



Particulate Matter (PM) Symposium: Status Report

BAY AREA
AIR QUALITY
MANAGEMENT
DISTRICT

Presentation to BAAQMD Board of
Directors

By BAAQMD Advisory Council

July 15, 2020



PM Symposium: Context

- Following three years of **intense wildfire smoke**, focus on **reducing diesel PM** emissions, and conclusion that PM is overwhelming **health risk driver** in Bay Area air
- Air District asked Advisory Council to **focus on PM**
- Provide Advisory Council's take on **latest and best science**, in science-affirming way
- **Assist Air District** to identify those further PM measures that would most move public health needle, especially in most impacted communities, above and beyond what the Air District is already doing



PM Symposium: Overview

- Convened by **Air District and Advisory Council**
- Engage **nationally-recognized experts**, including leading experts previously involved at Federal level
- **Support Air District** in identifying health-focused “target” guidelines based on latest science, beyond standards already in effect
- Facilitate **Advisory Council feedback** on Air District planning
- Include **local stakeholders**
- Provide **national leadership**



Particulate Matter: Spotlight on Health Protection



Date: Oct. 28, 2019 Time: 9:00 am - 4:45pm Advisory Council Chair: Mr. Stan Hayes Facilitator: Jeff McKay

Agenda Items

8:30 AM	Registration/Coffee and light breakfast	Atrium
9:00 AM	Welcome	Board Room
9:25 AM	PM Health Effects Panel	Board Room
11:05 AM	Break	Atrium
11:15 AM	Joint Discussion: Health Effects Panel	Board Room
12:00 PM	Lunch with Keynote Speaker – Former EPA Administrator Gina McCarthy	Yerba Buena
1:15 PM	PM Exposure & Risk Panel	Board Room
2:55 PM	Break	Atrium
3:10 PM	Joint Discussion: Exposure & Risk Panel	Board Room
4:00 PM	Advisory Council Deliberation	Board Room

Additional information

This is a meeting of the BAAQMD Advisory Council.

Public comment will take place during welcome remarks.

For ADA related assistance, please contact Areana Flores at aflores@baaqmd.gov.

375 Beale Street, Suite 600, San Francisco, California 94105 • 415.749.5000 • baaqmd.gov



Particulate Matter: Spotlight on Health Protection

- ~160 registrants
- ~Hundreds online
- 2 panels
 - PM Health Effects
 - PM Exposure & Risk
- 9 leading experts

Gina McCarthy

- **Former EPA Administrator**
- Finalized the Clean Power Plan and the Clean Water Rule
- Professor of the Practice of Public Health in the Department of Environmental Health at Harvard T.H. Chan School of Public Health
- Director of the Center for Climate, Health, and the Global Environmental
- Member of the Board of Directors of the Energy Foundation and Ceres
- M.Sc. in Environmental Health Engineering, Planning and Policy from Tuft's University





Jason Sacks, USEPA



Michael Kleinman, UCI



John Balmes, UCSF



Christopher Frey, NC State

**PM Health
Effects Panel**



Lauren Zeise, OEHHA



Scott Jenkins, USEPA



Julian Marchall, UWash



Phil Martien, BAAQMD

**PM Exposure &
Risk Panel**

Advisory Council Discussion with Experts



PM Symposium: Work Products

October

**Particulate Matter:
Spotlight on Health Protection**

Symposium Summary:
Health Effects and
Exposures and Risk

October 28, 2019

BAY AREA AIR QUALITY
MANAGEMENT DISTRICT

- State of Science: PM health effects, exposures, risk
- 9 national experts
- 33-pg report

December

**Particulate Matter:
Spotlight on Health Protection**

Advisory Council Meeting Summary:
BAAQMD Update on Current and
Emerging Efforts on Particulate Matter

December 9, 2019

BAY AREA AIR QUALITY
MANAGEMENT DISTRICT

- Council deliberations
- District update on emerging PM efforts
- 35-pg report

February

**SUMMARY: Community Particulate Matter Discussion
February 27, 2020**

NOTE: A full transcript of the event is available from the stenographer. This summary aims to capture key themes in advance of the submission date for background materials for the next PM Symposium.

Overview

Community members, grassroots organization leaders, and Air District staff members met at the Bobby Bowens Center in Richmond on the evening of February 27, 2020 to gather community input on particulate matter (PM) impacts, monitoring, and regulatory efforts. The event was organized by a Design Team of community leaders with assistance from Elsinor Matters of the Air District's Community Engagement Section. Approximately 30 people attended to express their concerns regarding PM, its sources, and its health effects.

Input from community members centered on the following issues:

Localized PM data availability

- Desire for data beyond West Oakland
- Desire for real-time, continuous, publicly accessible localized monitoring
- Consolidating/sharing community-collected data (e.g. PurpleAir)

Toxicity of different PM species

- Concerns regarding severity of problems from refineries and other permitted sources (e.g. cement plant, concrete crushers, metal processing facilities)
- Skepticism regarding wood burning as a major driver of health impacts

Lack of observable results from prior rulemaking

- 2017 Clean Air Plan
- Crude state inventory
- General enforceability issues

Potential for problems to worsen

- Issuance of new permits
- Emerging indoor air concerns (e.g. vapor intrusion) beyond the scope of the Air District
- Climate impacts
- Lengthy time horizon prior to implementation (e.g. diesel PM rules took 10 years)

This summary provides a brief background on the event. Additional details regarding these community concerns and the Air District's clarifications in reply are noted in the transcript.

- Community PM discussion
- District staff, ~30 community members, ~16 organizations

May

AGENDA: 4A

**Community Reflections
from Feb. 27 Community
Summit on PM**

Jed Holtzman, MEM
Senior Policy Analyst

on behalf of the
BAAQMD Network

AGENDA: 5

**Update on Air District
Particulate Matter (PM)
Potential Policy
Strategies**

Advisory Council Meeting
May 12, 2020
Greg Nudd
Deputy Air Pollution Control Officer

- Community presentations to AC
- District update on PM potential policy strategies

June - July

Title of Panel: "Developing a Path Forward for PM2.5 Regulation in the Bay Area"

A&WMA's 113th Annual Conference & Exhibition
San Francisco, California
June 29 - July 2, 2020

Panel Abstract #840981

Chair or Moderator: Brian Buzgar, District Counsel, Bay Area Air Quality Management District, 375 Beale Street, San Francisco, CA

Co-Chair or Vice Chair: Stanley Hayes, Chair, Bay Area Air Quality Management District Advisory Council, 25 Napier Lane, San Francisco, CA 94133, (415) 299-0489, stanhayes1967@gmail.com

Synopsis of Panel: With the San Francisco Bay Area at or approaching a number of ambient air quality standards, including those for particulate matter (PM), the Bay Area Air Quality Management District (Air District) and its Advisory Council (Council) seek to identify the next best steps, beyond those efforts already underway, that will achieve the greatest public health improvement in Bay Area air quality, especially in the most impacted communities. The Air District and the Council have determined that PM is a key public health risk driver, both as a criteria pollutant, P_{2.5}, and a toxic air contaminant in the form of diesel PM. This panel will describe the nature, and present the findings, of a PM Health Effects Symposium convened by the Air District and the Council in October 2019, and will discuss sharing the path forward toward greater public health protections from PM. The symposium included nationally recognized experts who provided timely and important updates on the latest PM health science, a topic of key relevance given the Environmental Protection Agency's recent proposal to retain, rather than strengthen, current federal PM standards.

List of Potential Panelists:

- Dr. Christopher Frey, Professor of Environmental Engineering, North Carolina State University, Chair, Independent Particulate Matter Review Panel
- Dr. Jeffrey McKee, Chief Financial Officer, Bay Area Air Quality Management District Member, Advisory Council
 - Dr. Michael Kleinman, Professor of Occupational and Environmental Medicine, Department of Medicine, University of California, Irvine
 - Dr. Steven Borstein, Professor of Business Administration and Public Policy, Haas School of Business, University of California at Berkeley
 - Dr. Timothy Iqbal, Co-Director, Transportation Research Center, University of California at Berkeley
 - Dr. Jane C.S. Long, Associate Director for Energy and Environment, retired, Lawrence Livermore National Laboratory
 - Dr. Linda Raddolph, M.D., Director, Center for Climate Change and Health, Public Health Institute
 - Dr. Gus Solomon, M.D., M.P.H., Clinical Professor, Division of Occupational and Environmental Medicine, University of California San Francisco

- Panel Session
- A&WMA Virtual Annual Meeting
- June 30 - July 2, 2020



PM Symposium: Q&A Document – Health Effects Panel

Are current PM standards sufficiently health protective?

NOT SUFFICIENTLY PROTECTIVE; MORE STRINGENT STANDARDS NEEDED URGENTLY; LOWER STANDARD WOULD SAVE THOUSANDS OF LIVES IN U.S. EACH YEAR; NO EVIDENCE OF A “NO EFFECT” THRESHOLD – ADDITIONAL PM REDUCTION, EVEN BEYOND STANDARDS, WILL ACHIEVE ADDITIONAL PUBLIC HEALTH IMPROVEMENT

Are some species of PM more dangerous than others?

QUITE POSSIBLY, BUT NOT ENOUGH INFORMATION; NO PM SPECIES “EXONERATED”; NEED BETTER PM SPECIATION AND MORE MONITORING

What is role of ultrafine particles (UFPs)?

TOXICOLOGICAL STUDIES SHOW EFFECTS OF SERIOUS CONCERN; NEED REFERENCE TESTING METHOD, MORE MONITORING; NEED EPIDEMIOLOGICAL STUDIES RELATING HEALTH EFFECTS TO UFP EXPOSURE

Should PM expand “target” to account for more than just mass?

IN RESEARCH, ABSOLUTELY; IN REGULATION, MAY BE TOO SOON, BUT WE SHOULD BE THINKING ABOUT HOW TO MOVE IN THAT DIRECTION

How should we include draft PM ISA’s new “likely-causal” health endpoints (nervous system effects, cancer) and new more sensitive populations (children, lower socio-economic status)?

MUCH STRONGER EVIDENCE SUPPORTING MORTALITY/MORBIDITY AS CAUSAL; ADDITIONAL HEALTH EFFECTS NOW “LIKELY-CAUSAL”; PLUS MORE SENSITIVE HIGH-RISK GROUPS (E.G., CHILDREN AND LOW SES); NEED TO INCORPORATE THIS INFORMATION INTO REGULATORY EFFORTS

What are health impacts of high-concentration short-term events (e.g., wildfires)? How should we compare them to longer-term PM impacts?

ISSUE OF URGENT CONCERN; DATA ON SUB-DAILY ACUTE EXPOSURES IS LIMITED; SERIOUS EFFECTS REPORTED IN EARLY STUDIES; NEW STUDIES ONGOING; MORE RESEARCH NEEDED



PM Symposium: Q&A Document – Exposure & Risk Panel

What are major sources of PM in the Bay Area?

WEST OAKLAND (LOCAL EMISSIONS): PM2.5 – PORT (17%), STREET (17%), HIGHWAY (16%), RESTAURANTS (16%), STATIONARY SOURCES (14%)
DIESEL PM – PORT (57%), STREET (7%), HIGHWAY (8%)

ONROAD BRAKE AND TIRE WEAR NOW SIGNIFICANT REGIONAL SOURCES OF PM2.5 – DIFFICULT TO ADDRESS THIS PROBLEM

What PM levels exist in Bay Area? What health risks do they pose?

WEST OAKLAND (AVERAGE): PM2.5 = ALL SOURCES - 8.7 ug/m³, LOCAL SOURCES – 1.7 ug/m³
DIESEL PM = ALL SOURCES - 0.7 ug/m³, LOCAL SOURCES – 0.3 ug/m³

How much additional health benefit can be achieved?

REDUCING ANNUAL PM2.5 FROM CURRENT FEDERAL STANDARD OF 12 ug/m³ TO 10 ug/m³ COULD REDUCE MORTALITY RISK BY 10-15%; WOULD SAVE THOUSANDS OF LIVES IN U.S. EACH YEAR; NO THRESHOLD; COULD REGULATE BELOW 10 ug/m³ BASED ON THE SCIENCE

How should we account for spatial scale of effects (i.e., regional versus local-scale impacts, including proximity to major sources)?

REGIONAL VS. LOCAL VS. HYPER-LOCAL IMPACTS – ALL CAN BE IMPORTANT, AND SHOULD BE ADDRESSED

WEST OAKLAND: PM2.5 – OVERALL = 80% FROM REGIONAL SOURCES, 20% FROM LOCAL SOURCES
DIESEL PM – OVERALL = 40% FROM REGIONAL SOURCES, 60% FROM LOCAL SOURCES
(BUT HYPER-LOCALIZED HOT SPOTS FROM LOCAL SOURCES COULD BE HIGHER)

How should we determine which measures would most move public health needle?

WE NEED TO TAKE ACTION NOW, AND WE NEED MORE SCIENCE; MONITORING AND RESEARCH NEEDED; DISTRICT STAFF WILL PROPOSE ACTIONS; NO SINGLE ANSWER, WILL NEED TO ADDRESS MULTIPLE SOURCES



PM Symposium: Possible Findings (DRAFT, For Discussion Only)

Number	Possible Findings
1	PM is the health risk driver in Bay Area air.
2	Addressing risk in the most impacted areas is a high priority.
3	The current PM national ambient air quality standards (NAAQS) are not sufficiently health protective; more stringent standards are needed and would save thousands of lives in the U.S. each year.
4	Excluding wildfire smoke days as exceptional events, the Bay Area has attained the current federal annual/24-hour 12/35 ug/m ³ PM _{2.5} NAAQS.
5	The Bay Area also would attain alternative, more stringent 10/25 ug/m ³ NAAQS (except for West Oakland, whose annual average PM _{2.5} in 2018 was above an alternative 10 ug/m ³ standard by 0.7 ug/m ³ , or 7%).
6	There is no evidence of a health effects PM _{2.5} threshold; thus, additional PM reductions beyond the current standards will achieve additional public health improvement.
7	An Air District guideline "target" below the current PM _{2.5} NAAQS is warranted; it would need to be at or below an annual average of 10 ug/m ³ to be effective.
8	Nearly half of PM _{2.5} (47%) regionally is secondary PM produced by photochemical processes involving ROG, NO _x , SO ₂ , and NH ₃ ; measures to reduce this secondary PM also should be considered, in addition to directly emitted primary PM (e.g., from stacks, tailpipes).
9	Community-specific PM source attribution tools are useful in identifying the most important sources; use of such tools should focus initially on the most impacted communities (e.g., West Oakland, Richmond).
10	There are significant differences in PM levels among neighborhoods within West Oakland.
11	Some species of PM may be more dangerous than others; no PM species can be exonerated; better PM speciation is needed, along with more monitoring.
12	Monitoring and other studies for UFP are important and should be continued and expanded; further studies linking UFP and health impacts are needed.
13	Some PM localized hot-spot areas may experience PM levels significantly higher than their community-average level.
14	PM action plans should consider exposure, health vulnerability, and the population of the most sensitive groups (e.g., children, nonwhite, low SES, elderly) among the criteria used in developing those plans.
15	PM action plans should account for regional PM sources, with approximately 80% of PM _{2.5} in West Oakland coming from regional sources not in West Oakland.
16	PM action plans should consider sources that are regional (Bay Area-wide), local (community-level), and localized hot-spots (block-level).
17	PM action plans should consider emission reduction measures for both primary PM and secondary PM (i.e., precursor ROG, NO _x , NH ₃ , and SO ₂).
18	PM action plans should use source attribution tools to identify the most important sources.
19	Wildfire PM could well be a serious contributor to PM health effects; more research on those effects is needed; following the precautionary principle, significant community protection
20	In developing a PM action plan, there are no single answers; multiple source categories must be addressed; there is no "silver bullet," rather, it is more like "silver buckshot."
21	Source categories once viewed as of lesser importance have increased in importance relative to other sources as PM has been reduced from previously large source categories (e.g., on-road vehicle exhaust).
22	Because of significant reduction in vehicle exhaust PM, tire and brake wear PM emissions are now the most significant contributors to PM from on-road vehicles; they are difficult to address, however, and may require activity reduction measures (e.g., VMT, trip reduction).
23	Newly important PM source categories may not fall within current Air District rules, may be hard to regulate, may need better technical characterization (e.g., emission factors), and may need a more well-defined suite of control measures.
24	Key PM reduction strategies may include cleaner trucks/industry, reduction in vehicle trips and road dust, zero emissions plans (e.g., ports, the Air District's diesel-free in '33 initiative), neighborhood-specific PM action plans, exposure reduction measures, and more enforcement.
25	Techniques for treating PM as an air toxic may be helpful in putting criteria pollutant PM _{2.5} and air toxics diesel PM on same "balance sheet."

- More than 20 possible findings identified so far
- Based on outside experts, District staff, council expertise





PM Symposium: Evaluation of Potential Actions (DRAFT, For Discussion Only)

Number	Potential Actions
1	Establish goal for PM reductions below current standard (8-10 ug/m3)
2	Set more stringent state PM standards
3	Classify undifferentiated PM as toxic air contaminant
4	Improve emission estimation methods for emerging source categories (e.g., tires & brakes, road dust)
5	Develop Air District PM plan updated with new information
6	Set improved UFP filtration requirements for on-road vehicles
7	Attack PM from all directions, including regional, local, and hyper-local
8	Include sources that have slipped through cracks before in air toxics programs
9	Make air quality data more accessible and closer to real time
10	Reassess need to regulate smaller sources not of regional significance
11	Take aggressive action to reduce PM, additional PM reduction in PM results in additional improvement in public health
12	No single answer, no silver bullet, rather silver buckshot
13	Consider children and low SES groups especially
14	Factor in secondary PM, since nearly half (47%) of PM is secondary, formed in the air by photochemical processes
15	Regulate precursors of secondary PM (NOx, ROG, SO2, NH3), and see them as cumulative with local sources
16	Identify near-term actions, and roll them out early
17	Increase staff to implement/enforce Rule 11-18
18	Devote more staff to risk assessment for air toxics programs like Rule 11-18
19	Identify problematic local sources and deal with them faster
20	Take into account cumulative impact in permitting

- Nearly 50 potential actions identified so far
- Collected from outside experts, District staff, community, other



PM Symposium: Evaluation of Potential Actions (DRAFT, For Discussion Only)

Number	Category	Potential Actions	Authority
1	Planning	Establish goal for PM reductions below current standard (8-10 ug/m3)	District
2	Regulations	Set more stringent state PM standards	State
3	Planning	Classify undifferentiated PM as toxic air contaminant	State
4	Planning	Improve emission estimation methods for emerging source categories (e.g., tires & brakes, road dust)	State
5	Planning	Develop Air District PM plan updated with new information	District
6	Planning	Set improved UFP filtration requirements for on-road vehicles	Federal
7	Policy	Attack PM from all directions, including regional, local, and hyper-local	District
8	Planning	Include sources that have slipped through cracks before in air toxics programs	District
9	Air Quality	Make air quality data more accessible and closer to real time	District
10	Planning	Reassess need to regulate smaller sources not of regional significance	District
11	Planning	Take aggressive action to reduce PM, additional PM reduction in PM results in additional improvement in public health	District
12	Planning	No single answer, no silver bullet, rather silver buckshot	District
13	Planning	Consider children and low SES groups especially	District
14	Planning	Factor in secondary PM, since nearly half (47%) of PM is secondary, formed in the air by photochemical processes	District
15	Planning	Regulate precursors of secondary PM (NOx, ROG, SO2, NH3), and see them as cumulative with local sources	District
16	Policy	Identify near-term actions, and roll them out early	District
17	Enforcement	Increase staff to implement/enforce Rule 11-18	District
18	Enforcement	Devote more staff to risk assessment for air toxics programs like Rule 11-18	District
19	Planning	Identify problematic local sources and deal with them faster	District
20	Permitting	Take into account cumulative impact in permitting	District



PM Symposium: Evaluation of Potential Actions (DRAFT, For Discussion Only)

Number	Category	Potential Actions	Authority	Council Member [NAME]			
				Impact	Agreement	Timing	Top 5
1	Planning	Establish goal for PM reductions below current standard (8-10 ug/m3)	District	L	Y	<1yr	1
2	Regulations	Set more stringent state PM standards	State	L	Y	<3yr	3
3	Planning	Classify undifferentiated PM as toxic air contaminant	State	L	Y	<3yr	
4	Planning	Improve emission estimation methods for emerging source categories (e.g., tires & brakes, road dust)	State	M	Y	<5yr	
5	Planning	Develop Air District PM plan updated with new information	District	L	Y	<1yr	2
6	Planning	Set improved UFP filtration requirements for on-road vehicles	Federal	M	?	<10yr	
7	Policy	Attack PM from all directions, including regional, local, and hyper-local	District	L	Y	<3yr	
8	Planning	Include sources that have slipped through cracks before in air toxics programs	District	M	Y	<3yr	
9	Air Quality	Make air quality data more accessible and closer to real time	District	M	Y	<1yr	
10	Planning	Reassess need to regulate smaller sources not of regional significance	District	M	Y	<1yr	
11	Planning	Take aggressive action to reduce PM, additional PM reduction in PM results in additional improvement in public health	District	L	Y	<3yr	
12	Planning	No single answer, no silver bullet, rather silver buckshot	District	L	Y	<1yr	
13	Planning	Consider children and low SES groups especially	District	M	Y	<1yr	
14	Planning	Factor in secondary PM, since nearly half (47%) of PM is secondary, formed in the air by photochemical processes	District	L	Y	<3yr	
15	Planning	Regulate precursors of secondary PM (NOx, ROG, SO2, NH3), and see them as cumulative with local sources	District	L	Y	<3yr	
16	Policy	Identify near-term actions, and roll them out early	District	L	Y	<1yr	4
17	Enforcement	Increase staff to implement/enforce Rule 11-18	District	M	?	<3yr	
18	Enforcement	Devote more staff to risk assessment for air toxics programs like Rule 11-18	District	S	?	<1yr	
19	Planning	Identify problematic local sources and deal with them faster	District	L	Y	<1yr	
20	Permitting	Take into account cumulative impact in permitting	District	M	?	<3yr	



PM Symposium: Next Steps

- Further input from **stakeholders**
- Compilation and analysis of **policy/regulatory options**
- Development of **findings and recommendations**
- **Presentation** to Board and Staff



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AGENDA: 15

Spare the Air Advertising Campaign Video and Update

**Board of Directors Meeting
July 15, 2020**

**Kristine Roselius
Acting Communications Officer**

Spare the Air 2020 Campaign



- New advertising & outreach campaign with remote work focus
- Remote work benefits: clean air, cost savings and better work/life balance
- Advertising in multiple languages
- Digital and streaming TV
- Reassess advertising mediums in coming weeks





BAY AREA
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AGENDA: 16

Air Quality During Shelter-in-Place

**Board of Directors Meeting
July 15, 2020**

**Michael Flagg
Principal Air Quality Specialist**

Overview



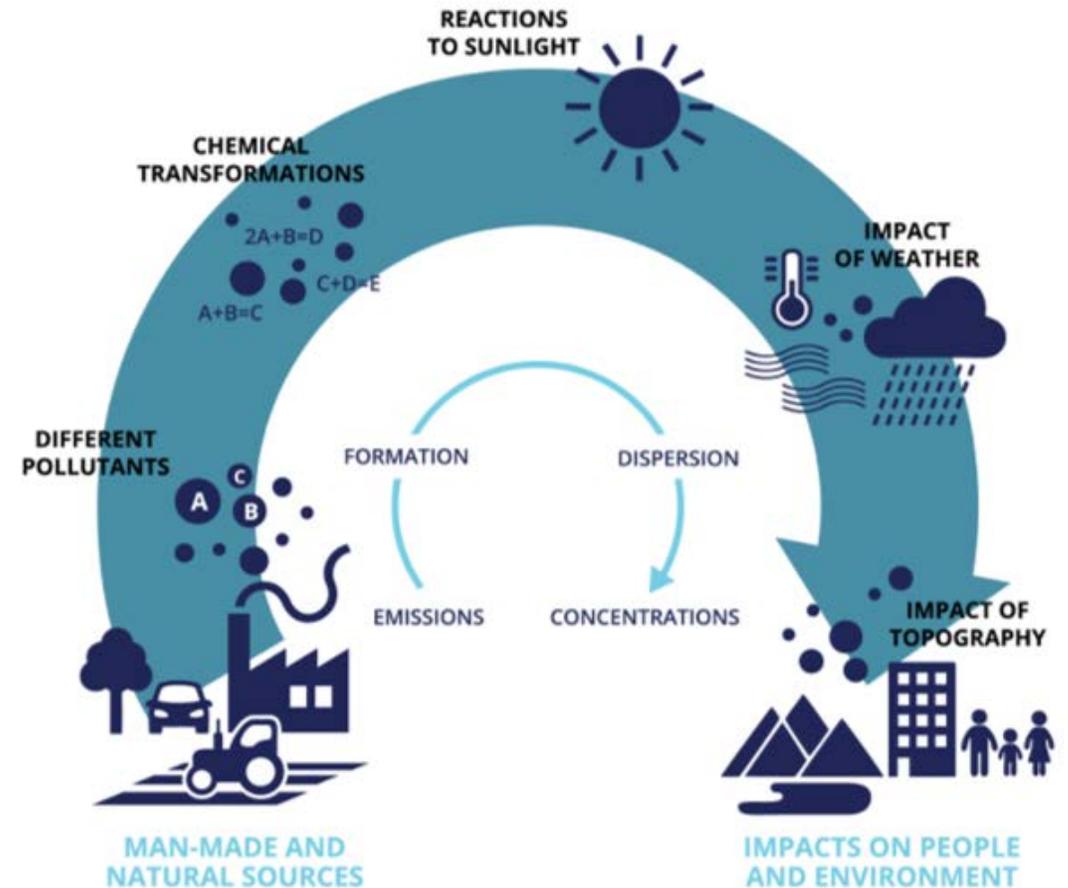
- Factors Affecting Air Quality
- Estimates of Emission Reductions
- Overview of Particulate Matter_{2.5} (PM_{2.5}) Network
- Analysis of PM_{2.5} During Shelter-in-Place Compared to Spring Months in Previous Years
- Challenges



Factors Affecting Air Quality



- Pollutant concentrations vary in time and space due to:
 - Natural background sources
 - Nearby emissions ←
 - Transport from other areas
 - Meteorology
 - Chemical reactions
 - Topography

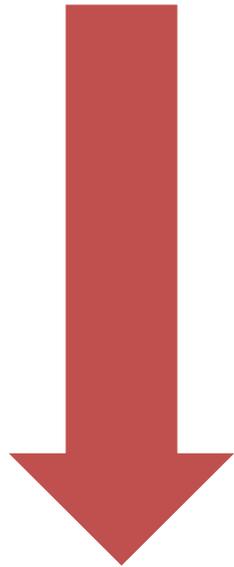


Source: EEA, 2015, Air Quality in Europe, 2015 Report

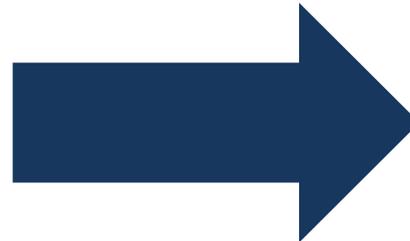
Estimates of Emission Reductions



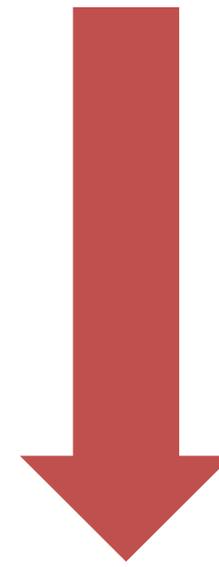
Traffic (VMT)



50% to 85%
*(per traffic counts
and cell phone
tracking data)*



Total Emissions

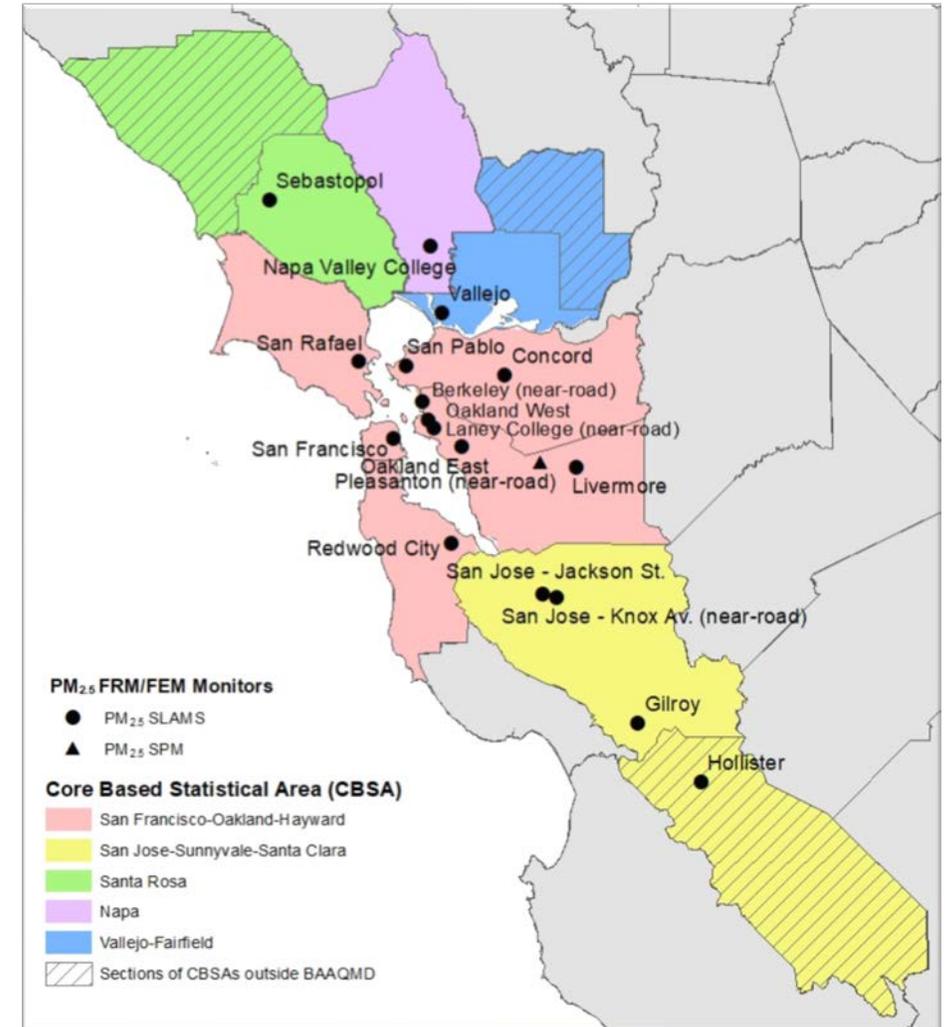


Carbon Dioxide
(CO₂): 20% to 30%
PM_{2.5}: 15% to 25%
Oxides of Nitrogen
(NO_x): 30% to 45%

PM_{2.5} Fixed Site Network



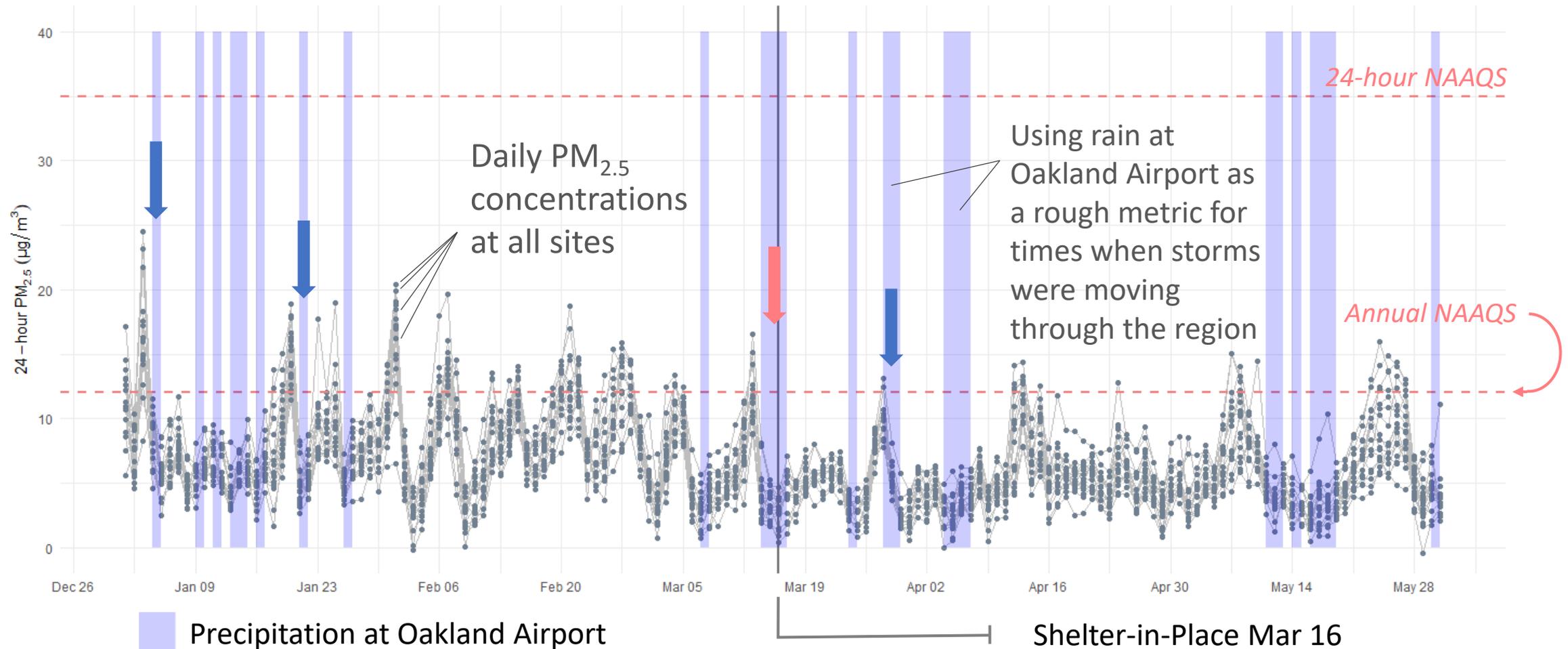
- PM_{2.5} network is designed to meet Environmental Protection Agency (EPA) federal monitoring requirements and other local objectives
- Currently, the Air District operates 17 PM_{2.5} monitoring sites throughout the region
- The network includes four (4) near-road sites



2020 Daily (24-hour) PM_{2.5} Timeseries



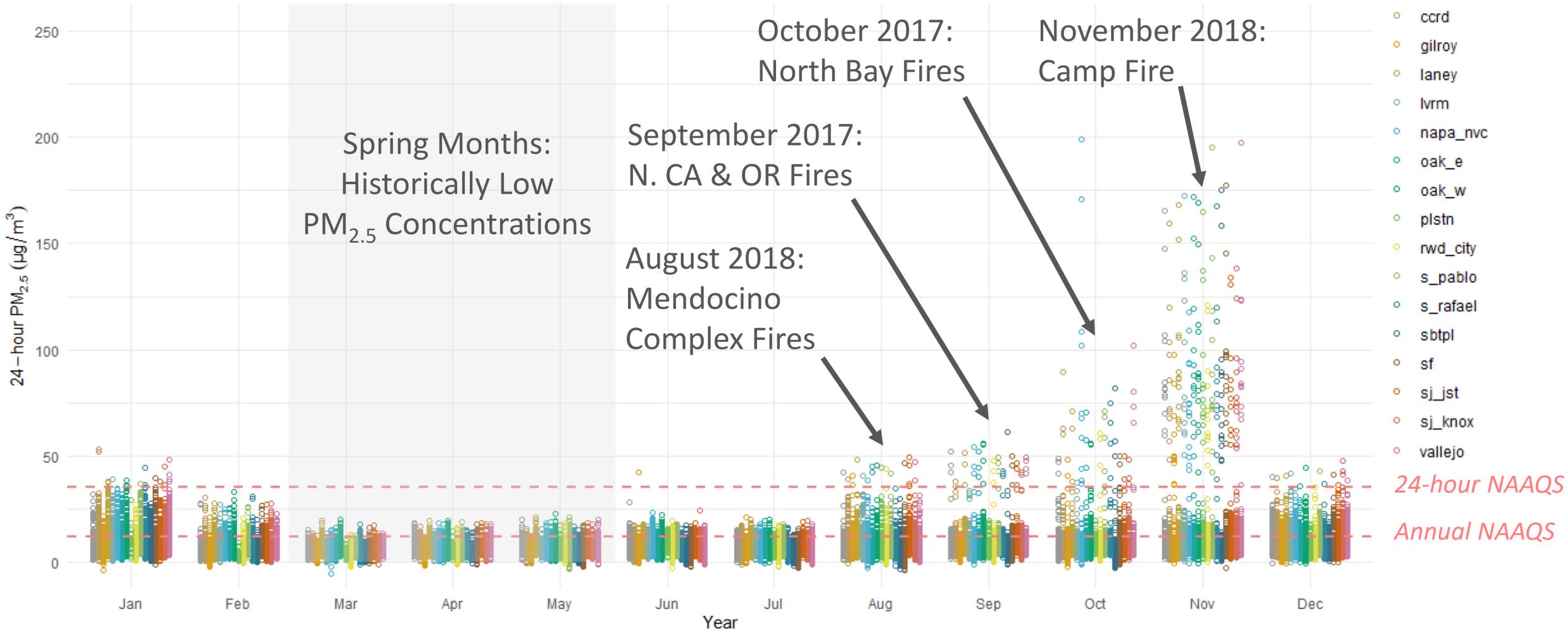
Bay Area PM_{2.5} Jan – May 2020



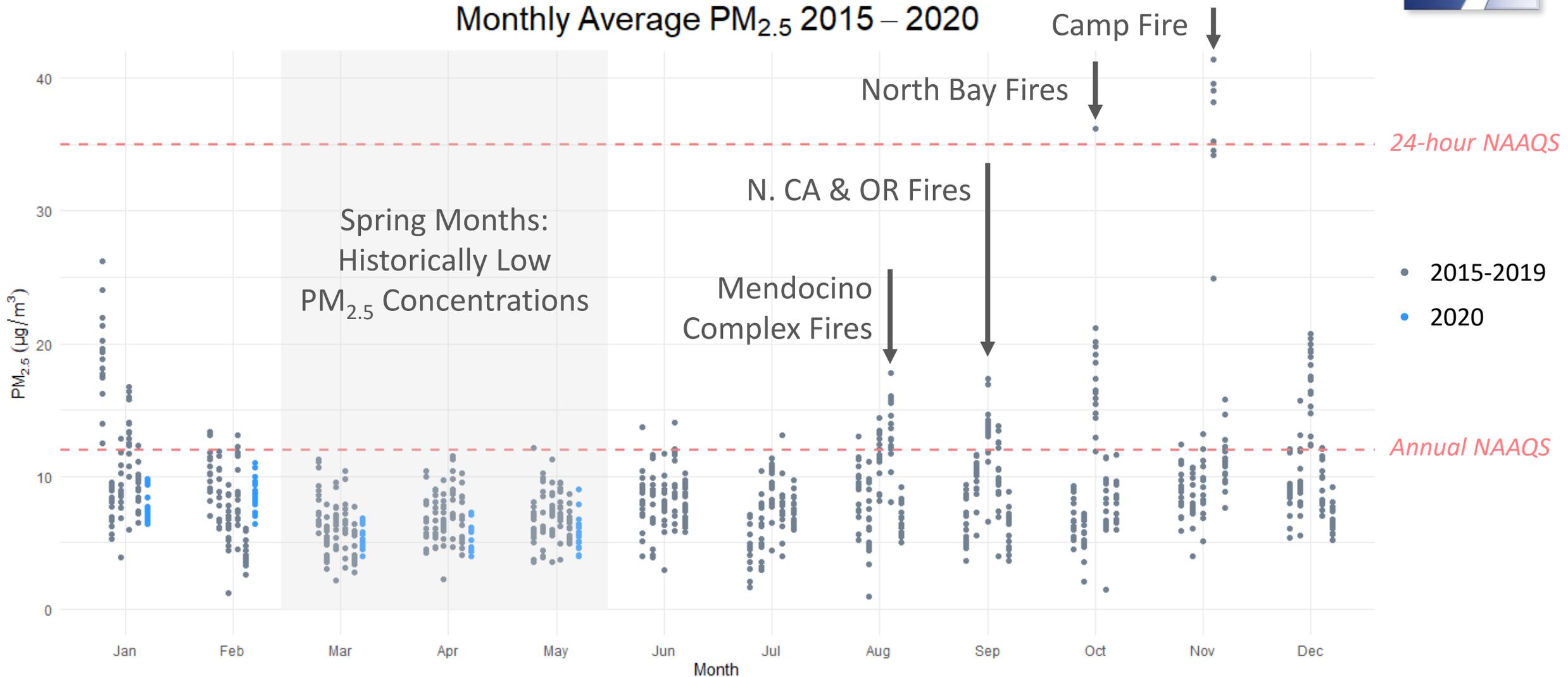
Historical Variation in Daily PM_{2.5}



24 – hour PM_{2.5} by Month 2015 – 2019



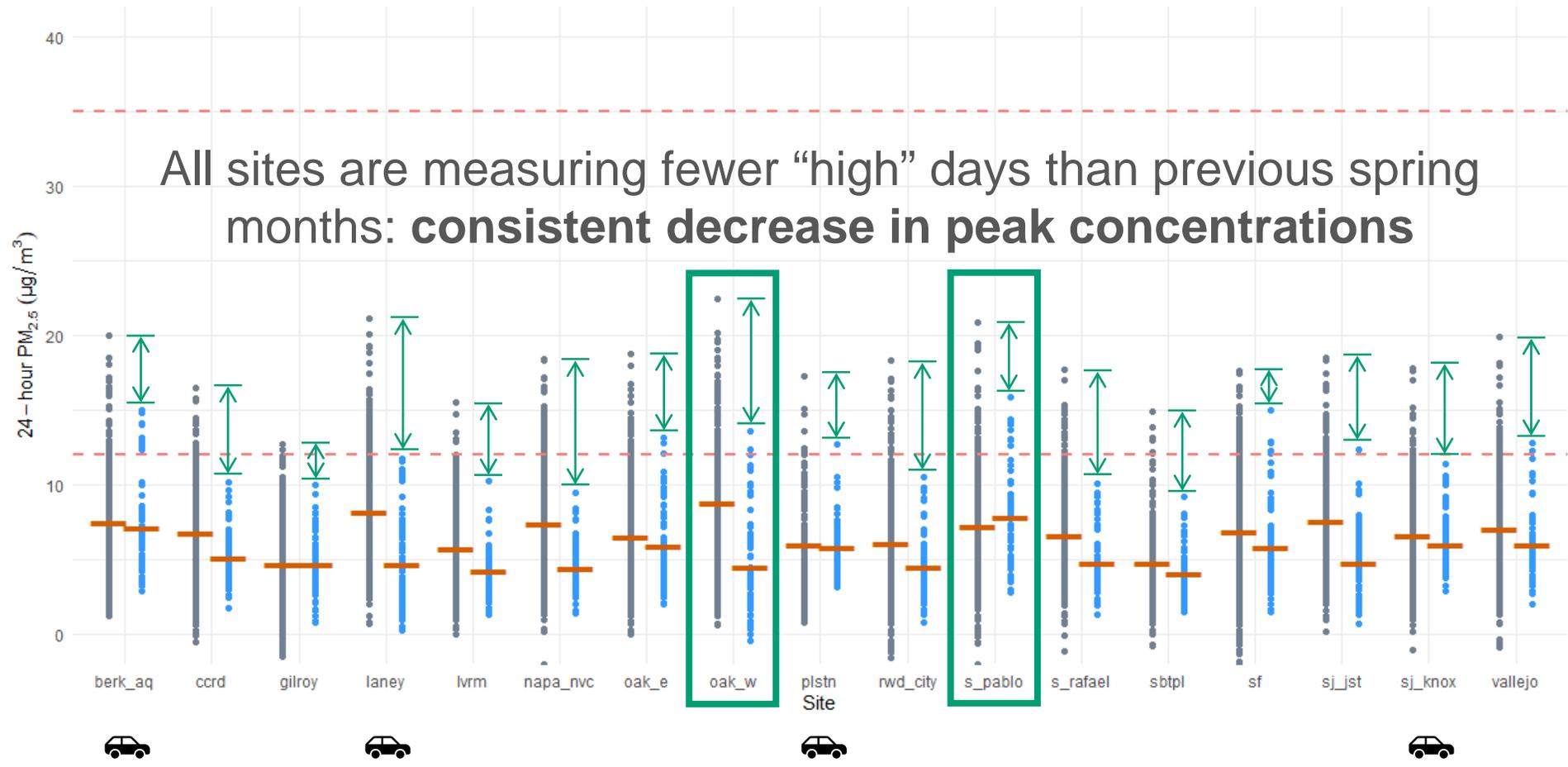
Historical Variation in Monthly Averages



Comparison to Previous Spring Months



Bay Area PM_{2.5} (March – May) 2015 – 2020



All sites are measuring fewer “high” days than previous spring months: **consistent decrease in peak concentrations**

- Historical:
 - (Mar - May 2015-2019 & Mar 1 – Mar 15, 2020)
- Shelter-in-Place:
 - (Mar 16 – May 31, 2020)
- Average Concentration
- 🚗 Near-Road Site

Summary of Observations



- Concentrations during shelter-in-place have been **low**, but also occurring during the **lowest time of year**
- Changes in mobile source emissions and PM_{2.5} concentrations are **not uniform throughout the region**
- Reductions in mobile source emissions may have **greater benefit at some locations**

Summary of Observations (Cont'd)



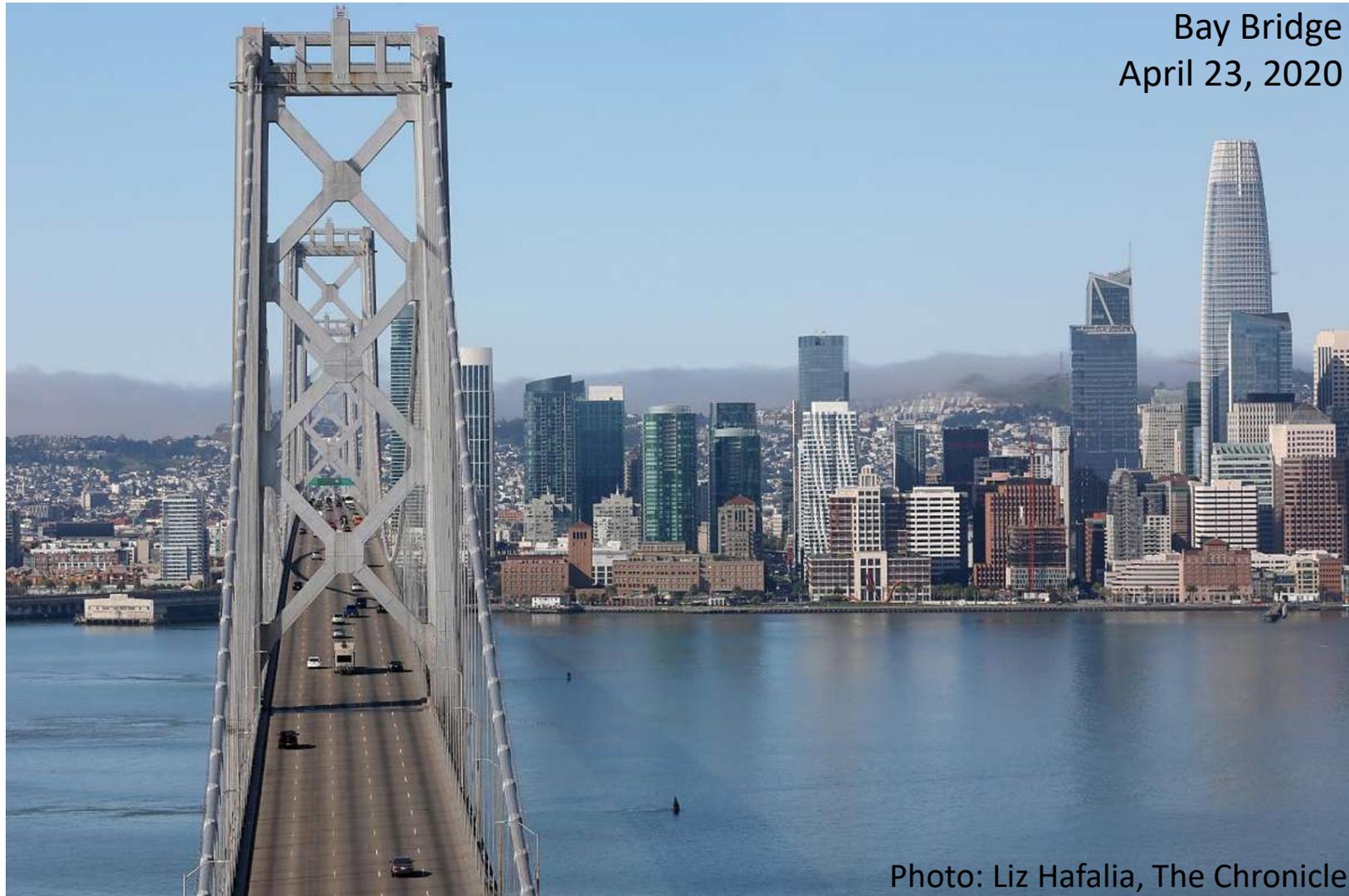
- Some sites measuring **lower average concentrations** compared to previous spring months, others measuring **similar concentrations**
- All sites are measuring fewer “high” days than previous spring months... so, there is a **consistent decrease in peak concentrations**
- How PM_{2.5} concentrations are changing is **site specific**: diurnal profiles and day-of-week patterns

Challenges



- Assessing causality remains difficult due to a number of confounding factors:
 - Seasonally
 - Favorable meteorology for low concentrations during spring months
 - Year-to-year variability
 - Measurement uncertainty at low concentrations

Questions



Bay Bridge
April 23, 2020

Photo: Liz Hafalia, The Chronicle