

9 ug/m3 Annual PM2.5 Workshop: Recommendations and Inventory Updates

December 5, 2024

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State Recommendations

- Uses the 2023 PM2.5 Design Values
 - Average of 2021 2023 PM2.5 annual averages
 - Federal reference or equivalent monitors
- Nonattainment (> 9.0)
- Attainment or Unclassifiable (all other areas)



Nonattainment Area Boundary Considerations



- Boundaries for each nonattainment areas are evaluated on a case-by-case basis.
- Boundaries are determined by a weight-of-evidence approach based on consideration of five factors.



Areas Exceeding the 9.0 ug/m3 Annual PM2.5 NAAQS



2023 DV (µg/m³)
16.2
14.0
13.1
11.2
11.0
10.2
9.9
9.6
9.2



Portola

- 14.0 ug/m3 2023 Design Value
- Portola monitoring site
- Existing boundary 12 ug/m3 Annual PM2.5 Standard
- Portion of Plumas County





Mendocino

- 11.0 ug/m3 2023 Design Value
- Willits monitoring site
- New boundary recommendation
- Selected township, range, sections to encompass Little Lake Valley Basin along with neighboring areas, major roads



Yuba City - Marysville

- 11.2 ug/m3 2023 Design Value
- Yuba City monitoring site
- Existing boundary 35 ug/m3 24-hour PM2.5 Standard
- Sutter County and portion of Yuba County





San Francisco Bay Area Air Basin

- 9.6 ug/m3 2023 Design Value
- San Pablo monitoring site in Contra Costa County
- Existing boundary 35 ug/m3 24-hour PM2.5 Standard





Sacramento

- 9.9 ug/m3 2023 Design Value
- Bercut Drive monitoring site
- New boundary recommendation
- Sacramento County





San Joaquin Valley

- 16.2 ug/m3 2023 Design Value
- Bakersfield Airport monitoring site in Kern County
- Existing boundary 12 ug/m3 Annual PM2.5 Standard





South Coast Air Basin

- 13.1 ug/m3 2023 Design Value
- Ontario-Route 60 monitoring site in Riverside County
- Existing boundary 12 ug/m3 Annual PM2.5 standard





San Diego

- 9.2 ug/m3 2023 Design Value
- Sherman Elementary School monitoring site
- New boundary recommendation
- San Diego County





Imperial

- 10.2 ug/m3 2023 Design Value
- Calexico Ethel Street
 monitoring site
- Existing boundary 12 ug/m3 Annual PM2.5 Standard



Designation and Planning Schedule

- December 13 Post Recommendations for public comment
- January 23, 2025 Board update
- February 7, 2025 Recommendations due to EPA
- October 9, 2025 EPA 120-day notice
- February 6, 2026 EPA promulgates designations
- Fourth Quarter 2027 State Implementation Plans due to EPA



Questions on Designations





State Implementation Plan





What are PM2.5 Emissions?

- Solid and liquid material released and suspended in the air
- Gases released into the atmosphere
- PM2.5 is directly emitted
- AND PM2.5 is created from gases emitted into the atmosphere
- PM2.5 precursor gases vary in their significance and include
 - Oxides of Nitrogen (NO_x)
 - Sulfur Dioxide (SO₂)
 - Volatile organic compounds (VOCs)
 - Ammonia (NH₃)



The What, Who, How, and Why of Emissions Inventory

- What is it?
- Who creates it?
- How is it created?
- Why do we need it?



What is an Emissions Inventory?

A comprehensive estimate of air pollutant emissions data, by source, for a specific geographic area during a given time period.

The time period **(when)** and geographic area **(where)** varies depending on the goals and requirements of the inventory

CA Air Districts report stationary/area data to CARB **each year** into the California Emissions Inventory Data Analysis and Reporting System (<u>CEIDARS</u>). CARB reports statewide data to the EPA for the National Emissions Inventory (<u>NEI</u>) **every third year**.





Who Creates the Emissions Inventory?

Point Sources (stationary sources such as industrial facilities)

- Air Districts compile emissions data and report to CARB
- CARB QA's the data in multiple stages

Area-wide Sources (such as consumer products)

 CARB and/or Air Districts develop estimation methodologies

Mobile Sources (cars, tractors, boats, etc.)

 CARB develops emission models (e.g. <u>EMFAC</u>, <u>OFFROAD</u>)

Natural Sources (such as wildfires or biological soil processes)

• CARB develops estimation methodologies

It's a team effort! 35 local air districts and many different teams at CARB work on creating the different methodologies and performing checks on the data to ensure its accuracy.





How are Emissions Estimated?

• Basic Formula:

Emissions = Process Rate × Emission Factor

- Process Rate = how much material is processed
- Emission Factor = emissions generated per unit of material



Why Do We Need Emissions Inventories?

State and federal laws require CARB to compile the statewide emission inventory annually:

- Clean Air Act
- California Health and Safety Code (Section 39607)
- The AB 2588 Air Toxics "Hot Spots" Emission Inventory Criteria and Guidelines Regulation (EICG Regulation)
- Regulation for the Reporting of Criteria Air Pollutants and Toxic Air Contaminants (CTR)
- And more....





Area Source Updates

The area source inventory includes approximately 400 area source categories for which emissions are estimated using methodologies

- CARB and Districts are responsible for updating their specific categories
- CARB is planning for a comprehensive effort to review existing area source methodologies and identify/prioritize categories that require updating to reflect current science and data
- Near-term goal is to prioritize categories that are critical sources for the PM2.5 SIP



2023 Updates for Area Sources

Source	Update Authority	Activity Data		
Residential Wood Combustion	В	Latest census and other survey data; updated emission factors for wood stoves based on recent studies		
Commercial Cooking	D	Number of restaurants, type and number of cooking devices, amount of meat and potatoes cooked		
Paved Road Dust	В	Vehicle Miles Traveled (VMT)/ travel fraction by road type (e.g., freeway, local)		
Unpaved Road Dust: Farm, Non-farm Roads	В	Harvested crop acreage and crop specific VMT; unpaved road VMT and miles		
Building and Road Construction/ Demolition	В	Housing units, commercial area , road miles		
Windblown Dust: Ag and non-ag lands	В	TBD; exposed surface area		
CADD and District Undate Authority				

CARB and District Update Authority:

CARB

- A = CARB develops emissions, Districts may not overwrite emissions
- B = CARB develops default emissions, Districts may overwrite emissions, subject to CARB review and approval
- D = District must provide emissions, otherwise emissions are assumed to be zero

2023 Updates for Area Sources, cont'd

Source	Update Authority	Activity Data
Farming Operations: Dust from farming activities	В	Harvested crop acreage and crop-specific VMT factors
Farming Operations: Dairy Cattle Waste	В	Dairy cow population from CARB California Dairy and Livestock Database (CADD)
Farming Operations: Silage	В	CADD cattle population and San Joaquin Valley Air Pollution Control District (SJVAPCD) methodology
Soil NOx and Ammonia (NH3)	В	CARB contract in progress

CARB and District Update Authority:

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Residential Wood Combustion

Wood combustion in fireplaces and wood stoves

Activity Data:

 Latest census data and other survey data on wood combustion devices and technology

Methodology:

- Emissions = amount of wood burned in each device x pollutant specific emission factors*
- Statewide methodology last updated in 2011 uses 2005 data
- Recent methodologies include SJV 2016 and Portola 2023



*Pollutant-specific emission factors for wood stoves will be updated based on recent study/testing by the Northeast States for Coordinated Air Use Management (NESCAUM)



Commercial Cooking

Commercial charbroiling and deep fat frying

Activity Data:

- Number of restaurants
- Type and number of cooking devices
 - Chain-driven/under-fired charbroilers
 - Deep fat fryers
 - Flat/clamshell griddles
- Amount of meat and potatoes cooked

- Emissions = amount of food cooked on each device x pollutant specific emission factors
- No statewide methodology





Fugitive Dust: Paved Road Dust

Dust from vehicle travel on paved roads

Activity Data:

• VMT and travel fraction by road type (e.g., freeway, local)

- Emissions = VMT by road type x emission factor
- Current methodology, last updated in 2021, uses 2017 activity data





Fugitive Dust: Unpaved Farm Roads

Dust from vehicle travel on unpaved farm roads

Activity Data:

 Harvested acreage, VMT factors by crop type, crop calendar on operations such as land preparation, tilling, harvesting

- Emissions = crop-specific harvest acre x crop-specific VMT factors x emission factor
- Current methodology, last updated in 2016, uses 2012 activity data





Fugitive Dust: Unpaved Non-Farm Roads Dust from vehicle travel on non-farm unpaved roads

Activity Data:

- Unpaved road miles and VMT
- Methodology:
 - Emissions = VMT on unpaved roads x emission factor
 - Current methodology, last updated in 2012, uses 2008/2009 activity data





Fugitive Dust: Building and Road Construction/Demolition

Dust from construction and demolition activities

Activity Data:

• Residential units and commercial area; road miles

Methodology:

 Emissions = (residential units/ commercial area/ road miles) x emission factor





Fugitive Dust: Windblown

Dust from wind blowing across surfaces (e.g., agricultural, pasture, unpaved, open areas)

Activity Data:

• TBD; exposed surface area

- Emissions = exposed area x emission factors from a 1997 Wind Erosion Equation
- Methodology and emission factors review in progress





Farming Operations Dust

Dust from harvesting, tilling, land preparation activities

Activity Data:

- Land preparation and harvest acreage by crop type
- Crop type VMT factors
- Methodology:
 - Emissions = harvested crop acreage x by crop specific emission factors
 - Current methodology last updated in 2016, uses 2012 harvested acreage





Farming Operations: Dairy Cattle Waste and Dust Emissions Emissions from cattle waste and land application of manure

Activity Data:

Dairy cow population

- Emissions = (population x emission factor) + (amount of manure applied on land x emission factors)
- Dust emissions from dairies and cattle feedlots
- Current methodology last updated in 2004, uses 2001data





Farming Operations: Silage Emissions from silage in dairy farms

Activity Data:

- Cattle population
- SJVAPCD methodology includes pile size, pile numbers, silage type, Total Mix Ration etc.

- No published methodology
- Current ROG inventory mostly from SJVAPCD's dairy silage inventory (2021 from District); no silage emissions for other areas





Soil NOx and Ammonia (NH3)

Emissions from unmanaged lands (forest, shrub, grass, fallow) and application of nitrogen rich fertilizers to managed lands (crop, urban)

- Activity Data:
 - CARB contract in progress
- Methodology:
 - CARB contract in progress





Updates for Fire Sources

	What Is Being Updated?			
Source	Activity Level*	Activity Data Source	Methodology	
Ag Burn	Yes	No Change Air District's Title 17 Annual Report	No Change	
Wildfire	Yes	Yes (partial) No change to primary data source (CAL FIRE fire history geo- database) but will augment with new day-specific satellite data	Yes New framework combining data from CAL FIRE and satellites	
Prescribed Fire	Yes	Yes (More in the next slide)	Yes (More in the next slide)	

* CARB annually updates activity levels with the latest year of data released by the activity data sources.



Prescribed Fire

Forest management, range improvement

Activity Data:

 Prescribed Fire Information Report System, data from Land Management Agencies and Air Districts, supplemented with satellite data

Methodology:

 CARB-developed framework to integrate agency records & satellite observations





Questions on Area Sources





On-Road Mobile Sources

Emissions from Cars, Trucks, Buses, Motorcycles (EMFAC202Y)

Activity Data:

• Travel demand models submitted by Metropolitan Planning Organizations

- Incorporates recently adopted regulations (e.g., Clean Truck Check Program)
- Registration data (e.g., DMV)
- Emission rates updates based on new test data
- Newly includes age 45+ vehicles
- Increased tire-wear PM from light-duty zeroemission vehicles





Agricultural Equipment Emissions from Agricultural Equipment

Activity Data:

- Survey of farms (early 2025)
- 2022 United States Department of Agriculture (USDA) data

Methodology:

 Combines survey of mobile equipment by crop type and acreage reported by USDA and County Ag Commissioners





Construction, Drilling, and Mining 2022 In-Use Emission Inventory

Activity Data:

CARB Reporting Data, Survey

Methodology:

• Uses CARB reporting data and survey of companies to update population, activity, and reflect latest rule amendments





Forestry Equipment 2021 Forestry Equipment Emission Inventory

Activity Data:

- Survey of forestry operations
- Data on timber harvest

Methodology:

 Survey timber and mill operations, scale up to total California board-feet of lumber





Propane and Gasoline Forklifts 2023 LSI Emission Inventory

Activity Data:

• Survey of LSI businesses

Methodology:

 Uses CARB reporting data, industry sales numbers, and electrification trends, along with new forklift electrification requirements to develop emission inventory





Locomotives 2022 Locomotive Emission Inventory

Activity Data:

• Freight ton miles

Methodology:

 Uses CARB reporting data for South Coast region, voluntary reporting for smaller rail lines, and fuel totals or freight ton-mile surrogates, along with EPA emission factors





Recreational Marine Vessels

Activity Data:

 Cal State Fullerton survey from 2021-2022 of vessel owners

- Reflects updated usage and ownership patterns
- Emissions factors from certification
- Spatial allocation and population from DMV registration data
- Turnover and future population forecast using economic indicators





Aircraft

Statewide Aircraft Emissions Inventory (CAI2024)

- Activity Data:
 - Federal Aviation Administration (FAA) Terminal Area Forecast (TAF)
 - FlightAware and FltPlan.com for general aviation activities

- Newly consistent across California for all 857 facilities
- Considers emissions below mixing height (~3,000 feet above ground)
- Commercial aircraft uses FAA models corrected for California airport mixing height, fleet mix, taxi times
- Includes rotorcraft, military and agricultural aircraft emissions





Ocean-Going Vessels Emissions from Ocean-Going Vessels

Activity Data:

• Satellite Automatic Identification System (AIS) Data

Methodology:

 Develop AIS data into vessel movement tracking, apply emission rates to main, auxiliary and boiler engines





What is a Forecasted Emissions Inventory?

The California Emissions **Projection Analysis** Model holds the forecasted inventory.



What is growth and control?



Growth and control factors are the **ratio** of two activity levels at the end point years

Year	Growth Factor	Year	Control Factor
2020	1.00	2020	1.00
2025	1.04	2025	0.89
2030	1.08	2030	0.82
2035	1.13	2035	0.82
2040	1.18	2040	0.81
2045	1.23	2045	0.80
2050	1.28	2050	0.78

CARB applies the growth and control factors, but the air districts have input into how they are created.





Numbers on this slide are used as an example only and do not represent real data



Bringing it All Together

QA may compare reported data to previous years and looks for outliers in the data, ensure sources are coded correctly, etc.

Air Districts collect local data, using various methods, and send the data to CARB.

CARB compiles Data from districts and performs QA to ensure accuracy CARB develops estimates, using the best available science, where exact emissions data are not available CARB reconciles estimates with reported data to ensure we do not double count anything

A base year inventory has been created! Projections for future years can now be created by combining a base year inventory with growth and control data.

Various estimation methodologies are used, including continuous emission monitors, source testing, or US EPA emission factors.



E.g., Estimating emissions from wildfires, consumer products use, or assigning aircraft emissions to the correct geographic locations.

Upcoming Workshops

- Soil NOx Contract Update January 2025
- 4th (and Final) EMFAC 202Y Workshop Early 2025
- Area Source Emissions Inventory Updates Spring 2025
- Late Spring Summer 2025 Next 9 ug SIP Workshop



PM2.5 Resources

- Website:
 - <u>https://ww2.arb.ca.gov/our-work/programs/california-state-implementation-plans/statewide-efforts/sips-9-mgm3-pm2-5</u>
 - Educational videos
 - Helpful links and resources for more information
 - Workshop recordings
 - Announcements, important dates, workshop materials
- Email for questions: <u>sipplanning@arb.ca.gov</u>
- Local District webpages
- Comments and responses



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Questions?



