminary data during wildfire and high-wind dust events. AQMIS continues to display the 1997, 2008, and 2015 federal 8-hour ozone standard exceedance days for easy comparison, as well as a year-to-date design value for certain geographic regions for evaluating the current attainment status. CARB staff has also continued to develop a new community air quality data portal – Community Air Quality Viewer (AQ-View) as part of the Community Air Protection Program (<https://aqview.arb.ca.gov/>).

Enforcement

Nonvehicular Sources

CARB's stationary source enforcement team provides compliance training to regulated entities, assists local air districts with inspections of stationary sources, investigates complaints, issues notices of violations, evaluates district variances for compliance with statutory requirements, obtains and analyzes evidence to determine the date of onset, cause, and extent of violation of air pollution regulations, and reviews air district rules for enforceability. In Fiscal Year 2021-2022, CARB stationary source enforcement personnel:

- Provided enforcement assistance and training to air districts and other local and regional environmental agencies;
- Responded to air pollution complaints at stationary facilities;
- Conducted investigations, and referred them to other agencies when appropriate;
- Reviewed all air district hearing board orders for compliance with Health and Safety Code requirements;
- Gathered and analyzed data from emission monitoring devices required by air districts at stationary sources;

- Reviewed air district rules for enforceability, compliance with State laws, clarity, and accuracy; and
- Developed a variety of practical, rule-specific publications that describe source processes and emission control equipment, clarify rule requirements, identify compliance issues, and promote self-regulation.

Consumer Products

CARB consumer product program investigators purchase samples of regulated consumer products from outlets all over California. They inspect product containers for compliance with registration and dating requirements and send selected products to the laboratory for testing. CARB laboratory staff conduct laboratory analyses of products selected and submitted by CARB's enforcement team to determine compliance with the applicable VOC and aromatic compound limits, and chlorinated solvent prohibitions, to name a few. During Fiscal Year 2021-2022, CARB enforcement staff collected 233 samples of household and institutional consumer products. A majority of these were analyzed by Special Analysis Section laboratory staff. Sample selections focused on cleaning products, such as general purpose or bathroom cleaners, and fragrance products.

As a result of continuing investigations, CARB issued 42 notices of violation during the fiscal year. After conducting office conferences, CARB staff worked to resolve the enforcement cases through administrative or civil actions. During the fiscal year, staff settled 31 cases involving a variety of products including general purpose cleaners, solvents, and aerosol coatings. The \$1,101,000 in penalties collected helped to mitigate more than 55 tons of excess VOC emissions and 15 tons of toxic compounds resulting from these violations. Some significant settlements involved substantial sales of noncompliant paint thinners, multi-purpose solvents, and general purpose cleaners. CARB attorneys provided assistance to the Enforcement Division staff as needed. The annual enforcement report can be found at: [*Enforcement Reports / California Air Resources Board*](#).

The 2021 regulatory amendments to the Consumer Products Regulation included amendments to Method 310, Determination of Volatile Organic Compounds in Consumer Products and Reactive Organic Compounds in Aerosol Coatings. Specifically, the 2021 regulatory amendments included new or lower VOC standards for various consumer products, several modified category definitions, clarification of various regulatory provisions and improvement of program transparency, enforceability and effectiveness. Changes to Method 310 included removal and addition of several reference test methods, and revision of equations to better reflect how CARB staff calculates VOC and ROC. The new amendments were approved August 1, 2022.

CARB staff conducted laboratory analyses of products submitted for determination of compliance with applicable VOC limits. When appropriate, test results were used to support follow up enforcement efforts. Staff continue to review and update Standard Operating Procedures (SOPs) for consumer product analyses.

Further, staff deployed a new gas chromatograph instrument for the determination of boiling point distribution in consumer products. Additional instrumentation installed include a gas chromatograph with a triple quad mass selective detector and an Intuvo Gas Chromatograph. Both systems will be utilized for future method development projects. Propellant method development utilizing a gas blender and two new custom-made gas chromatographs is ongoing with a corresponding update to the SOP, SAS05 - Determination of Compounds in Aerosol Consumer Product Propellant by Gas Chromatography. Also, staff received training on a new chemical inventory system and updated Laboratory Information Management System Quality Control procedures.