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CITY CLERK'S OFFICE

Regular Council Meeting

August 14, 2025

FRESNO CITY COUNCIL

City of FRESNO

Public Comment Packet

ITEM(S)

9:20 A.M. (ID 25-1026)

HEARING to Consider Annexation Application No. P21-05778; Pre-zone Application No. P21-05870; Development Permit Application No. P23-00149; and related Environmental Assessment No. P21-05778/P21-05870/P23-00149 for ±80.91 acres of property located on the west side of South Cherry Avenue between East North and East Central Avenues (Council District 3)

[TITLE TRUNCATED FOR SUPPLEMENTAL PACKET COVER PAGE]

Contents of Supplement: Public Comment Received

Supplemental Information:

Any agenda related public documents received and distributed to a majority of the City Council after the Agenda Packet is printed are included in Supplemental Packets. Supplemental Packets are produced as needed. The Supplemental Packet is available for public inspection in the City Clerk's Office, 2600 Fresno Street, during normal business hours (main location pursuant to the Brown Act, G.C. 54957.5(2). In addition, Supplemental Packets are available for public review at the City Council meeting in the City Council Chambers, 2600 Fresno Street. Supplemental Packets are also available on-line on the City Clerk's website.

Americans with Disabilities Act (ADA):

The meeting room is accessible to the physically disabled, and the services of a translator can be made available. Requests for additional accommodations for the disabled, sign language interpreters, assistive listening devices, or translators should be made one week prior to the meeting. Please call City Clerk's Office at 621-7650. Please keep the doorways, aisles and wheelchair seating areas open and accessible. If you need assistance with seating because of a disability, please see Security.

From:	Ben Granholm
To:	Clerk; Todd Stermer
Cc:	Ethan Smith
Subject:	SUPPORT: ID 25-1026 – Crown Enterprises Project
Date:	Tuesday, August 12, 2025 9:23:11 AM
Attachments:	8.12.25 - INVEST Fresno - Crown Enterprises Letter.pdf

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External Email: Use caution with links and attachments

On behalf of INVEST Fresno—a coalition of Fresno residents, businesses, and community organizations committed to building a diverse and sustainable economy—we are writing to express our strong support for Annexation Application No. P21-05778; Pre-zone Application No. P21-05870; Development Permit Application No. P23-00149; and the related Environmental Assessment (collectively, the "Crown Enterprises Project").

The Crown Enterprises Project embodies exactly the kind of investment Fresno should prioritize. Crown Enterprises has a long and respected history in our community. By continuing and expanding its operations here, the company is reaffirming its commitment to Fresno—bringing new jobs, generating additional tax revenue for critical city services, and exceeding environmental standards in the process.

Please don't hesitate to reach out with any questions.

Thank you,

--
Ben Granholm
Executive Director
INVEST Fresno
www.INVESTFresnoCA.com

INVEST FRESNO in Community. in Jobs. in Our Future.

INVESTFresnoCA.com

August 12, 2025

Mike Karbassi, President
Fresno City Council
2600 Fresno Street
Room 3065
Fresno, CA 93721

Submitted via Email

RE: SUPPORT – ID 25-1026 – Annexation Application No. P21-05778; Pre-zone Application No. P21-05870; Development Permit Application No. P23-00149; and related Environmental Assessment

Dear Council President Karbassi and City Council,

On behalf of INVEST Fresno—a coalition of Fresno residents, businesses, and community organizations committed to building a diverse and sustainable economy—we are writing to express our strong support for Annexation Application No. P21-05778; Pre-zone Application No. P21-05870; Development Permit Application No. P23-00149; and the related Environmental Assessment (collectively, the "Crown Enterprises Project").

The City of Fresno is at a pivotal moment—choosing whether to harness its unique advantages of location and workforce to build a next-generation economy, or risk forfeiting its position as the Valley's economic leader to neighboring Madera and Tulare counties.

For the past two years, Fresno has faced budget deficits, a challenge tied directly to the strength of our local economy. Attracting new businesses and supporting the growth of existing ones expands and diversifies the city's tax base, increasing property tax, sales tax, and business license revenue without raising rates on residents. A broader and more stable revenue base is key to sustainable economic development—development that grows city revenues, creates jobs, and enhances quality of life.

The Crown Enterprises Project embodies exactly the kind of investment Fresno should prioritize. Crown Enterprises has a long and respected history in our community. By continuing and expanding its operations here, the company is reaffirming its commitment to Fresno—bringing new jobs, generating additional tax revenue for critical city services, and exceeding environmental standards in the process.

The recent groundbreaking of the Scannell Properties project is a direct example of the types of investments that employers are willing to make in Fresno and its residents. We see firsthand how projects like this create ripple effects that go far beyond the construction site and bring a wide range of jobs to local families, generate revenue to support city services, and send a strong message that Fresno is a place worth investing in. As our community continues to grow, we need more smart, forward-looking development to meet the evolving needs of our people and economy.

SCSP Economic & Community Benefits

South Central Fresno is the city's economic engine. While fewer than one-quarter of one percent of Fresno's residents live within the 5,629-acre planning area, this area accounts for 7.5% of the city's land, generated approximately $13 billion in economic activity in 2022 (35% of the city's total output), and contributed over $102 million in tax revenue (21% of the General Fund). A full breakdown of these impacts is available at [redacted]*.com/EconomicImpact*.

As Fresno addresses budget deficits, strengthening the General Fund through the approval of projects that bring new investment—while retaining and expanding long-standing businesses—benefits all residents. These revenues directly support essential services like public safety, parks, infrastructure improvements, and countless other community programs residents rely on daily.

Air Quality Improvements

The Valley's geography and climate—surrounded by mountains and subject to temperature inversions—can trap pollutants, leading to high pollution rankings for cities like Fresno, Visalia, and Bakersfield. But the story is not without hope.

Since 1980, emissions from stationary sources have dropped by 85%. Federal regulations have cut mobile source emissions by 99% since 1970, with heavy-duty trucks now roughly 99% cleaner than their 1970 counterparts. Valley residents' exposure to elevated ozone has fallen by 90%, and fine particulate matter (PM2.5) by 85%, resulting in a 95% reduction in cancer risk from air pollutants, according to the San Joaquin Valley Air Pollution Control District.

Importantly, these dramatic improvements occurred while Fresno's population grew 2.5 times larger and its economy more than doubled in size—demonstrating that clean air and economic growth can and do work together.

Public Support

A 2024 public opinion survey commissioned by INVEST Fresno—representative of voters across all seven council districts—found overwhelming support for the city's

retail distribution and warehousing sector. Fully 71% of respondents see the industry as a net positive for the community, with 39% citing jobs and wages as their top reason for support. Additional survey findings are available at *INVESTFresnoCA.com/Survey*.

Conclusion

If Fresno is to continue raising living standards and expanding opportunities—particularly for low-income families—we must remain committed to a diverse and growing economy. Turning away from growth now would risk reversing decades of progress and push more families into poverty.

A strong economy and sensible air quality policies are not mutually exclusive. The transition to zero-emission heavy-duty trucks will only be possible if Fresno maintains the economic strength to afford and adopt this technology.

Crown Enterprises has long been a valued part of our local economy, employing residents and investing in Fresno's future. We respectfully urge the City Council to approve the Crown Enterprises Project—ensuring continued economic vitality, career opportunities, and community benefits for years to come.

Sincerely,

[redacted]

Ethan Smith
Chairman

[redacted]

Ben Granholm
Executive Director

cc: Fresno City Council
Mayor Jerry Dyer

From:	DePew, Rosa@EDD
To:	Clerk
Subject:	Prezoning meeting August 14, 2025
Date:	Tuesday, August 12, 2025 2:02:32 PM
Attachments:	Fresno City Council Prezoning Letter August 12 2025.docx

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External Email: Use caution with links and attachments

Hello,

Here is a submission for the meeting on August 14, 2025 at 9 AM. Please present to the Fresno City Council

Sincerely,

Rosa DePew
[redacted]
Fresno CA 93706
[redacted]

August 12th, 2025

Fresno City Council
City Hall Council Chamber, 2nd Floor,
2600 Fresno Street, Fresno, CA 93721

Dear Fresno City Council,

My name is Rosa DePew. I am a resident of Fresno County. I am an officer on the school board of Orange Center Elementary. I am writing to you to urge you to deny Annexation Application No.P21-05778, Pre-zone Application No. P21-05870, and Development Permit Application No. P23-00149 to protect the health, safety, and wellbeing of the students, teachers and staff who attend and work at Orange Center Elementary, and of the residents who live on Cherry Ave, Daleville, and surrounding disadvantaged unincorporated communities. I oppose this project because I am concerned about the impacts to our air quality from the emissions of heavy-duty truck traffic, traffic safety concerns, especially for the families commuting to Orange Center Elementary, and the longer-term implications of industrial development less than a mile away from an elementary school.

The proposed annexation, prezoning to heavy industrial, and development permit for Central Transport in South Central Fresno will exacerbate already poor environmental and health conditions in the community. Conditions in South Central Fresno are so critical that the community of South Central Fresno was selected as one of the first communities for the AB 617 Community Air Protection Program to develop a Community Emissions Reduction Program and the Community Air Monitoring Program. The community of South Central Fresno worked for at least a year to develop strategies to reduce emissions including rerouting truck traffic from Cherry Ave. The community has also heavily engaged in and pushed for the development and adoption of a South Central Specific Plan to provide safeguards to protect residents from further industrial development. At this point, the City should be working to address existing issues instead of considering more projects that will create a larger impact to residents.

In 2024, the City of Fresno conducted a Health Impact Assessment (HIA) which found that South Fresno residents were more likely to live closer to a major street, truck route, or freeway, and as a result residents were more exposed to PM 2.5, ozone, and diesel particulate matter. The HIA found that South Central Fresno residents had a significantly higher risk of experiencing a pre-term birth and infant mortality. Emergency room visits or hospitalization due to asthma or cardiovascular issues were found to be more prevalent in South Central Fresno than in other areas of the City, specifically for residents living within 1000 feet of a highway or truck route. In fact, residents in South and Southwest Fresno have a 20 year less life expectancy than residents in other areas of Fresno.

My experience living near industrial operations has contributed or impacted me by health issues that plagued my family members. My brothers, sister and father all died at a younger age after dealing with health issues that were worsened by air quality and contamination. My mother is dealing with health issues currently.

Our area of town may be seen to many as an undesirable area to live in. Modest homes with bad roads and bad air pollution to breathe. But we are proud humble people. We strive to live our lives humbly and respectfully and to contribute to the community. Our area has contributed many successful people to the community. Many are now doctors, lawyers, teachers, and respectful citizens of the community. South Central Fresno deserves to be treated with respect. South Central Fresno needs to be allowed to continue to raise bright, healthy, contributing members of society. Please, for the sake of disadvantaged communities, stop industrial growth in South Central Fresno. Keep our communities safe and healthy!

Again, I urge you to please deny Annexation Application No.P21-05778, Pre-zone Application No. P21-05870, and Development Permit Application No. P23-00149 to protect the community of South Central Fresno from continued industrial growth in our backyards.

Rosa DePew
[redacted]
Fresno CA 93706
[redacted]

From:	Kristi Bascom
To:	Clerk
Cc:	Edward T. Schexnayder; Carmen J. Borg
Subject:	Public comment on 8/14/2024 City Council agenda Item ID 25-1026
Date:	Tuesday, August 12, 2025 6:08:00 PM
Attachments:	image001.png image002.png SMW-SFCA So Fresno Annexation Comment letter CC item ID 25-1026.pdf

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External Email: Use caution with links and attachments

Mayor Dyer and Members of the City Council (via the City Clerk's Office),

On behalf of Edward Schexnayder and firm clients South Fresno Community Alliance, please accept this comment letter (attached) for **Item ID 25-1026 on the August 14, 2025 Fresno City Council agenda**, a hearing to Consider Annexation Application No. P21-05778; Pre-zone Application No. P21-05870; Development Permit Application No. P23-00149; and related Environmental Assessment No. P21-05778/P21-05870/P23-00149 for ±80.91 acres of property located on the west side of South Cherry Avenue between East North and East Central Avenues (Council District 3).

The attachments that accompany this letter are provided in two ways:

1. Via this link to a One Drive folder: Attachments A-N, optimized.pdf
2. Due to file size, directly sent in two separate emails to follow.

Please respond if either the attached letter or the One Drive link to the attachments are not readily accessible.

Kind regards,
Kristi Bascom

Kristi Bascom, AICP
Urban Planner
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San Francisco, CA 94102-4421
o: 415/552-7272 x 202 c: 925/872-6327
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Edward T. Schexnayder
Attorney
schexnayder@smwlaw.com

August 13, 2025

Via E-Mail only

Mayor Dyer and
Members of the City Council
City of Fresno
2600 Fresno Street
Fresno, California 93721
clerk@fresno.gov

Re: Comments on the Annexation, Rezoning, and Development Application for the Central Transport Regional Facility and related Initial Study/Mitigated Negative Declaration-Environmental Assessment No.P21-05778/P21-05870/P23-00149

Mayor Dyer and Members of the City Council:

On behalf of the South Fresno Community Alliance ("SFCA"), we have reviewed the Initial Study/Mitigated Negative Declaration ("MND") prepared in connection with the proposed Annexation Application No. P21-05778; Pre-zone Application No. P21-05870; Development Permit Application No. P23-00149 for the Central Transport Regional Facility ("CTRF Project").[1] SFCA has serious concerns about the environmental impacts of the Project as currently proposed. As discussed below, the proposed CTRF Project and other future Heavy Industrial facilities would be located within .27 miles of Orange Elementary School and several residential communities.

Although there are residences located across the road from the CTRF Project site, and an elementary school only .27 miles away, the MND makes no meaningful effort to direct traffic away from these sensitive receptors or to decrease project emissions. Add Cite to Map. The Project's environmental documentation should have included additional mitigation measures and an alternatives analysis to minimize the Project's impacts,

[1] Throughout this letter we refer to the proposed annexation/pre-zone/development permit applications together as the "Project" and we refer to the development permit application as the "CTRF Project."

including public safety, air pollution and noise impacts. Such alternatives—including a reduced scale alternative—would ensure that these impacts to existing residents and children are reduced.

The current MND for the Project violates the minimum standards for an environmental document under the California Environmental Quality Act ("CEQA"), Public Resources Code § 21000 et seq., and the CEQA "Guidelines," California Code of Regulations, title 14, § 15000 et seq. As discussed below, the MND fails to adequately describe the existing conditions or the whole of the Project—including the entirety of the proposed annexation—fails to analyze the full range and severity of environmental impacts, including potentially significant effects related to transportation and public safety, air quality, noise, and loss of agricultural land; and fails to adequately mitigate for significant impacts. *See* Exhibit N to the Planning Commission June 18, 2025 Staff Report (containing the MND). All of these impacts must be more fully addressed and mitigated before the City may approve the Project.

In addition, as discussed throughout this letter, evidence in the record presents a fair argument that the Project will result in significant impacts that require that the City prepare an EIR so that the public and decision-makers receive a proper analysis of the Project's significant environmental impacts and feasible mitigation for those impacts. See CEQA Guidelines § 15002(a)(1) (listing as one of the "basic purposes" of CEQA to "[i]nform governmental decision makers and the public about the potential, significant environmental effects of proposed activities").

I. The City May Not Approve the Project Without Preparing an Environmental Impact Report Under CEQA.

CEQA is designed to ensure that "the long-term protection of the environment shall be the guiding criterion in public decisions." *Friends of College of San Mateo Gardens v. San Mateo County Community College District* (2017) 11 Cal.App.5th 596, 604 ["*San Mateo Gardens II*"] (quoting *No Oil, Inc. v. Los Angeles* (1974) 13 Cal.3d 68, 74). An agency evaluating a project's environmental impacts must develop an EIR whenever "substantial evidence supports a fair argument that a proposed project 'may have a significant effect on the environment.'" *Committee for Re-Evaluation of T-Line Loop v. San Francisco Municipal Transportation Agency* (2016) 6 Cal.App.5th 1237, 1245-46 (quoting *Laurel Heights Improvement Assn. v. Regents of University of California* (1993) 6 Cal.4th 1112, 1123).

The fair argument standard establishes a "low threshold" for requiring a lead agency to prepare an EIR. *Pocket Protectors v. City of Sacramento* (2004) 124 Cal.App.4th 903, 928. Courts "owe no deference to the lead agency's determination," and

judicial review must show "*a preference for resolving doubts in favor of environmental review.*" *Id.* (italics in original). Further, where the agency fails to study an entire area of environmental impacts, deficiencies in the record "enlarge the scope of fair argument by lending a logical plausibility to a wider range of inferences." *Sundstrom v. County of Mendocino* (1988) 202 Cal.App.3d 296, 311.

Substantial evidence supporting a fair argument may consist of personal observations of local residents on nontechnical subjects (*Oro Fino Gold Mining Corp. v. Cty. of El Dorado* (1990) 225 Cal.App.3d 872, 882; *Protect Niles v. City of Fremont* (2018) 25 Cal.App.5th 1129, 1152) as well as expert opinion supported by facts—even if that opinion is not based on a specific analysis of the project at issue (*Pocket Protectors*, 124 Cal.App.4th at 928). In marginal cases, where it is not clear whether there is substantial evidence that a project may have a significant impact and there is a disagreement among experts over the significance of the effect on the environment, the agency "must treat the effect as significant" and prepare an EIR. CEQA Guidelines § 15064(g); *City of Carmel-By-The-Sea v. Board of Supervisors*, (1986) 183 Cal.App.3d 229, 245.

As discussed below, ample evidence supports a "fair argument" that the Project may result in significant environmental impacts that were not properly analyzed and mitigated in the MND. Potentially significant impacts not adequately analyzed in the MND include, but are not limited to, transportation and public safety, air quality, noise, and loss of agricultural land. Because the Project has the potential to result in significant impacts, the City is required to prepare an EIR before it may approve the Project.

The MND's failings will most directly and significantly impact low-income, disadvantaged residents and communities in South Fresno, especially communities of color. The City must prepare an EIR to provide the community and the broader public an accurate assessment of the environmental issues at stake, and a mitigation strategy—developed *before* Project approval—that fully addresses the Project's significant impacts. The City must also take a serious look at alternatives that can avoid or lessen most of the Project's significant impacts.

II. The MND's Flawed Description of the Existing Environmental Setting and the Proposed Project Does Not Permit Meaningful Environmental Review.

A. Existing Setting

The MND fails to describe the Project's environmental setting as required by CEQA. An environmental document "must include a description of the physical environmental conditions in the vicinity of the project, as they exist at the time the notice

of preparation is published, or if a notice of preparation is not published, at the time environmental analysis is commenced, from both a local and regional perspective." CEQA Guidelines § 15125(a). This description of the environmental setting constitutes the baseline physical conditions against which a lead agency determines the significance of an impact. *Id.* "Knowledge of the regional setting is critical to the assessment of environmental impacts." CEQA Guidelines § 15125(c). Without such an understanding, any impacts analysis or proposed mitigation becomes meaningless.

Accurate and complete information pertaining to the setting of the project and surrounding uses is critical to an evaluation of a project's impact on the environment. *San Joaquin Raptor/Wildlife Center v. Stanislaus County*, 27 Cal.App.4th 713, 728 (1994); see also *Friends of the Eel River v. Sonoma County Water Agency*, 108 Cal.App.4th 859, 875 (2003) (incomplete description of the Project's environmental setting fails to set the stage for a discussion of significant effects). Here, the MND's deficiencies in describing the Project's environmental setting undermine its adequacy as an informational document.

The MND fails to present important contextual information related to residential communities in the area around the Project. For example, the MND disregards existing residences located immediately adjacent to the proposed Project site. Instead, the MND skips over a description of the existing setting and highlights planned uses, existing zoning, and existing uses (which do not acknowledge all of the residences). MND at PDF p. 9. The MND's analysis of the Central Transport Regional Facility's potential to change the visual character of the area similarly states that the "proposed site is located in an industrialized area, within and adjacent to the City, surrounded primarily by commercial logistics, warehouses, and auto repair businesses." MND at PDF p. 17. As discussed below, this is a blatant mischaracterization of the area surrounding the proposed development site.

The proposed CTRF facility would be located in close proximity to several residential communities, with several residences located immediately adjacent and across the street from the facility. Attach. A, Figure Showing Residential Areas near CTRF Project site and whole annexation/rezoning area. These and other nearby communities have been designated as "Disadvantaged Communities" by the California Office of Health Hazard Assessment ("OEHHA").[2] Attach. B, CalEnviroScreen Data for Census Tracts 6019001500, 6019001700, and 6019001800. The census tracts surrounding the Project site and nearby designated truck routes predominantly identify as Hispanic, and

[2] See Disadvantaged Communities Map, California Office of Environmental Health Hazard Assessment, available at https://oehha.maps.arcgis.com/apps/View/index.html?appid=c3e4e4e1d115468390cf61d9db83efc4.

are already heavily burdened by pollution—particularly ozone, PM2.5, and diesel emissions. *Id.*[3] Local residents rank in the 90th-100th percentile for pollution burden and experience high levels of asthma, poverty, unemployment, and housing burden.[4] Moreover, the community of Daleville, located just one-half mile south of the CTRF Project site, is designated as a Disadvantaged Unincorporated Community ("DUC") in the Local Agency Formation Commission (LAFCO) Disadvantaged Unincorporated Communities Database.[5] Attach. N LAFCO Disadvantaged Unincorporated Communities Database at p. 13. Accordingly, nearby residents are those most at risk of environmental harm from the proposed Project. Notwithstanding these data, the MND fails to take these neighbors into account.

In addition, the MND fails to incorporate critical findings from the Truck Reroute Study, and its associated Fresno Health Impact Assessment ("Fresno HIA") by UC Merced regarding the severity of existing air quality and health risk conditions in the South Fresno and City of Fresno as a whole. See South Central Fresno AB 617 Community Truck Reroute Study Truck Routing and Implementation Strategies Report April 2024, attached as Attach. C and Fresno Community Environmental Health Impact Assessment, April 2024, attached as Attach. D. Cherry Avenue is identified as a City-designated truck route in the Fresno 2005 Truck Route Map. However, Cherry Avenue is only designated a truck route for the section under City jurisdiction. Attach. C at 28. Notably, the proposed truck reroute map removes Cherry Avenue as a designated truck route, thus traffic calming on Cherry Ave. would require diverting trucks altogether. Id. at Figure 4 (showing no "Future Planned Route" on Cherry Avenue south of North Avenue). Removing Cherry Avenue as a designated truck route is supported by the Fresno HIA, which recommends developing truck routes outside of a 1,000 foot buffer from areas where people live, work, and play. See, Attach. D Fresno HIA at 34. Approval of the Project would be directly counter to this recommendation, which was adopted in recognition of the existing pollution burden on South Fresno residents.

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[3] Data may be viewed by clicking on individual census tracts, including but not limited to census tracts 6019001500, 6019001700, and 6019001800. For convenience, selected data for these tracts are attached hereto as Attach. B.

[4] *Id.*

[5] Northeast Cherry and Central (Atkins Tract): This DUC is also known as "Daleville" and it consists of 42 properties. LAFCo estimates that there are 42 dwelling units located in an area of approximately 26 acres; the community has 68 registered voters. The Median Household Income was $38,973 between 2012 and 2016. The DUC is located within the Fresno SOI at the northeast corner of Cherry Avenue and Central Avenue.

In addition, The research conducted in the HIA found that South Fresno residents were more likely to live closer to a major street, truck route, or freeway, and as a result residents were more exposed to PM 2.5, ozone, and diesel pm. The HIA found that South Central Fresno residents had a significantly higher risk of experiencing a pre-term birth (PTB) and infant mortality (IM). Emergency room visits or hospitalization due to asthma or cardiovascular issues were found to be more prevalent in South Central Fresno than in other areas of the City, specifically for residents living within 1000 feet of a highway or truck route. The HIA also found that 43% of residents reported having at least one chronic health condition, According to the HIA, women of reproductive age (18-46 years) reported having an adverse pregnancy outcome, such as miscarriage (22%), stillbirth (3%), infant mortality (0.8%), or having a child with a birth defect (1.6%)[6]

Moreover, a 2015 health risk assessment prepared for the Downtown Neighborhoods Community Plan (DNCP), which is immediately adjacent to the South Central Fresno area, showed particulate matter concentrations from vehicle emissions near SR 99, SR 41, and SR 180 in the DNCP area indicate existing cancer risk to sensitive receptors exceeds 100 in a million at distances from 1,000 to 5,000 feet from the freeways. By omitting data and recommendations from these reports, the MND failed to incorporate information about the existing poor air quality conditions and impacts in the Project area. Describing these existing conditions is critical because they affect analysis of multiple issues, including cumulative impacts to air quality, public health, and public safety, among others.

As a result of these incomplete baseline characterizations, it is not possible to accurately determine the full scope or extent of the physical impacts that would result from the Project, which violates CEQA. The MND's inaccurate description of the Project's environmental setting frustrates the core goals of CEQA: to allow intelligent public participation and to provide an adequate environmental impact analysis. *See County of Inyo v. City of Los Angeles*, (1977) 71 Cal.App.3d 185, 197.

B. Project Description

Under CEQA, a clear and comprehensive description of the proposed project is critical to meaningful public review. *County of Inyo v. City of Los Angeles* (1977) 71 Cal.App.3d 185, 193. "An accurate, stable and finite project description is the sine qua non of an informative and legally sufficient" environmental document. *San Joaquin Raptor/Wildlife Rescue Center v. County of Stanislaus* (1994) 27 Cal.App.4th 713, 730 (quoting *County of Inyo v. City of Los Angeles* (1997) 71 Cal.App.3d 185, 193). As a

[6] See, Attach D Fresno Community Environmental Health Impact Assessment April 2024, University of California Merced. Pg.8.

result, courts have found that, the use of a "truncated project concept" violates CEQA and mandates the conclusion that the lead agency did not proceed in a manner required by law. *Id*.

Furthermore, "[a]n accurate project description is necessary for an intelligent evaluation of the potential environmental effects of a proposed activity." *Id*. (citation omitted). Thus, an inaccurate or incomplete project description renders the analysis of environmental impacts inherently unreliable. While extensive detail is not necessary, the analysis should describe proposed projects with sufficient detail and accuracy to permit informed decision-making. See CEQA Guidelines §15124.

Here, the MND's description of the Project is critically flawed for multiple reasons. First, and most egregiously, the MND fails to provide any description of the annexation beyond the CTRF Project site (aside from a statement that the Project area would be rezoned to Heavy Industrial) and of potential uses that could be developed once the entire area is annexed. The City has an obligation to describe what types of projects would be allowed under the new zoning, the type of infrastructure likely required, utilities and services likely needed, and other pertinent information.

Under well-settled law, an CEQA document must analyze a planning amendment's maximum development potential. As *City of Redlands v. County of San Bernardino* explained, "an evaluation of a first phase-general plan amendment must necessarily include a consideration of the larger project, i.e., the future development permitted by the amendment." (2002) 96 Cal.App.4th 398, 409 (emphasis added). Environmental review of potential development allowed by planning enactments must occur. *Christward Ministry v. Super. Ct.* (1986) 184 Cal.App.3d 130, 194-95; *City of Carmel-by-the-Sea v. County of Monterey* (1986) 183 Cal.App.3d 229, 235, 240-41 (an EIR must be prepared for rezoning even if "no expanded use of the property was proposed").

In this case, the proposed rezoning to an IH zoning district would allow the following uses by right on all private property throughout the annexation area: Motorcycle Riding Club, Maintenance and Repair Services, Construction and Materials Yard (includes Concrete Batch Plants, Storage Yards, and Similar Uses), Custom Manufacturing, Freight/Truck Terminals and Warehouses, and Major Utilities. See Fresno Municipal Code Table 15-1302: Land Use Regulations – Employment Districts. The rezoning needs to be analyzed for the foreseeable impacts resulting from the development of uses allowed in the zoning district. Rezoning to IH zoning will allow this area to transition in the same way as a number of adjacent uses. Similar uses within a one-mile radius of the proposed rezoning area, include numerous warehouse and logistics facilities, including Federal Express, Amazon, Kraft Foods, and Home Depot Distribution Center. All of these facilities, generate enormous amounts of truck traffic and related

noise and emissions. An EIR for the Project must include a description and impact analysis for the annexation and rezoning of the whole area.

Second, the MND fails to provide a stable, accessible project description at the start of the Initial Study as CEQA requires. Spreading a project description across multiple chapters and hiding the basic elements of the proposed action in appendices is impermissible. *San Joaquin Raptor Rescue Center v. County of Merced* (2007) 149 Cal.App.4th 645, 659 ("decision makers and [the] general public should not be forced to sift through obscure minutiae or appendices in order to ferret out" fundamental aspects of the project's description); *Vineyard, supra,* 40 Cal.4th at 442 ("[I]nformation 'scattered here and there in EIR appendices,'" or a report "buried in an appendix," is not a substitute for "a good faith reasoned analysis"). The MND's fractured, cryptic and muddled project description frustrates CEQA's goal of making the agency's decision-making accessible to the public. *Laurel Heights Improvement Assn. v. Regents of University of California* (1988) 47 Cal.3d 376, 392.

The MND does precisely what the courts have explicitly struck down. It presents a skeletal description of the Project at the beginning of the MND that offers scant information beyond the approvals being sought. The MND's project description lists the acreage and Accessor Parcel Numbers for the parcels being rezoned, the square footage of the various CTRF buildings proposed, and three paragraphs that briefly describe the fuel system, the proposed operating hours, the assumed number of truck and car trips, and one sentence regarding project operations. Additional information is scattered throughout the 889 pages of the MND. For instance, not until PDF page 195, in an attachment, does the MND include a proposed site plan. Similarly, the CTRF Project construction schedule is found on PDF page 140 and the construction equipment at PDF page 141. This approach hinders the reader's review of the Project.

In some cases, project features are not described at all. For example, the MND fails to describe what the facility will look like. No visual simulations, elevations, or information on building materials is provided. The MND states that "[D]etailed architectural plans, color palettes and building materials as well as landscaping plans will be submitted by the Project developer to the City of Fresno Planning and Development Department" and that the plans shall be required prior to issuance of any building permits. MND at PDF p. 17. The time for the City to gather information about what the CTRF Project will look like is now, not after project approval when it is too late for the public and decisionmakers to review and comment on the CTRF Project.

Moreover, this lack of information about how the Project will look implicates the MND's aesthetics analysis. Specifically, the MND's analysis of potential changes to visual character and other visual impacts is deficient in part due to the omitted details.

The MND's assertion that "Developments such as those proposed by the Project are typical of large city industrialized areas and are generally expected from residents of the City" does not relieve the City from the obligation of analyzing the impacts from proposed and foreseeable development. MND at PDF p. 17. Therefore, the MND's analysis of the Project's impacts to visual character is inadequate and an EIR for the Project must evaluate these impacts.

In another example, the MND indicates that the Project will include street lighting and landscaping, but fails to include information on either one. MND at PDF p.79. Once again, project details, such as lighting design, should have been disclosed as part of this MND so that the public and decision-makers can understand the planned illumination for the site. Lighting on the site would affect light and glare experienced by nearby residents, yet these impacts cannot be evaluated because the lighting design has not been included. Similarly, the MND states that landscaping will provide visual screening of the CTRF Project facility from vehicles travelling along S. Cherry Avenue, yet these impacts cannot be evaluated with a landscape plan.

In other cases, the MND makes vague references regarding key Project features. For example, the MND states that the construction of a sidewalk and bike lanes will close gaps in pedestrian and bicycle access. MND at PDF p. 106. However, the MND fails to provide any information on where these features are located or how these features would connect to other facilities. In another example, the site plan shows a "Proposed Temporary Basin", but the MND text never mentions this project feature, let alone provide any details about how it would operate. MND at PDF p. 195.

Similarly, the MND does not disclose the amount of impervious surfaces resulting from construction of the CTRF Project or provide information on the design and construction of the associated drainage system. Thus, the MND provides no evidence to support the conclusion that development project runoff would not result in flooding and that it would not exceed the capacity of stormwater drainage systems or result in sources of polluted runoff. MND at PDF p. 86. The MND states that:

> "the proposed Project would design and submit a site-specific SWPPP to minimize the discharge of wastewater during construction and a Water Quality Management Plan that includes best management practices (BMPs) for runoff control as required. Therefore, the proposed Project would not require new stormwater drainage facilities to manage stormwater runoff during construction or operation."

MND at PDF p. 122. However the MND fails to include the referenced SWPPP or the Water Quality Management Plan, nor does it indicate what kinds of BMPs will be

required. These omissions render the project description incomplete and result in deferred analysis, which is also impermissible. *Sundstrom*, 202 Cal.App.3d at 306-07.

Moreover, the MND indicates that the applicant will move all operations from their existing location at 2440 East Church Avenue to the proposed CTRF Project site. Fresno Planning Commission Agenda, June 18, 2025, Supplemental Exhibit Q – Staff Presentation at slide 9. The applicant's existing operation appears to have 26 dock doors. See Attach. E, Google Aerial image and Google Streetview Map. However, despite the fact that the Site Plan provided in the MND is barely legible, careful review reveals that the proposed CTRF facility would have 106 doors, which is four times the capacity of the existing facility. MND at PDF p. 195. The MND fails to mention this expansion of the applicant's operation capacity, which is a key feature for determining transportation, air quality, and noise impacts.

The failure to describe the whole of the Project is a serious and pervasive deficiency in the MND's environmental impact analyses and discussion of potential mitigation measures and alternatives to minimize those impacts. The City must prepare an EIR for the Project and provide a sufficient description of off-site improvements associated with the Project, information regarding required plans to minimize Project-related construction and operational impacts, details of anticipated construction activities, and any other Project details. This information is necessary for decision makers, the public and responsible agencies to evaluate potential environmental impacts.

III. The MND Fails to Adequately Analyze or Mitigate the Project's Impacts.

As explained below, the MND fails to adequately analyze the Project's numerous environmental impacts, including those affecting air quality, noise, and public health and safety. This is in large part because the MND fails to consider the impacts of annexing all of the 81 acres included in the Project. These inadequacies require that the City prepare an EIR so that the public and decision-makers receive a proper analysis of the Project's significant environmental impacts and feasible mitigation for those impacts.

A. The MND Fails to Evaluate the Impacts Related to Annexing and Rezoning the Project Area to Heavy Industrial Uses and There Is a Fair Argument that the Project May Have Significant Environmental Impacts.

While the whole of the Project is to annex 81 acres and rezone 51.72 acres from Limited Agriculture (AL-20) to Heavy Industrial/Annexed Rural Residential Transitional Overly (IH), the impact analysis solely assesses the potential impacts of the proposed development site (the CTRF Project), which is only 15.95 acres. The remaining 35.52

acres that are proposed to be rezoned and annexed into the City of Fresno are completely ignored in the CEQA analysis, despite the fact that with the rezoning, the IH zoning district would allow the following uses by right: Motorcycle Riding Club, Maintenance and Repair Services, Construction and Materials Yard (includes Concrete Batch Plants, Storage Yards, and Similar Uses), Custom Manufacturing, Freight/Truck Terminals and Warehouses, and Major Utilities. See Fresno Municipal Code Table 15-1302: Land Use Regulations – Employment Districts.

This approach is flawed because CEQA requires that an agency take an expansive view of any particular project as it conducts the environmental review for that project. *See McQueen v. Bd. of Directors* (1988) 202 Cal.App.3d 1136, 1143 (disapproved on other grounds in *Western States Petroleum Assn. v. Superior Court* (1995) 9 Cal.4th 559, 570) (term "project" is interpreted so as to "maximize protection of the environment").

The MND appears to assume that because no specific development is being contemplated on 64.5 acres of the area proposed for annexation (the whole annexation area minus the 15.95-acre CTRF Project development site), that no environmental analysis is required. This assumption is incorrect. Inasmuch as the annexation is the first discretionary approval that will ultimately result in development within the area, this environmental document must analyze the environmental impacts from the development in as detailed a manner as possible.

The City made a similar error last year when the Court struck down the City's Program EIR that purported to review implementation of the General Plan, an amendment to the General Plan's Mobility and Transportation Element, and an update to the City's Greenhouse Gas Reduction Plan. The Court held that a program-level document and the possibility of future environmental review did not excuse the City's current failure to adequately analyze reasonably foreseeable significant impacts or allow the City to defer analysis to a later project-specific EIR. *South Fresno Community Alliance v. City of Fresno*, Fifth Appellate District No. F086180, Opinion, August 6, 2024.

The same error is present here. CEQA recognizes that environmental impacts from plan amendments might be less definite than those associated with specific construction projects, but that does not excuse an analysis from taking place. In fact, case law supports CEQA Guidelines that all actions considered part of the project must be considered. *City of Redlands v. County of San Bernardino* (2002) 96 Cal.App.4th 398, 410 (setting aside a negative declaration after finding the project description in the initial study inadequate for inaccurately characterizing substantive amendments to a general plan as mere clarifications). *Nelson v. County of Kern* (2010) 190 Cal.App.4th 252, 267 ("The scope of the environmental review conducted for the initial study must include the

entire project.") (emphasis added). The project in *Nelson v. County of Kern* (2010) 190 Cal.App.4th 252 consisted of a mining operation and a reclamation plan to restore the land thereafter. 190 Cal.App. at 259. The court set aside the mitigated negative declaration, holding the project description to be inadequate where the initial study analyzed only the reclamation plan, and not the mining and thus did not describe the entire project. 190 Cal.App. at 272-3. These holdings point to the fact that annexation and rezoning is part of Project and thus must be included in the project description and its impacts must be analyzed.

An EIR for the whole of the Project must analyze the impacts from development that would be allowable under the proposed annexation and rezoning together with impacts from the proposed CTRF Project development. Once the analysis is completed, the EIR must identify feasible mitigation measures and identify feasible alternatives to avoid or minimize any significant impacts to the extent practicable.

B. The MND's Transportation Analysis Is Inadequate, and There Is a Fair Argument that the Project May Have Significant Transportation Impacts.

The MND's analysis of transportation impacts fails to inform decisionmakers and the public about the potential significant environmental effects of the Project. Guidelines § 15002(a). CEQA requires "adequacy, completeness, and a good-faith effort at full disclosure" in an environmental document. *Id.* § 15003(i). The MND here does not meet these requirements for several reasons. As an initial matter, the omitted analysis of foreseeable uses on the whole of the Project renders the transportation analysis incomplete. Further, the MND's transportation analysis for the CTRF Project relies on trip generation figures that appear to be substantially under-estimated. In addition, the MND relies on artificially constrained traffic patterns even though nothing limits truck traffic to the analyzed routes. The MND's conclusion that the Project would not result in any potentially significant transportation impacts is therefore not supported by substantial evidence.

1. The MND's Assumptions Regarding Project Trip Generation Are Grossly Underestimated and Misleading.

The MND states that the applicant's operations at the current site at the Southwest Corner of Church and Cherry Avenue would relocate to the proposed CTRF Project site. Fresno Planning Commission Agenda, June 18, 2025, Supplemental Exhibit Q at slide 12. The current facility appears to have 26 dock doors. By contrast, the proposed CTRF facility has 106 dock doors, or four times as many as the existing facility.

The MND claims that the CTRF Project would generate 84 truck trips per day and 120 passenger vehicle trips per day.[7] MND at PDF pp. 7, 8 and 773. However, as discussed above, the site plan for the proposed CTRF Project indicates that the 68,570 square foot cross-dock transfer platform would include 106 dock doors. *Id*. and at PDF p. 195. According to industrial real estate/logistics expert Chuck Berger, if the CTRF facility was operating at full capacity, it would generate a substantially larger number of trucks than assumed in the MND. Attach. F, "How Many Dock Positions Do I Need?" August 2025 and article " LTL Terminals: Key Locations for Efficient Freight Handling". According to Mr. Berger's studies of LTL facilities, a conservative estimate has a LTL facility handling 2-3 times the number of truck dock doors over an 8-hour workday. Therefore, a 106-door truck dock terminal is conservatively estimated to manage between 210 and 320 truck visits per day. That translates to approximately 2 to 3 trucks per dock per day, depending on factors like shift schedules (single vs. multiple shifts); average dwell times (duration of time trucks are on site); operational efficiency and scheduling; and whether trucks arrive at peak vs. off-peak hours. Accounting for one ingress trip and one egress trip per truck, 210 to 320 trucks per day would equate to 420 to 640 truck trips over a typical 8-hour workday. Given that the facility would operate 24 hours a day during the week (with multiple shifts) and during the morning on Saturday, the daily truck trip number is likely to be far higher. The MND's Energy section discloses that the CTRF Project would result in a total of 8,381 daily VMT and more than three million annual VMT. MND at Table 11, PDF pp. 50 and 51. This amount of VMT also suggests that the number of truck trips used in the MND's transportation analysis is far too low. Moreover, this increase in truck trips exceeds the City's threshold of 500-average-daily-trips that would trigger the need for a more detailed VMT analysis. MND at PDF p. 70 and 114.

The Project Conditions of Approval have no cap on the amount of truck volume allowed at the CTRF facility, so once the CTRF Project is built, the market – not the MND transportation analysis – would determine the actual daily truck volume at the site. Based on the above LTL logistics analysis, if the applicant only needs to plan for 84 truck trips per day (42 trucks in and 42 trucks out), their facility could be much smaller, roughly a quarter of the size being proposed. With 106 truck dock doors available, completing an analysis for this facility based on the claim of 84 truck trips/day is completely unrealistic and misleading. An EIR must evaluate the CTRF Project's

[7] The MND states that calculations for trip generation rates and average daily trips are based on information provided by the applicant, but does not explain how this information is accurate. MND at PDF p. 106 and 780.

transportation impacts based on realistic estimates of truck traffic tied to the number of dock doors at the site and realistic industry practices.

2. The MND Relies on Artificially Constrained Traffic Patterns.

The MND's discussion of anticipated truck route use and analysis of truck trip distribution that is vague and unclear about its methodology. Specifically, the MND indicates that CTRF Project trip distribution "was based on the *most logically traveled routes* for traffic accessing the project and a review of the potential draw from population centers within the region as well as the types of land uses involved." MND at PDF p. 773 (emphasis added). However, the MND fails to elaborate on this vague statement regarding what constitutes a "logically traveled route;" how the traveled routes, specifically the truck routes, were determined; or what percentage of trucks would travel each route. MND at PDF p. 773. The MND refers the reader to Figure 4 for project distribution, which shows a study area intersection analysis only for intersections along North Avenue and Cherry Avenue. MND at PDF p. 775. Presumably, this means that the MND assumes CTRF Project-related trucks would all travel to and from the site using SR 41 via North Avenue and Cherry Avenue. MND at PDF p. 775. As discussed below, this assumption is unrealistic given the multiple truck routes available in the area. Fresno Planning Commission Agenda, June 18, 2025, Supplemental Exhibit Q PDF at p.13

There are four primary regional connectors for the proposed Project site: State Route ("SR") 41, which is the nearest freeway to the CTRF Project site; State Route 99, which connects with SR 41 to the north; I-180, which connects with both SR 41 and SR 99; and I-168, which is located to the northeast of the City. The MND and its supporting analysis identify SR 41 in the "Existing Streets" description, but do not include any of the other highways. As the MND acknowledges, designated or planned truck routes exist on all major thoroughfares in the area. *Id*.

Therefore, in reality, trucks coming to and leaving from the CTRF Project site will have multiple paths available to the City's four main regional connectors. The MND inexplicably appears to assume that 100 percent of truck trips to and from the Project site will use the SR-41 via corridor. MND at PDF p. 773-775. The City has not offered any evidentiary basis to justify using this artificially constrained trip distribution to evaluate the Project's traffic impacts. The City states that CTRF Project-related truck traffic will enter and exit the site through two ingress/egress points on S. Cherry, and trucks will turn north onto S. Cherry. Staff Presentation to Planning Commission. June 18, 2025, Supplemental Exhibit Q. However, the MND includes no measure to constrain truck operators from using different truck routes than those assumed. MND at PDF pp. 114 and 115 (includes no mitigation measures to ensure trucks use one certain routes).

Even the City's proposed Condition of Approval to limit trucks arriving to the CTRF site to travel southbound only from E. North Avenue and to limit trucks departing from the site to travel northbound from S. Cherry Avenue to East North Avenue is inadequate to ensure the truck-related impacts on the community are minimized. Planning Commission Agenda, June 18, 2025, Exhibit K – Conditions of Approval [6-18-2025] at Condition 7. Truck traffic on S. Cherry Avenue is already heavy so that drivers will most likely avoid turning left from the CTRF facility onto S. Cherry as prescribed. Despite conditions constraining truck routes for other projects, area residents find that many trucks in the area travel off-route and violate the conditions.

Taken together, the availability of alternative truck routes to major regional thoroughfares and the City's existing truck traffic patterns show that the City's decision to assume a singular truck route is not only unsupported, but is also contradicted by substantial evidence. This error is fatal to the MND because it masks several potentially significant impacts and thus renders the MND insufficient as an informational document. For example, it is well established that "[t]ruck traffic can present substantial safety issues," particularly where that "traffic passes through residential areas, school zones, or other places where pedestrians are common and extra caution is warranted." California Attorney General's Warehouse Projects: Best Practices and Mitigation Measures to Comply with the California Environmental Quality Act at pg. 9-10, attached as Attach. G. Here, without further mitigations to ensure use of the identified route, trucks could use S. Cherry Avenue south of the proposed CTRF Project site, which the map in Attach. A illustrates, passes right next to residences and at least one school. Without analyzing all available truck routes to and from the Project site, the City cannot know whether further mitigation—such as designing entrances/exits oriented to face north and/or including physical barriers "[r]estricting the turns trucks can make entering and exiting the facility to route trucks away from sensitive receptors" (Warehouse Best Practices at pg. 10)—is needed. The MND says trucks have to turn left onto S. Cherry when exiting the facility but without a physical barrier, the City cannot rely on the trucks complying.

The prevalence of impacts from trucks travelling close to sensitive receptors are evidenced in the attached declarations from an area resident and from the Superintendent of the Orange Center School District document impacts experienced by the community from increased truck traffic from industrial development-related traffic. See, Attach. H and Attach. I, Declarations from T. Hirschfield and K. Taylor.

An EIR for the Project must provide a robust analysis of truck routes and related impacts. The EIR should evaluate effective mitigations, such as orienting truck ingress/egress driveways facing north on the site so that access to the site can only take place if a truck arrives from S. Cherry Ave. travelling southbound from E. North Ave. or departs from the site headed northbound on S. Cherry Ave. A thorough evaluation of

truck routes in the Project area is important because, as explained in the Community Truck Reroute Study of 2024, freight-impacted communities in the area have high asthma rates and cardiovascular disease impacts, along with high rates of poverty, and unemployment. South Central Fresno AB617 Community Truck Reroute Study, April 2024 at p. 2. Such truck impacts include air pollution, noise, traffic crashes, traffic congestion, active transportation conflicts, and residential and school impacts, among others. *Id.*

The artificial constraints placed on the traffic analysis also infect the MND's analysis of air quality and noise impacts. Because the MND assumes use of limited truck routes without ensuring that all operational truck traffic would proceed along the S. Cherry Avenue/E. North Avenue corridor, the MND fails to analyze the Project's air quality, public health and safety, and noise impacts at sensitive receptors along other likely truck routes. *Id.* Without further analysis, neither the City nor the public can fully understand the potentially significant environmental impacts of the Project.

3. The MND's VMT Analysis Failed to Include VMT from Trucks.

In addition, the MND's vehicle miles travelled ("VMT") analysis is flawed because it only included passenger vehicles in the analysis. The MND explains that because the City's VMT guidelines only require analysis of VMT from passenger vehicles, heavy truck trips were not analyzed. MND at PDF p. 791. However, this approach is irrational given that the proposed development project consists of a heavy-duty truck facility.

Guidance from the California Governor's Office of Planning and Research ("OPR") regarding the evaluation VMT impacts makes clear that truck VMT can be included. Attach. J, OPR Technical Advisory on Evaluating Transportation Impacts in CEQA, December 2018 at p. 4. Therefore, nothing prevents the City from analyzing VMT from trucks where it makes sense to do so as it does here. Nonetheless, as discussed above, the MND's Energy section discloses that the CTRF Project would result in a total of 8,381 daily VMT and more than three million annual VMT. MND at Table 11, PDF pp. 50 and 51. This amount of VMT suggests that the number of truck trips used in the MND is too low. Moreover, the MND failed to estimate VMT from future uses in the whole of the Project to account for the change in zoning from Limited Agriculture to Heavy Industrial. An EIR for the Project should analyze all anticipated VMT and identify mitigation measures to minimize impacts.

4. The MND Fails to Sufficiently Analyze Impacts Related to Pedestrian and Bicyclist Safety.

The City has a duty under CEQA to consider whether a project would . . . "create[s] risks to pedestrians in and around the project site." *City of Maywood* v. *Los Angeles Unified School Dist.* (2012) 208 Cal.App.4th 362, 391. The MND, however, fails to adequately analyze the Plan's potential danger to pedestrians, cyclists, or other residents who may be vulnerable to traffic hazards. It neglects to examine the impact of increased truck traffic near sensitive existing uses in and near the proposed Project Area, such as around Orange Center Elementary School.

The extent of the MND's so-called analysis of impacts to pedestrian and bicyclist safety is a single paragraph of accident data from the Statewide Integrated Traffic Records System in an attachment to the MND. MND at PDF p. 789. The data reveal that there were 46 accidents at the four intersections studied for the CTRF Project area from July 2018 to July 2023. *Id*. Here too, the MND fails to fully analyze the potential for increased accidents with the Project, and fails to provide adequate detail for an intelligent evaluation of public safety impacts.

First, given that the Project would allow heavy industrial development on all 80 acres, the MND should have evaluated impact areas beyond the four intersections chosen near the CTRF Project. Moreover, the MND fails to provide any details from these data. For instance, how many of the accidents involved injuries or fatalities? How many of the accidents involved trucks or cars? How many of the accidents involved pedestrians, bicycles or drivers? Answers to these questions would provide decision-makers and the public information on existing roadway hazards that can be incorporated into an analysis of hazards from having increased truck and car traffic in the area.

The City must also disclose the extent of increased truck traffic and identify where there are cyclists, pedestrians, or other sensitive receptors who would be impacted by them. In the *City of Maywood*, the court invalidated an EIR for a parallel problem as here—the EIR lacked sufficient detail and analysis to provide a basis on which to assess risks to pedestrians. 208 Cal.App.4th at 387. While the *Maywood* EIR and accompanying safety study expressly contemplated some traffic safety hazards, it crucially failed to evaluate the issue in detail, and "[t]he record [did] not contain any evidence that the [planner] considered or otherwise addressed these issues." *Id.* at 395.

Similarly, here, the MND should have reasonably described the characteristics of proposed uses in the whole of the Project area and the proposed CTRF Project's features and how they would impact pedestrian and traffic safety—particularly for areas where safety considerations were most pressing. If community members had been adequately

consulted, the MND might have noted the following traffic safety hot spots, where residents feel the most acute danger from truck traffic. For instance, Orange Center Elementary School is located in close proximity to the proposed CTRF Project, on South Cherry Avenue between East Central Ave and East North Avenue. The school is a block from the CA-41 freeway. Elementary-age students and their guardians walking to and from school are particularly vulnerable to safety issues brought by increased truck traffic. The MND omits any mention of Orange Center Elementary in the context of traffic safety The MND does not, as required, provide an analysis of the safety risk that the increased Project-related traffic might cause.

In addition, residential communities exist in close proximity to industrial uses throughout the South Fresno area, to which the proposed Project area would be a part. These communities already face danger from truck traffic brought by warehouse development within the past decade. Residents report that trucks pass right in front of their homes, and that the increase in traffic has led them to feel unsafe walking or driving in their neighborhoods. See, Attach. H and Attach. I, declarations from T. Hirschfield and K. Taylor. For a number of communities in South Central Fresno, light and heavy industrial uses and business park uses are located immediately adjacent to known residential areas. The MND entirely fails to contemplate how residents of these communities will be impacted by truck and other traffic the proposed Project's uses will inevitably bring.

The MND's complete failure to evaluate potential traffic safety harms renders the analysis legally deficient. The City therefore cannot approve the Project unless it prepares an EIR that (1) includes a realistic estimate of trip generation from the whole of the Project; (2) models all truck routes available to the CTRF Project operator (3) analyzes VMT for the whole of the Project (including all of the annexed area); and (4) analyzes safety impacts from increased traffic to area residents. Once a full analysis is performed the City should adopt Project alternatives or mitigation measures that restrict Project-related traffic to the analyzed routes. See Guidelines § 15002(a); see also Pub. Resources Code § 21002; Guidelines §§ 15002(a)(3), 15021(a)(2); *Citizens for Quality Growth v. City of Mount Shasta* (1988) 198 Cal.App.3d 433, 443-45.

C. The MND's Air Quality Analysis is Inadequate and There Is a Fair Argument that the Project May Have Significant Air Quality and Greenhouse Gas Emission Impacts.

The City of Fresno, and the surrounding San Joaquin Valley Air Basin, suffer from some of the nation's worst air quality. South Central Fresno where the proposed Project is located, experiences poor air quality due to a large concentration of industrial uses and high volumes of truck traffic. South Central Fresno was prioritized and selected

by the California Air Resources Board (CARB) for additional emissions monitoring, adoption of a community emission reduction plan, including measures that will result in quantifiable emission reductions, and investment of additional resources under Assembly Bill 617 due to the community's disproportionate cumulative air pollution exposure burden. Attach. K, Community Emissions Reduction Program, South Central Fresno, September 19, 2019 at p. 1. Therefore, it is imperative that the City provide an accurate assessment of the Project's potential to further degrade air quality and public health.

Here, the air quality analysis and the conclusion that the Project would have less than significant impacts on residents and schoolchildren in the area are based on an incomplete description of the Project and are completely unsupported by evidence. Mobile emission sources significantly impact South Central Fresno from VMT on major freeways including State Route 180, State Route 99, and State Route 41, and major interchanges including the Belmont Avenue, Mckinley, and Olive interchanges. In addition, South Central Fresno also has multiple designated truck routes, most of which directly bisect through residential communities exposing residents to toxic air contaminants and pollution. According to the South Central Fresno CERP, the community was found to exceed the 24-hour average PM2.5 concentration prioritization factor levels during the 2014-2016 period and the 8-hour average ozone concentration prioritization factor during 2014-2016 period. Attach. K, Community Emissions Reduction Program, South Central Fresno, September 19, 2019 at p. 19.

Despite plentiful evidence that the South Central area of Fresno suffers from poor air quality, the MND fails to adequately analyze the Project's air quality emissions for several reasons. First, because the MND failed to adequately describe the environmental setting of the area, including consistently poor air quality, the analysis fails to capture the cumulative impacts from the Project's emissions combined with existing poor air quality. *Id*. at 1. Second, the analysis only includes the CTRF Project, and fails to take into account emissions from trucks and vehicles resulting from planned heavy industrial uses on the remaining 36 acres, it only considers a fraction of the polluting emissions that will result from the whole of the Project. Third, because the transportation analysis grossly underestimates truck trips from the CTRF Project, what analysis the MND does provide is incomplete and misleading. Fourth, the MND's myopic assumption that CTRF-related truck trips will only use one truck route artificially constrains the analysis and fails to adequately analyze air pollutant impacts on residents and schoolchildren along other available truck routes. Once all of these elements are analyzed, the air emissions are likely to be much higher.

The MND's analysis of greenhouse gas emission ("GHG") impacts is similarly lacking. The MND begins the discussion by explaining that the City has done nothing to evaluate or mitigate city-wide greenhouse gas emissions. The City has not adopted a

GHG reduction plan, and has not completed a GHG inventory, benchmarking, or goal-setting process required to identify a reduction target. MND at PDF p. 64. The MND also states that the San Joaquin Valley Air District has adopted a Climate Action Plan, but that none of the measures are applicable to the Project. *Id*. For these reasons, the MND qualitatively evaluates consistency with CARB's adopted Scoping Plan.

The MND however, limits its discussion to how the Project will comply with the law and concludes that, because it will comply with legal requirements as they are adopted, the Project would be consistent with State policy for reaching carbon neutrality. MND at PDF p. 75 and 76. Simply stating compliance with the law is not enough. The analysis must demonstrate how the Project aligns with the Scoping Plan's objectives and measures, and how it contributes to achieving state climate goals. The Scoping Plan makes clear that local efforts to reduce greenhouse gases are also required for the State to meet the goal of net neutrality. The Scoping Plan states that jurisdictions without formal climate action plans "can still take actions that effectively translate key state plans, goals, and targets, including those articulated in this Scoping Plan for local action." Attach. L 2022 Scoping Plan for Achieving Carbon Neutrality at p. 269. Furthermore, in its Appendix D Local Actions, the Scoping Plan specifies that "a substantial portion of California's GHG reduction potential comes from activities over which local governments have authority or influence" and that local government actions are crucial for supporting attainment of the States's Climate Goals. Attach. M, 2022 Scoping Plan for Achieving Carbon Neutrality, Appendix D Local Actions at p. 3. Therefore, it is not enough to rely on compliance with state laws alone to reduce greenhouse gas emissions. Local jurisdictions must demonstrate how the Project complies with the Plan's objectives, but also how it contributes to achieving emissions reductions that advance the state climate goals.

Under the California Supreme Court findings for *Center for Biological Diversity v. Department of Fish & Wildlife* (2015) 62 Cal.4th 204 ("*Newhall Ranch*") a project's GHG emissions should be evaluated based on its effect on California's efforts to meet the State's long-term climate goals. As the Supreme Court held in that case, a project that would be consistent with meeting those goals can be found to have a less-than-significant impact on climate change under CEQA. If a project would contribute its "fair share" of what will be required to achieve those long-term climate goals. *Id.* at 220–223. But an agency may only rely on statewide documents like the Scoping Plan if it has substantial evidence of the local action and project-specific reductions needed to achieve compliance with the state goal. *See id*. at 227-28. The MND lacks any such substantial evidence for its assertion that the Project is consistent with the Scoping Plan.

Here, the Project would allow for approximately 52 acres of heavy industrial uses, including almost 16 acres of proposed trucking facilities that will result in hundreds of additional trucks on City roads every day, and more than three million VMT annually. MND at Table 11, PDF pp. 50 and 51. Build-out of the whole Project area will add millions more VMT and would increase polluting emissions, including GHG emissions. Therefore, the MND's conclusion that the Project would have less than significant GHG impacts borders on the absurd. An EIR must include an evaluation of all of the Project's emissions, including GHGs, and identify mitigation measures or alternatives to minimize those impacts.

The EIR must also take into account and include recommendations from the Truck Reroute Study and the Fresno HIA. For example, the Truck Reroute Study recommends policy strategies applicable to Cherry, Central and North Ave including: transitioning to zero emission trucks, time-of-day restrictions, and enforcement. Requiring zero emission trucks is vital for reducing emissions on Cherry Avenue to reduce the health impacts on residents living on Cherry Avenue and the students, parents, and staff at Orange Center Elementary. Without transitioning to zero emission trucks, the City continues to expose residents to significant levels of PM 2.5, Ozone, and diesel PM thus contributing to their risk of suffering preterm births, infant mortality, needing emergency car or hospitalization due to asthma or cardio-cerebrovascular disease. Attach. C Truck Reroute Study at pp. 32-33.

The fact is that this Project will have a devastating impact on local and regional air quality. Disadvantaged communities and people of color, who already suffer from health impacts of poor air quality, will feel these impacts more acutely than other City residents. Unfortunately, the details of these impacts remain unknown because the MND does not provide anything close to a complete analysis of these issues. These egregious flaws in the air quality analysis must be remedied in a thorough evaluation in an EIR.

D. The MND's Noise Analysis Is Inadequate, and There Is a Fair Argument that the Project May Have Significant Noise Impacts.

The MND's failure to fully and accurately analyze the whole of the Project infects the MND's analysis of noise impacts and results in incomplete disclosure of the whole of the Project's impacts.

The type and amount of potential noise to be generated by the uses allowed by right in the IH zoning district must be analyzed if the property is rezoned to allow these uses. The analysis cannot be deferred to some point in the future, such as when a new business applies for a business license or a building permit to begin operations that are already allowed by right in the IH zoning district. The MND does not describe any Best

Management Practices or Standard Conditions of Approval that would be applied to new development in the IH district, or to the CTRF Project specifically, that would minimize noise impacts on nearby sensitive receptors.

Furthermore, the MND calculated noise impacts based on the truck trip volumes as identified in the CTRF Project traffic impact analysis. The future conditions noise modeling described in the acoustical analysis completed for the CTRF Project is based on inaccurate anticipated project-generated truck trip volumes. As discussed elsewhere in this letter, the anticipated truck trip volume (a mere 126 trucks per day stated in the MND) were studied in the transportation and air quality analyses. This trip number is well under the volume of heavy truck traffic that could be generated by a 106-door less-than-truckload facility that is open 24 hours/day five days a week plus Saturday mornings, which would expect a minimum of 2 to 3 times that volume.[8] Therefore, at its core, the future conditions noise modeling for the CTRF Project is inaccurate. The analysis needs to include accurate truck trip volumes for the CTRF Project, as well as assumptions for the entirety of the area proposed to be rezoned from Limited Agriculture to Heavy Industrial uses.

It is critical that the City understand the whole of the Project's noise impacts. Truck trips can create severe impacts for sensitive receptors, including schools and medical facilities. A diesel truck traveling 40 miles per hour generates 84 decibels at a distance of 50 feet. Noise Sources and Their Effects, Purdue University.[9] The City is aware that noise levels in this area are already excessive. The acoustical analysis completed as part of the MND, and included as Appendix D, notes that "[R]eference to Table IV indicates that existing noise levels in the vicinity the project vicinity (along S Cherry Avenue) exceed applicable City of Fresno noise level standards in every statistical category during every hour of the 24-hour measurement period. Table IV also provides the average daytime (7:00 a.m. to 10:00 p.m.) and average nighttime (10:00 p.m. to 7:00 a.m.) noise levels, as measured at site LT-1. MND Appendix D, Acoustical Analysis for CTRF dated August 25, 2023 at p. 7

The acoustical analysis was for the CTRF Project only, and even then it was limited. The acoustical analysis did not study the noise impacts of construction equipment to be used throughout the 51.72 acres of property that would be rezoned IH, nor did it study the construction noise impacts of work at the proposed 15.95 acre CTRF Project site.

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[8] See logistics expert Check Berger: https://www.chuckberger.com/blog/2020/08/25/calculating-dock-position-requirements?rq=truck%20

[9] Noise Sources and Their Effects is available at https://www.chem.purdue.edu/chemsafety/Training/PPETrain/dblevels.htm.

Also the MND did not include a noise analysis for ongoing operations for the whole of the Project. If existing noise levels already exceed City standards, one can only imagine what the noise environment will be like once the whole of the Project is assessed. Where significant noise impacts and disturbing noise events are already present, tolerance is very low for any increase in either the frequency of events, the decibel level of the events, or the duration of the events. Here, the proper question is not the relative amount of noise resulting from the Project, but "whether any additional amount of [noise] should be considered significant" in light of existing conditions. *Los Angeles Unified School District v. City of Los Angeles* (1997) 58 Cal.App.4th 1019, 1025-26 (citation omitted) ("*LA Unified*"). The conclusion that the noise impacts of the project are less than significant is not based on accurate data or a complete and thorough analysis of future project conditions, and is relying on incomplete evidence for support.

While the noise analysis in the MND is lacking evidence and completeness, the vibration analysis in the MND is non-existent. The MND simply skips to a conclusion of less than significant without any evidence for the claim. The entire vibration analysis is contained on a single page. It includes a table of typical vibration levels for different pieces of construction equipment (sourced from Caltrans) and the following conclusion: "After full Project build out, it is not expected that ongoing operational activities will result in any vibration impacts at nearby sensitive uses. Additional mitigation is not required. There are no aspects of construction or daily operations that would create groundborne vibration. As such, any impacts would be less than significant." See MND at PDF p. 96.

This conclusion cannot be supported. The IH zoning district allows many uses *by right* that would have vibration impacts, including Motorcycle Riding Club, Maintenance and Repair Services, Construction and Materials Yard (includes Concrete Batch Plants, Storage Yards, and Similar Uses), Custom Manufacturing, Freight/Truck Terminals and Warehouses, and Major Utilities. Construction and materials yards, for instance, often use equipment for loading/stockpiles and, at times, vibratory rollers and large dozers. Another allowed use, Major Utilities, could include operations with blowers, pumps, and turbines, which could have vibration (and noise) impacts. Neither the MND, nor any technical appendix, provides a discussion of data of existing conditions, or data on future conditions based on expected construction or operational conditions. There is absolutely no evidence or support for a conclusion that vibration impacts resulting from the rezoning or proposed CTRF Project will be less than significant.

Based on the numerous failures of the acoustical analysis, the MND thus fails as an informational document. CEQA Guidelines §§ 15002(a), 15003(i); see also *Friends of the Eel River*, 108 Cal.App.4th at 875 (incomplete description of the Project's environmental setting fails to set the stage for a discussion of significant effects). The

City cannot approve the Project without first conducting additional analysis of noise impacts for the whole of the Project that uses accurate truck trip volumes for the part of the analysis that is specific to the CTRF Project site, as well as providing evidence for conclusions reached on the impacts of construction and operational vibrations.

E. The MND's Land Use Analysis Is Inadequate, and There Is a Fair Argument that the Project May Have Significant Land Use Impacts.

The MND's analysis of land use impacts fails to achieve CEQA's most basic purpose: informing governmental decisionmakers and the public about the potential significant environmental effects of a proposed activity. Guidelines § 15002(a). CEQA requires "adequacy, completeness, and a good-faith effort at full disclosure" in an environmental document. *Id.* § 15003(i). The MND here does not meet these requirements. Specifically, the MND's asks if the project will "cause a significant environmental impact due to a conflict with any land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect?"

The MND claims the CTRF Project is consistent with the Fresno General Plan goals and objectives related to land use and urban form. However, because the MND is only considering the CTRF Project, no analysis is provided on how the whole of the Project is consistent with General Plan goals and objectives related to land use and urban form. The MND completely ignores the application of the North Avenue Industrial Triangle Specific Plan to the whole of the Project area and includes no assessment of consistency.

The MND's conclusion that the Project would not result in any potentially significant land use impacts is therefore not supported by substantial evidence.

IV. Conclusion

As set forth above, the MND does not come close to satisfying CEQA's requirements. At a fundamental level, it fails to describe the Project setting and the Project, and fails to provide a complete analysis of Project impacts and feasible mitigation measures. At the same time, ample evidence demonstrates that a fair argument exists that the Project may result in significant environmental impacts. In light of this evidence, CEQA requires that an EIR be prepared. For this reason, SFCA respectfully requests that the City Council not approve the proposed Project until an EIR is prepared to fully evaluate the Project's impacts.

Very truly yours,

SHUTE, MIHALY & WEINBERGER LLP

Edward T. Schexnayder

Attachments:

A. Map illustrating proximity of Sensitive Receptors near CTRF Project site
B. California Office of Environmental Health Hazard Assessment. CalEnviroScreen Data for Census Tracts 6019001500, 6019001700, and 6019001800
C. South Central Fresno AB 617 Community Truck Reroute Study Truck Routing and Implementation Strategies Report April 2024
D. Fresno Community Environmental Health Impact Assessment, April 2024
E. Google Aerial image and Google Streetview Map of current Central Transport site at 2440 E. Cherry Ave. in Fresno
F. "How Many Dock Positions Do I Need?", industry expert blog post by Chuck Berger, dated August 25, 2020 and "LTL Terminals: Key Locations for Efficient Freight Handling", accessed August 12, 2025: https://parcelpath.com/ltl-terminals/
G. California Attorney General's Warehouse Projects: Best Practices and Mitigation Measures to Comply with the California Environmental Quality Act, updated September 2022
H. Declaration from T. Hirschfield, dated September 14, 2021
I. Declaration from K. Taylor, dated September 13, 2021
J. OPR Technical Advisory on Evaluating Transportation Impacts in CEQA, December 2018
K. Community Emissions Reduction Program (CERP), South Central Fresno, September 19, 2019
L. 2022 Scoping Plan for Achieving Carbon Neutrality, California Air Resources Board.
M. 2022 Scoping Plan for Achieving Carbon Neutrality, Appendix D Local Actions
N. LAFCO Disadvantaged Unincorporated Communities Database

cc: South Fresno Community Alliance
Leadership Council for Justice and Accountability

1952836.1

From:	Kristi Bascom
To:	Clerk
Cc:	Edward T. Schexnayder; Carmen J. Borg
Subject:	Public comment on 8/14/2024 City Council agenda Item ID 25-1026 - Email 1 of 2
Date:	Tuesday, August 12, 2025 6:08:56 PM
Attachments:	image001.png SMW-SFCA letter Attachments A-J.pdf

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External Email: Use caution with links and attachments

First email with attachments to comment letter on behalf of South Fresno Community Alliance for 8/14/2025 City Council agenda item # ID 25-1026. Attachments A through J included in this email.

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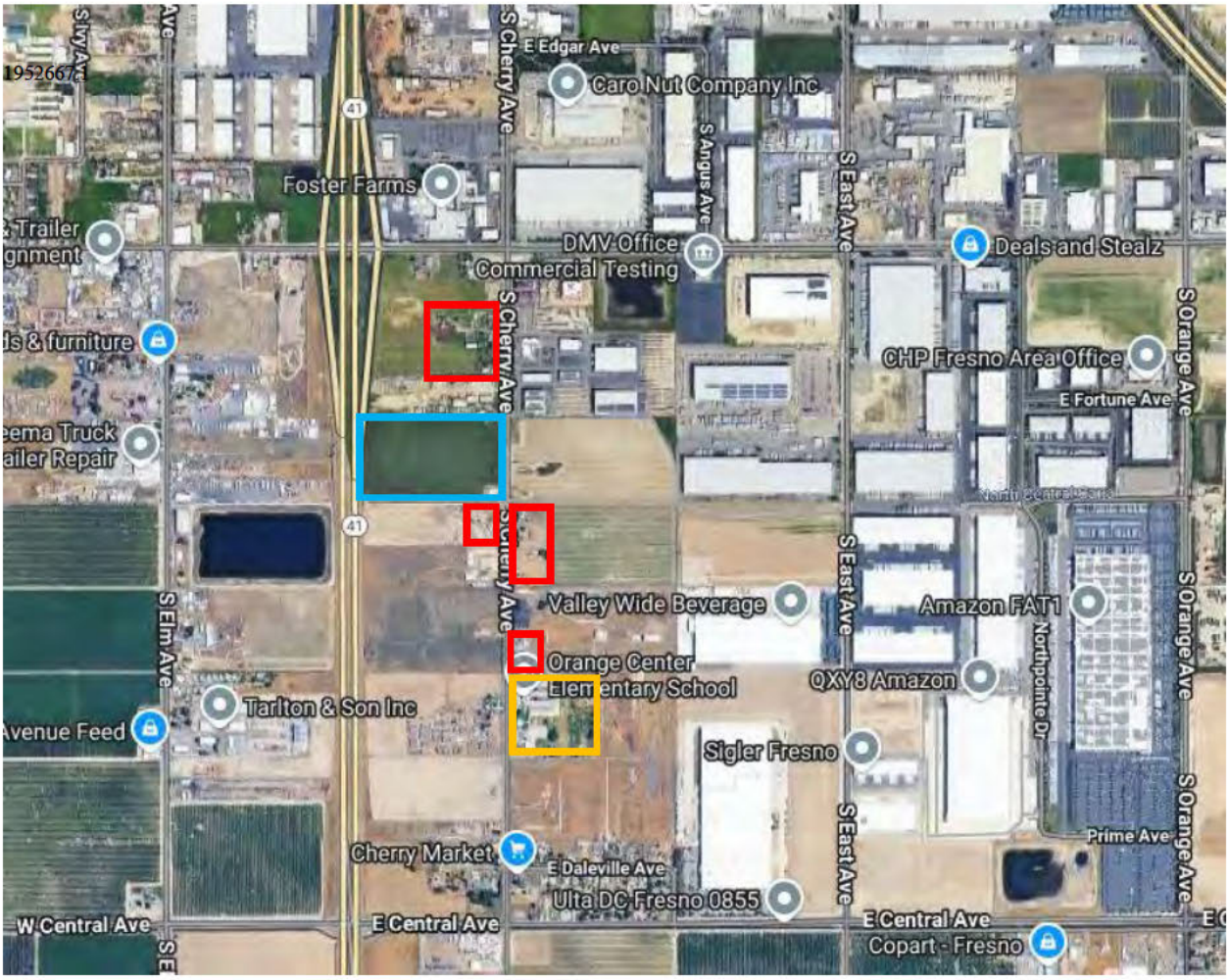
Attachment A

Map of CTRF Project Area and Sensitive Receptors



Rural residential cluster

Elementary School

CTRF Project site

Attachment B

Census Tract: 6019001500

Population: 2,206

CalEnviroScreen 3.0 Percentile: 95-100% (highest scores)

The following numbers represent the percentile score for that component or indicator. A higher percentile indicates a higher relative burden. Scroll to the bottom for a pie chart of race/ethnicity.

Pollution Burden Percentile:	**100**
Population Characteristics Percentile:	**93**
Ozone:	**98**
PM 2.5:	**97**
Diesel:	**58**
Pesticides:	**95**
Toxic Releases:	**98**
Traffic:	**24**
Drinking Water:	**99**
Cleanups:	**97**
Groundwater Threats:	**92**
Hazardous Waste:	**100**
Impaired Water:	**0**
Solid Waste:	**100**
Asthma:	**90**
Low Birth Weight:	**39**
Cardiovascular Disease:	**92**

Education:	**91**
Linguistic Isolation:	**74**
Poverty:	**90**
Unemployment:	**94**
Housing Burden:	**84**

Census Tract: 6019001700

Population: 5,701

CalEnviroScreen 3.0 Percentile: 95-100% (highest scores)

The following numbers represent the percentile score for that component or indicator. A higher percentile indicates a higher relative burden. Scroll to the bottom for a pie chart of race/ethnicity.

Pollution Burden Percentile:	**97**
Population Characteristics Percentile:	**87**
Ozone:	**98**
PM 2.5:	**97**
Diesel:	**42**
Pesticides:	**93**
Toxic Releases:	**70**
Traffic:	**39**
Drinking Water:	**98**
Cleanups:	**56**
Groundwater Threats:	**32**
Hazardous Waste:	**47**
Impaired Water:	**0**
Solid Waste:	**96**
Asthma:	**85**
Low Birth Weight:	**76**
Cardiovascular Disease:	**81**

Education:	**77**
Linguistic Isolation:	**69**
Poverty:	**72**
Unemployment:	**79**
Housing Burden:	**53**

Census Tract: 6019001800
Population: 4,615

CalEnviroScreen 3.0 Percentile: 95-100% (highest scores)

The following numbers represent the percentile score for that component or indicator. A higher percentile indicates a higher relative burden. Scroll to the bottom for a pie chart of race/ethnicity.

Pollution Burden Percentile:	98
Population Characteristics Percentile:	85
Ozone:	98
PM 2.5:	97
Diesel:	25
Pesticides:	93
Toxic Releases:	73
Traffic:	11
Drinking Water:	99
Cleanups:	87
Groundwater Threats:	59
Hazardous Waste:	88
Impaired Water:	0
Solid Waste:	100
Asthma:	95
Low Birth Weight:	83
Cardiovascular Disease:	89
Education:	72
Linguistic Isolation:	55
Poverty:	64
Unemployment:	68
Housing Burden:	31

Attachment C

South Central Fresno AB 617 Community Truck Reroute Study

Truck Routing and Implementation Strategies Report

April 2024

City of FRESNO | San Joaquin Valley AIR POLLUTION CONTROL DISTRICT | ARCADIS

Contents

1 Introduction and Background 2
2 Strategy Development 3
3 Strategy List 9
4 Strategy Map 27
5 Proposed Truck Routes 28
6 Non-Infrastructure Strategies 32
7 Implementation 34
7.1 Policy Strategies 34
7.2 Funding Strategies 35
7.3 Prioritization Framework 43
8 Next Steps 59

1 Introduction and Background

The City of Fresno and the San Joaquin Valley Air Pollution Control District (SJVAPCD) is seeking to develop innovative and implementable mobility solutions and strategies to support the South-Central Fresno community. There is a significant industrial presence operating in the southwest portion of the community, which includes a fossil fuel electric power generation facility along with several other industrial sources. Industrial uses in the South-Central Fresno community have created a high cumulative air pollution exposure burden. This has in turn impacted a considerable number of census tracts that have been designated as disadvantaged communities, as well as sensitive locations including schools, daycares, and hospitals.

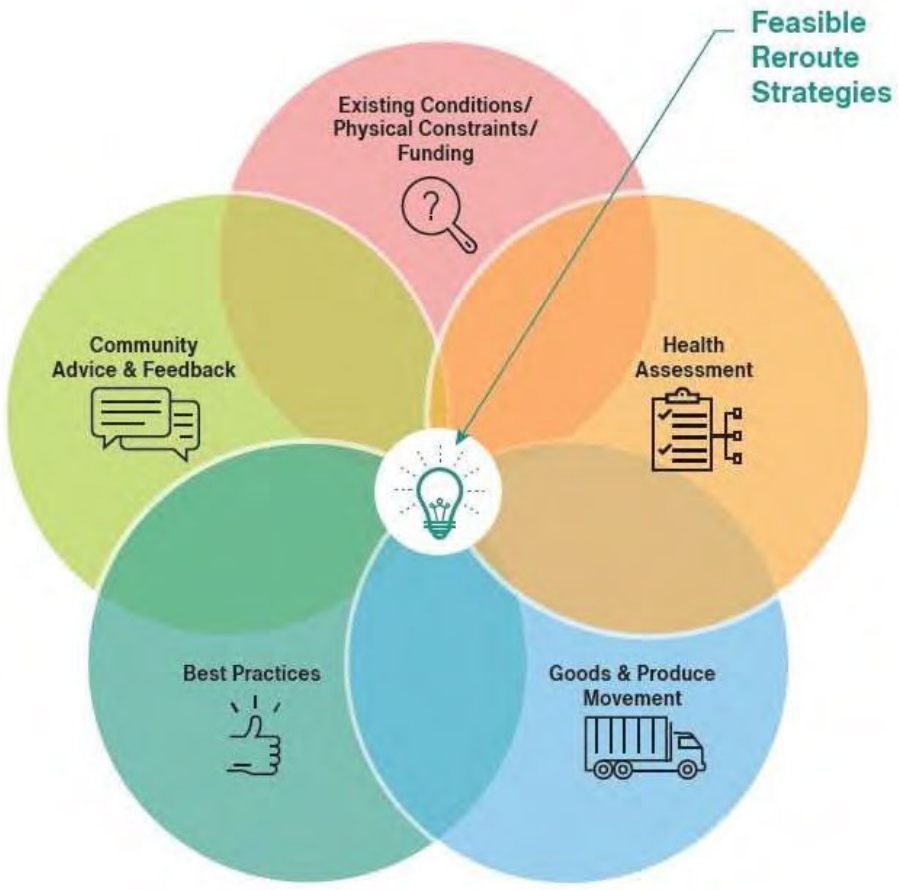
The community was prioritized by the San Joaquin Valley's AB 617 Environmental Justice Steering Committee. The San Joaquin Valley has been the focus of numerous air quality studies which lay the necessary foundation for the development of an emissions reduction program in this urban community. The community also has high asthma rates and cardiovascular disease impacts, along with high rates of poverty, unemployment, and linguistic isolation. The Truck Reroute Study will identify, analyze, and evaluate potential strategies that freight-impacted communities in the AB 617 area might take in cooperation with the City of Fresno to abate truck impacts. Such truck impacts include air pollution, noise, polluted runoff, traffic crashes, traffic congestion, active transportation conflicts, residential and school impacts, and excess wear for local pavements and bridges.

This study will ultimately determine whether heavy-duty trucks travelling within the community can be rerouted to reduce emissions exposure of South-Central Fresno community residents. However, the purpose of this report is to recommend specific strategies to mitigate negative freight impacts, improve air quality, and improve the overall quality of life for members of the South-Central Fresno community. This report also recommends a potential implementation plan that considers funding sources and availability, project performance metrics, as well as a prioritization framework for the proposed strategies.

2 Strategy Development

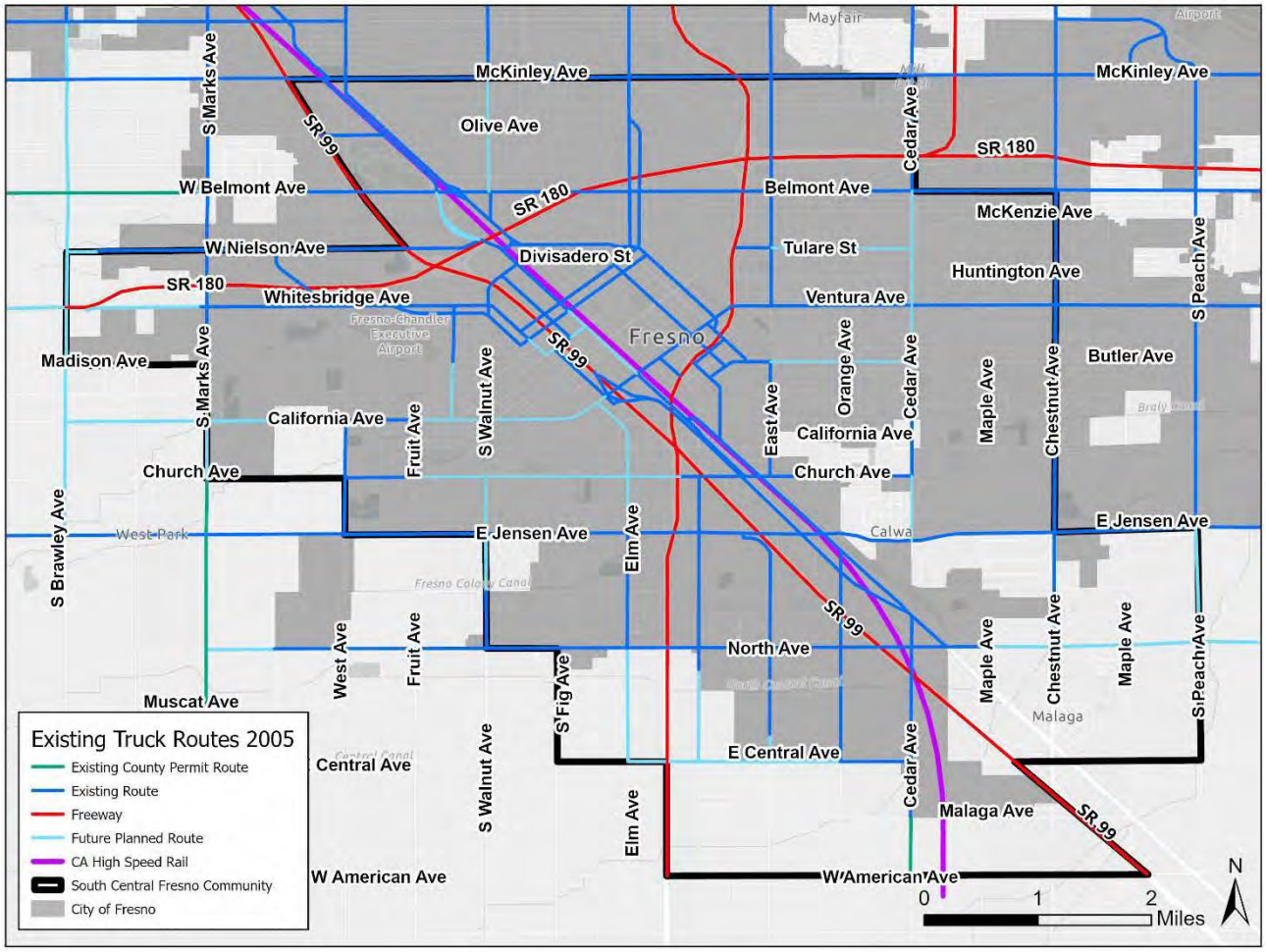
The *South-Central Fresno Truck Reroute Study* identified a host of truck routing strategies to implement throughout South-Central Fresno. The strategies were developed by combining findings from the assessment of existing conditions, community input from outreach events and stakeholder meetings, UC Merced (UCM)'s ongoing public health study, as well as truck routing best practices, while maintaining productivity of the goods and produce movement. This approach is summarized in Figure 1 below. Once implemented, the strategies aim to enhance health, safety, and mobility conditions for residents throughout South-Central Fresno, as well as streamline truck routing in the region.

FIGURE 1: KEY CONSIDERATIONS FOR FEASIBLE REROUTE STRATEGIES



In development of the truck routing strategies, a truck reroute strategies toolkit was created. The truck reroute strategies toolkit introduces nine unique strategy categories utilizing treatments that promote resident safety or divert truck traffic along existing truck routes. Figure 2 illustrates the City's existing truck routes last published in 2005.

FIGURE 2: EXISTING TRUCK ROUTES (2005)



The chosen strategy categories originated from any one or multiple sources, including assessment of existing conditions, the ongoing public health study, community input from outreach events and stakeholder meetings, previous plan and study goals and objectives, as well as truck routing best practices. Since public input is critical to this study, it should be noted that the feedback received during the first round of public outreach can be categorized into three major themes:

- **Pedestrian and bicyclist safety issues:**
  - Missing sidewalks and crosswalks near important destinations
  - Not enough separation between trucks and other users
  - Lack of bike lanes
  - Queueing at freeway onramps causes unsafe conditions
- **Truck behavior issues:**
  - Trucks drive at unsafe speeds and don't observe signs, especially near schools
  - Idling due to unsynchronized traffic signals
- **Roadway infrastructure issues**
  - Damaged street surfaces, potholes

Careful attention to these themes and detailed feedback from residents and stakeholders helped to develop the strategy categories. The nine strategy categories in the truck reroute strategies toolkit, their descriptions, and the origin of the toolkit strategies, are shown in Table 1 below. Previous plan goals within Table 1 are accompanied by a number that directly relates to a section heading from the Existing Conditions Report. Similarly, best practices within Table 1 are accompanied by a number that relates to a section heading in the Best Practices Report.

TABLE 1: SOUTH CENTRAL FRESNO TRUCK REROUTE STRATEGY TOOLKIT

No.	Strategy	Description	Origin				
			Community Input	Previous Plan Goals	Conditions Analysis	Best Practices	UCM Health Study
1	**New Sidewalks**	Close gaps in the existing sidewalk network, enhancing degraded or narrow portions of existing sidewalks, and ADA improvements	✓	✓ (4.25)	✓		
2	**New Crosswalks**	Additional crosswalks to enhance pedestrian mobility and connectivity, restriping of existing crosswalks, or improvements that increase visibility at existing crosswalks	✓	✓ (4.17)	✓		
3	**New Bike Lanes**	Dedicated travel lanes for bicyclists either through on-street, off-street or protected facilities to enhance bicycle accessibility and safety	✓	✓ (4.19/ 25/ 26)	✓		
4	**Roadway Repaving**	Removing potholes and cracks reduces truck maintenance and levels of GHG emissions	✓		✓		
5	**Traffic Calming**	Implements measures to reduce truck speeds or divert trucks altogether through roadway narrowing, speed bumps, and roundabouts	✓		✓	✓ (1.1.6)	✓
6	**Truck-Focused Signage**	Informs and provides confirmation to truck drivers on truck routes and regulated areas				✓ (1.3)	✓
7	**Traffic Signalization Improvement**	Improves the signalization of an intersection to	✓				

No.	Strategy	Description	Origin				
			Community Input	Previous Plan Goals	Conditions Analysis	Best Practices	UCM Health Study
		improve safety and the flow of vehicular movements					
8	**Roadway Reconfiguration**	Reconfigures a roadway or intersection to accommodate vehicle, pedestrian, and bicyclist access or alter truck movements	✓	✓ (4.4)			
9	**Truck Regulated Area**	Creates a boundary around sensitive receptors that can be used to limit truck bypass, either by time-of day, or at all times. The regulation may still allow trucks to enter or exit if their origin or destination resides within the boundary.[1] The truck regulated areas effectively limit some designated truck routes established under the 2005 Fresno Truck Route map and plan.	✓		✓	✓ (2.2)	✓

Of the strategies listed in the table above, Strategy #9, Truck Regulated Areas, have the most direct impact on permitted truck routes in South Central Fresno. The concepts and impacts of these areas are discussed below.

Truck Regulated Areas

As mentioned in Table 1, the Truck Regulated Areas create a boundary around sensitive receptors that can be used to limit truck bypass, either by time-of-day, or at all times. The regulations may still allow trucks to enter or exit if their origin or destination resides within the boundary. The truck regulated areas effectively limit some designated truck routes established under the 2005 Fresno Truck Route map and plan, by either removing existing truck routes or by introducing signage restricting truck access, implementing time-of-day restrictions, and lowering truck speeds. The proposed amendment to the

[1] California Vehicle Code 35703

City's truck route ordinance is described in the policy strategy section (Section 7.1) of this report.

The truck regulated areas do not limit any freeway entry or exit access point on any freeway, including SR 41, SR 99, and SR 180. Nevertheless, the truck regulated areas may result in diversion of trucks on specific arterial and collector streets that carry any number of sensitive receptors. Though the truck regulated areas were recommended to reduce truck bypass near sensitive receptors, they are designed in a way to maintain major truck connections without heavily disrupting throughput. The recommended truck regulated areas were also informed by the health impact assessment being performed by UC Merced, which found that pre-term birth (PTB) and infant mortality (IM) rates were highest among those living within 1000 feet of a highway or truck route. The truck regulated areas were designed to reduce the number of residential areas living within this buffer zone, thus reducing risk of health outcomes such as pre-term birth and infant mortality. The addition of truck regulated areas aims to reduce the number of truck routes present in residential areas. The incorporation of this recommendation is discussed further in Section 5, which presents the new proposed truck route map.

3 Strategy List

The toolkit strategies are paired with a comprehensive project list that specifies the locations where each improvement is recommended to be implemented within South Central Fresno. Due to the nature of the strategies, they are presented either as a single point (such as an intersection), a corridor (such as a roadway), or a polygon (representing a neighborhood). The project list may include an ID, a strategy ID, a strategy name, a street/ cross street, start and end boundary, or neighborhood name, depending on the type of strategy. Corridor strategies also show their length in miles, and polygon strategies in the project list show their area in square miles.

In total, there are 236 individual proposed improvements that can be used to enhance the transportation network in South-Central Fresno, especially related to truck movements. Of these improvements, 159 are "point" improvements, 65 are "corridor" improvements, and 13 are represented as "polygons". These strategies have been updated since the first round of strategies presented in November 2023, based on results of the online survey distributed in December 2023, and City staff review. Key additions include new locations for crosswalks, traffic calming measures, traffic signalization improvements, roadway reconfiguration, and new truck regulated areas. The City may choose to implement these proposed strategies based on safety and feasibility. Implementation is further discussed in Section 7 of this report.

A full breakdown of strategies by toolkit strategy type are denoted in Table 2 below.

TABLE 2: SOUTH CENTRAL FRESNO TRUCK REROUTE STRATEGIES SUMMARY

No.	Strategy	Type	Total	Total Length/ Area
1	**New Sidewalks**	Line	16	32.2 miles
2	**New Crosswalks**	Point	103	N/A
3	**New Bike Lanes**	Line	24	37.6 miles
4	**Roadway Repaving**	Line	13	11.6 miles
5	**Traffic Calming**	Line	12	26.6 miles
6	**Truck-Focused Signage**	Point	26	N/A
7	**Traffic Signalization Improvement**	Point	16	N/A
8	**Roadway Reconfiguration**	Point/ Line	14	6.2 miles + intersections
9	**Truck Regulated Area**	Polygon	13	11.33 square miles

The next table lists each strategy and the project type it is categorized as, the proposed location, length or area size for each improvement, and which funding category the strategy falls into. Project types are listed below for reference:

- Highway/Roadway
- Active Transportation
- Transportation System Management (TSM)
- Transportation Demand Management (TDM)
- Sustainability
- Freight

This breakdown will be helpful for future cost analysis where cost per unit is relevant. The funding categories listed in this table coincide with those listed in Section 6.1 of this report, where grants are categorized by funding category.

TABLE 3: FUNDING CATEGORIES

ID	Strategy ID	Strategy	Location	Cross Street	Project Type					
					Highway/ Roadway	Active Transportation	TSM	TDM	Sustainability	Freight
1	NC1	New Crosswalks	Cedar	Kaviland		X				
2	NC2	New Crosswalks	Rowell	Kaviland		X				
3	NC3	New Crosswalks	Jensen	Cedar		X				
4	NC4	New Crosswalks	Jensen	Holloway		X				
5	NC5	New Crosswalks	Jensen	Rowell		X				
6	NC6	New Crosswalks	Jensen Bypass	Cedar		X				
7	NC7	New Crosswalks	Jensen	Golden State		X				
8	NC8	New Crosswalks	Jensen	East (South)		X				
9	NC9	New Crosswalks	Jensen	East (North)		X				
10	NC10	New Crosswalks	Jensen	Cherry		X				
11	NC11	New Crosswalks	Jensen	Elm		X				
12	NC12	New Crosswalks	Jensen	MLK Jr		X				
13	NC13	New Crosswalks	Jensen	Walnut		X				

ID	Strategy ID	Strategy	Location	Cross Street	Project Type					
					Highway/ Roadway	Active Transportation	TSM	TDM	Sustainability	Freight
14	NC14	New Crosswalks	Jensen	Fruit		X				
15	NC15	New Crosswalks	Jensen	West		X				
16	NC16	New Crosswalks	North	Walnut		X				
17	NC17	New Crosswalks	North	MLK Jr		X				
18	NC18	New Crosswalks	North	Elm		X				
19	NC19	New Crosswalks	North	Cedar		X				
20	NC20	New Crosswalks	North	Maple		X				
21	NC21	New Crosswalks	North	Chestnut		X				
22	NC22	New Crosswalks	North	Peach		X				
23	NC23	New Crosswalks	Central	Peach		X				
24	NC24	New Crosswalks	Central	Willow		X				
25	NC25	New Crosswalks	Central	Golden State		X				
26	NC26	New Crosswalks	Central	Maple		X				
27	NC27	New Crosswalks	Central	Cedar		X				
28	NC28	New Crosswalks	Central	Orange		X				

29	NC29	New Crosswalks	Central	East		X				
30	NC30	New Crosswalks	Central	Cherry		X				
31	NC31	New Crosswalks	Fwy41	Central		X				
32	NC32	New Crosswalks	Central	Elm		X				
33	NC33	New Crosswalks	Central	MLK Jr		X				
34	NC34	New Crosswalks	Fwy41	American		X				
35	NC35	New Crosswalks	American	Cedar		X				
36	NC36	New Crosswalks	North	Cherry		X				
37	NC37	New Crosswalks	Golden State	Railroad		X				
38	NC38	New Crosswalks	Golden State	Orange		X				
39	NC39	New Crosswalks	Golden State	East		X				
40	NC40	New Crosswalks	Golden State	Church		X				
41	NC41	New Crosswalks	G	Church		X				
42	NC42	New Crosswalks	Church	Railroad		X				
43	NC43	New Crosswalks	Church	Cedar		X				
44	NC44	New Crosswalks	Church	Chestnut		X				
45	NC45	New	Church	East		X				

		Crosswalks								
46	NC46	New Crosswalks	Church	Cherry		X				
47	NC47	New Crosswalks	Church	MLK Jr		X				
48	NC48	New Crosswalks	Church	Clara		X				
49	NC49	New Crosswalks	Church	Fairview		X				
50	NC50	New Crosswalks	Church	Walnut		X				
51	NC51	New Crosswalks	Church	Fruit		X				
52	NC52	New Crosswalks	Church	West		X				
53	NC53	New Crosswalks	Church	Marks		X				
54	NC54	New Crosswalks	Jensen	Chestnut		X				
55	NC55	New Crosswalks	Jensen	Peach		X				
56	NC56	New Crosswalks	Chestnut	Butler		X				
57	NC57	New Crosswalks	Cedar	California		X				
58	NC58	New Crosswalks	Cedar	Hamilton		X				
59	NC59	New Crosswalks	Cedar	Heaton		X				
60	NC60	New Crosswalks	Butler	East		X				
61	NC61	New Crosswalks	Butler	O		X				

62	NC62	New Crosswalks	Los Angeles	M		X				
63	NC63	New Crosswalks	Los Angeles	Van Ness		X				
64	NC64	New Crosswalks	Van Ness	Hamilton		X				
65	NC65	New Crosswalks	Van Ness	California		X				
66	NC66	New Crosswalks	Van Ness	Railroad		X				
67	NC67	New Crosswalks	Railroad	G		X				
68	NC68	New Crosswalks	Ventura	C		X				
69	NC69	New Crosswalks	C	Mono		X				
70	NC70	New Crosswalks	C	Inyo		X				
71	NC71	New Crosswalks	C	Kern		X				
72	NC72	New Crosswalks	C	Tulare		X				
73	NC73	New Crosswalks	C	Fresno		X				
74	NC74	New Crosswalks	B	Stanislaus		X				
75	NC75	New Crosswalks	B	Amador		X				
76	NC76	New Crosswalks	Whites Bridge	Thorne		X				
77	NC77	New Crosswalks	Thorne	Kearney		X				
78	NC78	New	G	El Dorado		X				

		Crosswalks								
79	NC79	New Crosswalks	O	Santa Clara		X				
80	NC80	New Crosswalks	O	Butler		X				
81	NC81	New Crosswalks	Nielsen	Hughes		X				
82	NC82	New Crosswalks	Ventura	Cedar		X				
83	NC83	New Crosswalks	Belmont	1st		X				
84	NC84	New Crosswalks	Tulare	6th		X				
85	NC85	New Crosswalks	Tulare	1st		X				
86	NC86	New Crosswalks	Belmont	Cedar		X				
87	NC87	New Crosswalks	Belmont	Blackstone		X				
88	NC88	New Crosswalks	Blackstone	Olive		X				
89	NC89	New Crosswalks	Belmont	Weber		X				
90	NC90	New Crosswalks	Belmont	Wesley		X				
91	NC91	New Crosswalks	Belmont	Butler		X				
92	NC92	New Crosswalks	Olive	Weber		X				
93	NC93	New Crosswalks	Golden State	McKinley		X				
94	NC94	New Crosswalks	McKinley	Echo		X				

95	NC95	New Crosswalks	McKinley	Palm		X				
96	NC96	New Crosswalks	McKinley	Fresno		X				
97	NC97	New Crosswalks	McKinley	Millbrook		X				

98	NC98	New Crosswalks	Central	Chestnut		X				
88	NC88	New Crosswalks	Blackstone	Olive		X				
89	NC89	New Crosswalks	Belmont	Weber		X				
90	NC90	New Crosswalks	Belmont	Wesley		X				
91	NC91	New Crosswalks	Belmont	Butler		X				
92	NC92	New Crosswalks	Olive	Weber		X				
93	NC93	New Crosswalks	Golden State	McKinley		X				
94	NC94	New Crosswalks	McKinley	Echo		X				
95	NC95	New Crosswalks	McKinley	Palm		X				
96	NC96	New Crosswalks	McKinley	Fresno		X				
97	NC97	New Crosswalks	McKinley	Millbrook		X				
98	NC98	New Crosswalks	Central	Chestnut		X				
99	NC99	New Crosswalks	R	Huntington		X				
100	NC100	New	Thorne	California		X				

		Crosswalks								
101	NC101	New Crosswalks	Kearney	Fruit		X				
102	NC102	New Crosswalks	9th	Ventura		X				
103	RR1P	Roadway Reconfiguration	North	Willow	X					X
104	RR2P	Roadway Reconfiguration	Butler	Hazelwood	X					X
105	RR3P	Roadway Reconfiguration	California	Plumas	X					X
106	RR4P	Roadway Reconfiguration	Belmont	Palm	X					X
107	RR5P	Roadway Reconfiguration	Fwy99	North	X					X
108	RR6P	Roadway Reconfiguration	North	Golden State Frontage	X					X
109	RR7P	Roadway Reconfiguration	Broadway	Santa Clara	X					X
110	RR8P	Roadway Reconfiguration	Palm	Yale	X					X
111	RR9P	Roadway Reconfiguration	Cedar	Thomas	X					X
112	RR10P	Roadway Reconfiguration	Cedar	Floradora	X					X
113	RR11P	Roadway Reconfiguration	G	Stanislaus	X					X
114	RR12P	Roadway Reconfiguration	Kearney	Thorne	X					X
115	TS1	Traffic Signalization Improvement	Central	Chestnut	X		X			X

116	TS2	Traffic Signalization Improvement	B	Stanislaus	X		X			X
117	TS3	Traffic Signalization Improvement	California	West	X		X			X
118	TS4	Traffic Signalization Improvement	B	Rev Chester Riggins	X		X			X
119	TS5	Traffic Signalization Improvement	Divisadero	Glenn	X		X			X
120	TS6	Traffic Signalization Improvement	Divisadero	Calaveras	X		X			X
121	TS7	Traffic Signalization Improvement	M	Santa Clara	X		X			X
122	TS8	Traffic Signalization Improvement	O	San Benito	X		X			X
123	TS9	Traffic Signalization Improvement	Ventura	10th	X		X			X
124	TS10	Traffic Signalization Improvement	Abby	Harvey	X		X			X
125	TS11	Traffic Signalization Improvement	Belmont	Stafford	X		X			X
126	TS12	Traffic Signalization Improvement	McKinley	San Pablo	X		X			X

127	TS13	Traffic Signalization Improvement	Golden State	Church	X		X			X
128	TS14	Traffic Signalization Improvement	North	Parkway	X		X			X
129	TS15	Traffic Signalization Improvement	C	Walnut/ Martin	X		X			X
130	TS16	Traffic Signalization Improvement	Clinton	Marks	X		X			X
131	SN1	Truck Focused Signage	Fwy99	Chestnut	X					X
132	SN2	Truck Focused Signage	Fwy99	North	X					X
133	SN3	Truck Focused Signage	Fwy99	Orange	X					X
134	SN4	Truck Focused Signage	Fwy99	Jensen	X					X
135	SN5	Truck Focused Signage	Fwy99	Fwy41	X					X
136	SN6	Truck Focused Signage	Fwy99	Ventura	X					X
137	SN7	Truck Focused Signage	Fwy99	Fresno	X					X
138	SN8	Truck Focused Signage	Fwy99	Fwy180	X					X
139	SN9	Truck Focused Signage	Fwy 99	Belmont	X					X
140	SN10	Truck Focused Signage	Fwy99	Olive	X					X
141	SN11	Truck Focused Signage	Fwy 99	McKinely	X					X

142	SN12	Truck Focused Signage	Fwy180	Marks		X					X
143	SN13	Truck Focused Signage	Fwy180	Fwy99		X					X
144	SN14	Truck Focused Signage	Fwy180	Fwy99		X					X
145	SN15	Truck Focused Signage	Fwy180	Abby		X					X
146	SN16	Truck Focused Signage	Fwy180	Fwy41		X					X
147	SN17	Truck Focused Signage	Fwy180	Cedar		X					X
148	SN18	Truck Focused Signage	Fwy41	Central		X					X
149	SN19	Truck Focused Signage	Fwy41	North		X					X
150	SN20	Truck Focused Signage	Fwy41	Jensen		X					X
151	SN21	Truck Focused Signage	Fwy41	San Benito		X					X
152	SN22	Truck Focused Signage	Fwy41	O		X					X
153	SN23	Truck Focused Signage	Fwy41	Tulare		X					X
154	SN24	Truck Focused Signage	Fwy41	Fwy180		X					X
155	SN25	Truck Focused Signage	Fwy41	Fwy180		X					X
156	SN26	Truck Focused Signage	Golden State	Olive		X					X
ID	**Strategy ID**	**Strategy**	**Location**	**Extents**	**Length**	**Project Type**					
						Highway/ Roadway	**Active Transportation**	**TSM**	**TDM**	**Sustainability**	**Freight**
157	NS1	New Sidewalks	Willow	Jensen - Central	2.0		X			X	

158	NS2	New Sidewalks	Cherry	North - Central	1.0		X			X	
159	NS3	New Sidewalks	Chestnut	Jensen - Central	2.0		X			X	
160	NS4	New Sidewalks	American	Fwy41 - Fwy99	3.4		X			X	
161	NS5	New Sidewalks	Central	Fwy41 - Peach	3.8		X			X	
162	NS6	New Sidewalks	Orange	Railroad - American	2.8		X			X	
163	NS7	New Sidewalks	Golden State	California - Central	4.1		X			X	
164	NS8	New Sidewalks	California	Kern - Mono	0.2		X			X	
165	NS9	New Sidewalks	Church	Marks - MLK Jr	2.5		X			X	
166	NS10	New Sidewalks	Elm	North - Central	1.0		X			X	
167	NS11	New Sidewalks	Cedar	Parkway - American	1.6		X			X	
168	NS12	New Sidewalks	North	Parkway - Peach	2.4		X			X	
169	NS13	New Sidewalks	Jensen	Maple - Peach	1.5		X			X	
170	NS14	New Sidewalks	California	Marks - West	1.0		X			X	
171	NS15	New Sidewalks	Church	Cherry - 10th	1.4		X			X	
172	NS16	New Sidewalks	Walnut	Church - North	1.5		X			X	
173	BL1	New Bike Lanes	Chestnut	Jensen - Central	2.0		X			X	
174	BL2	New Bike Lanes	American	Fwy41 - Fwy99	3.4		X			X	

175	BL3	New Bike Lanes	Olive	Fwy99 - Cedar	4.2		X			X	
176	BL4	New Bike Lanes	Orange	Ventura - Butler	0.5		X			X	
177	BL5	New Bike Lanes	Golden State	California - Central	4.1		X			X	
178	BL6	New Bike Lanes	Belmont	Fwy99 - Chestnut	4.9		X			X	
179	BL7	New Bike Lanes	Palm	McKinley - H	1.2		X			X	
180	BL8	New Bike Lanes	Tulare	Fwy41 - Cedar	1.2		X			X	
181	BL9	New Bike Lanes	Church	Marks - MLK Jr	2.5		X			X	
182	BL10	New Bike Lanes	North	Walnut - Peach	1.5		X			X	
183	BL11	New Bike Lanes	Cedar	Woodward - Jensen	1.1		X			X	
184	BL12	New Bike Lanes	McKinley	Blackstone - Cedar	2.0		X			X	
185	BL13	New Bike Lanes	First	Tulare - Hazelwood	0.8		X			X	
186	BL14	New Bike Lanes	Abby	Blackstone - Divisadero	1.1		X			X	
187	BL15	New Bike Lanes	Blackstone	McKinley - Divisadero	1.5		X			X	
188	BL16	New Bike Lanes	H	Belmont - Divisadero	0.8		X			X	
189	BL17	New Bike Lanes	Ventura	C - H	0.4		X			X	
190	BL18	New Bike Lanes	Ventura	O - Parallel	0.3		X			X	
191	BL19	New Bike Lanes	P	Divisadero - Ventura	0.8		X			X	

192	BL20	New Bike Lanes	O	Ventura - Butler	0.4		X			X	
193	BL21	New Bike Lanes	Los Angeles/ Butler	Van Ness - Hazelwood	0.7		X			X	
194	BL22	New Bike Lanes	Van Ness	Ventura - Los Angeles	0.4		X			X	
195	BL23	New Bike Lanes	Tuolumne	A - E	0.3		X			X	
196	BL24	New Bike Lanes	Walnut	Church - North	1.5		X			X	
197	RR1L	Roadway Reconfiguration	Willow	Jensen - Central	2.0	x					x
198	RR2L	Roadway Reconfiguration	Olive	Fwy99 - Cedar	4.2	x					x
199	RP1	Roadway Repaving	Railroad	Church - Golden State	1.6	X					
200	RP2	Roadway Repaving	Jensen	Cedar - Barton	0.3	X					
201	RP3	Roadway Repaving	Kings Canyon	Maple - Chestnut	0.5	X					
202	RP4	Roadway Repaving	Jensen	West - Cedar	4.0	X					
203	RP5	Roadway Repaving	KcKinley	Fwy99 - West	0.4	X					
204	RP6	Roadway Repaving	A	Kern - Ventura	0.3	X					
205	RP7	Roadway Repaving	Church	Thorne - Walnut	0.2	X					
206	RP8	Roadway Repaving	Parkway	North - Cedar	0.5	X					
207	RP9	Roadway Repaving	Cedar	North - Parkway	0.3	X					

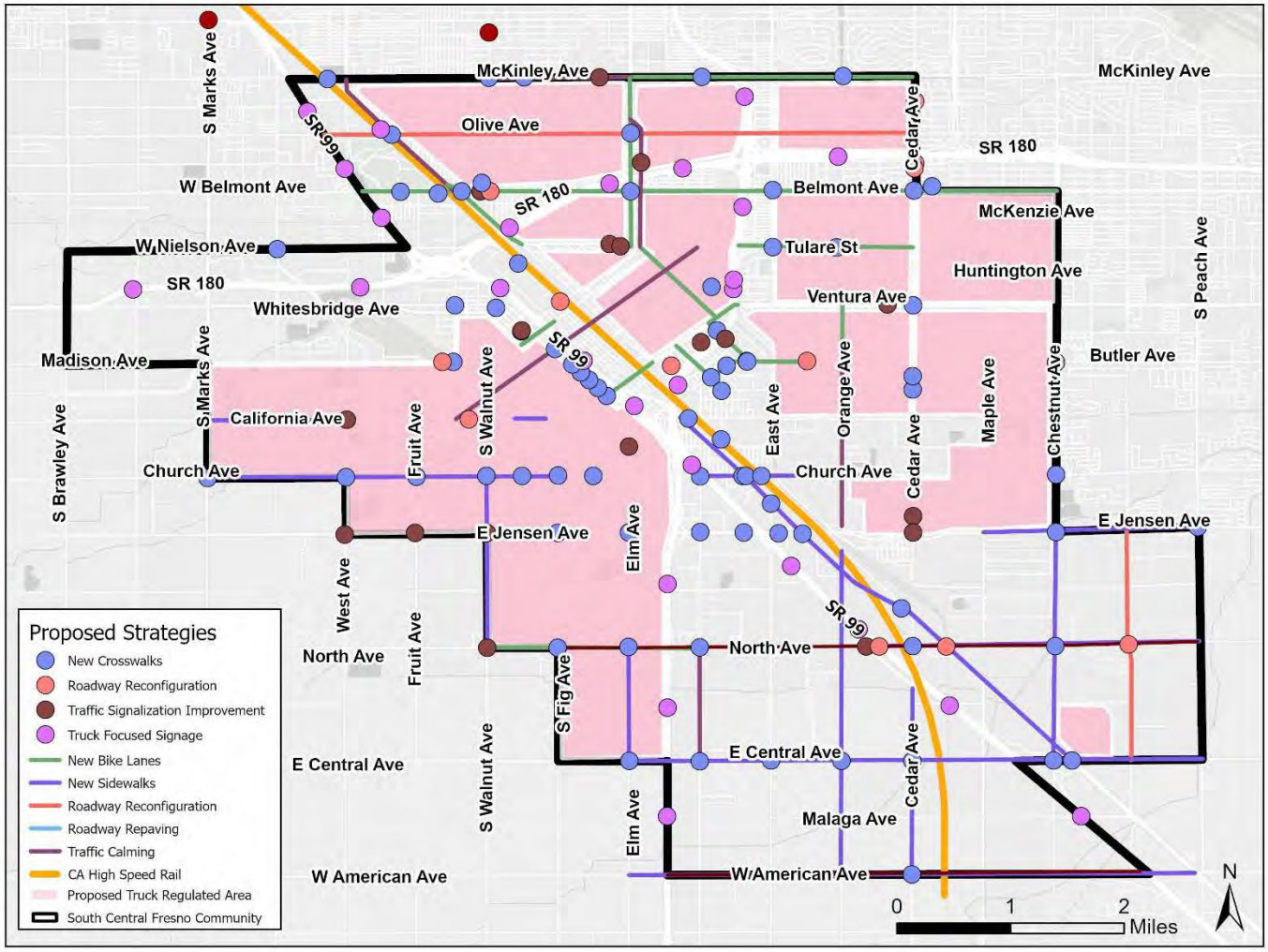
208	RP10	Roadway Repaving	Cedar	Woodward - Jensen	1.1	X					
209	RP11	Roadway Repaving	Cedar	Fwy180 - Belmont	0.3	X					
210	RP12	Roadway Repaving	Weber	McKinley - Belmont	1.3	X					
211	RP13	Roadway Repaving	H	Belmont - Divisadero	0.8	X					
212	TC1	Traffic Calming	Cherry	North - Central	1.0	X			X		
213	TC2	Traffic Calming	Central	Fwy41 - Peach	3.8	X			X		
214	TC3	Traffic Calming	Orange	Ventura - Butler	0.5	X			X		
215	TC4	Traffic Calming	Orange	Butler - Jensen	1.4	X			X		
216	TC5	Traffic Calming	Belmont	Fwy99 - Chestnut	4.9	X			X		
217	TC6	Traffic Calming	McKinely	Palm - Blackstone	1.0	X			X		
218	TC7	Traffic Calming	Weber	McKinley - Belmont	1.3	X			X		
219	TC8	Traffic Calming	Abby	Blackstone - Divisadero	1.1	X			X		
220	TC9	Traffic Calming	Blackstone	McKinley - Divisadero	1.5	X			X		
221	TC10	Traffic Calming	American	Elm – Peach	3.34	X			X		
222	TC11	Traffic Calming	North	Walnut – Peach	4.5	X			X		
ID	**Strategy ID**	**Strategy**	**Location**		**Area**	**Project Type**					
						Highway/ Roadway	**Active Transportation**	**TSM**	**TDM**	**Sustainability**	**Freight**
223	RA1	Truck Regulated Area	Central Fresno		0.4	X					X

224	RA2	Truck Regulated Area	Mural District	0.1	X					X
225	RA3	Truck Regulated Area	SW Fresno	2.5	X					X
226	RA4	Truck Regulated Area	Tower	1.3	X					X
227	RA5	Truck Regulated Area	Tulare West	0.9	X					X
228	RA6	Truck Regulated Area	Tulare East	0.9	X					X
228	RA7	Truck Regulated Area	Roosevelt West	0.92	X					X
229	RA8	Truck Regulated Area	Roosevelt West	1.8	X					X
230	RA9	Truck Regulated Area	Brookhaven	0.8	X					X
231	RA10	Truck Regulated Area	Malaga	0.2	X					X
232	RA11	Truck Regulated Area	Jefferson	0.4	X					X
233	RA12	Truck Regulated Area	Lowell	0.2	X					X
234	RA13	Truck Regulated Area	Cincotta	0.5	X					X
235	RA14	Truck Regulated Area	Hammond	0.4	X					X
236	RA15	Truck Regulated Area	McKinley	0.5	X					X
237	RA16	Truck Regulated Area	Divisadero	0.2	X					X
238	RA17	Truck Regulated Area	N Blackstone	0.5	X					X

4 Strategy Map

Following the project list, a detailed map shows the locations of each of the proposed strategies. The project list corresponds directly with the project map below where strategies have been categorized by color. It should be noted that multiple "corridor" strategies can fall under the same corridor. For instance, the corridor for Chestnut Avenue from Jensen Avenue to Central Avenue features two separate strategies for New Sidewalks as well as New Crosswalks. Shapefiles with the corresponding strategies will be delivered to the City of Fresno for future use and consideration.

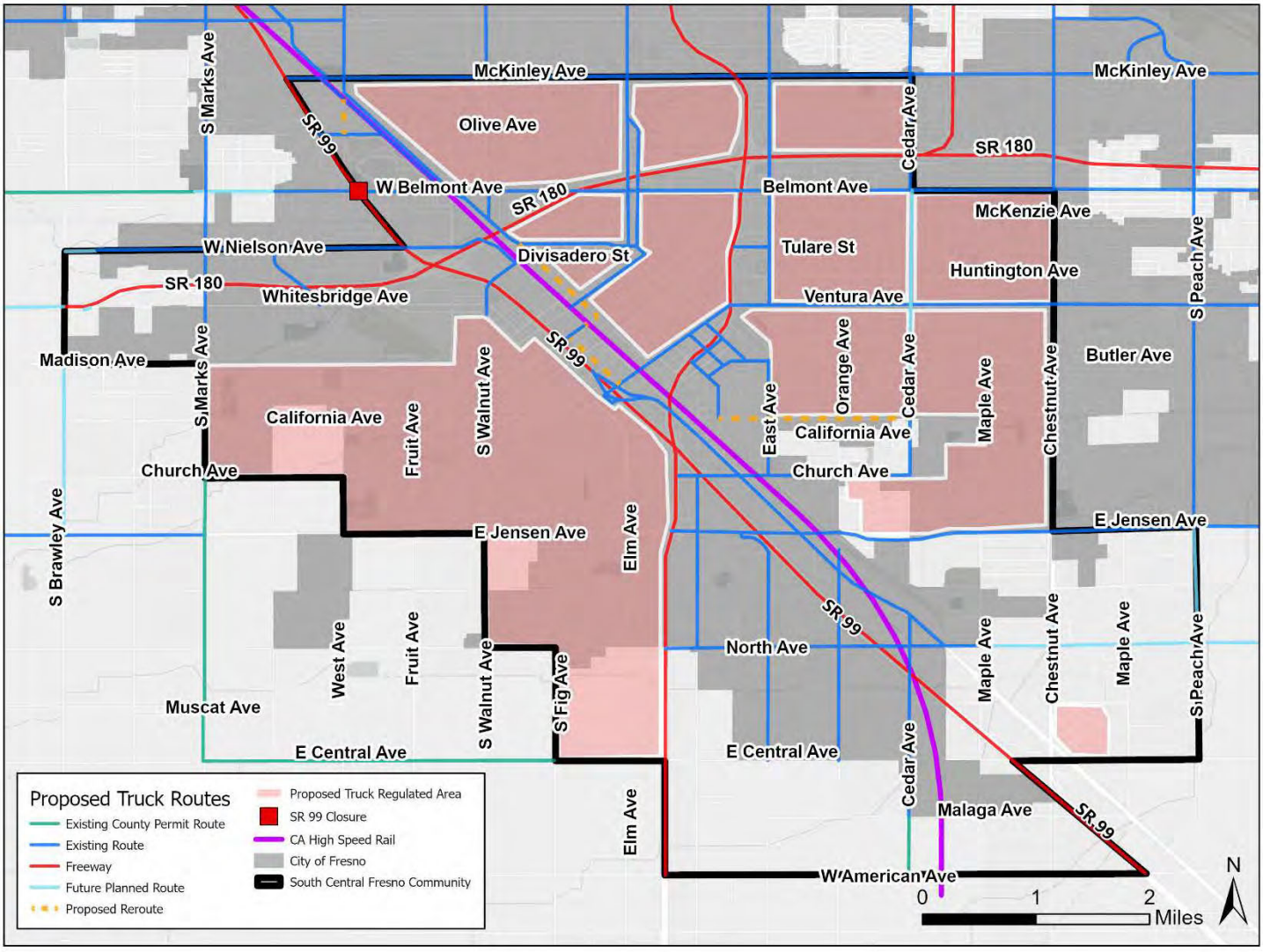
FIGURE 3: DRAFT STRATEGIES MAP



5 Proposed Truck Routes

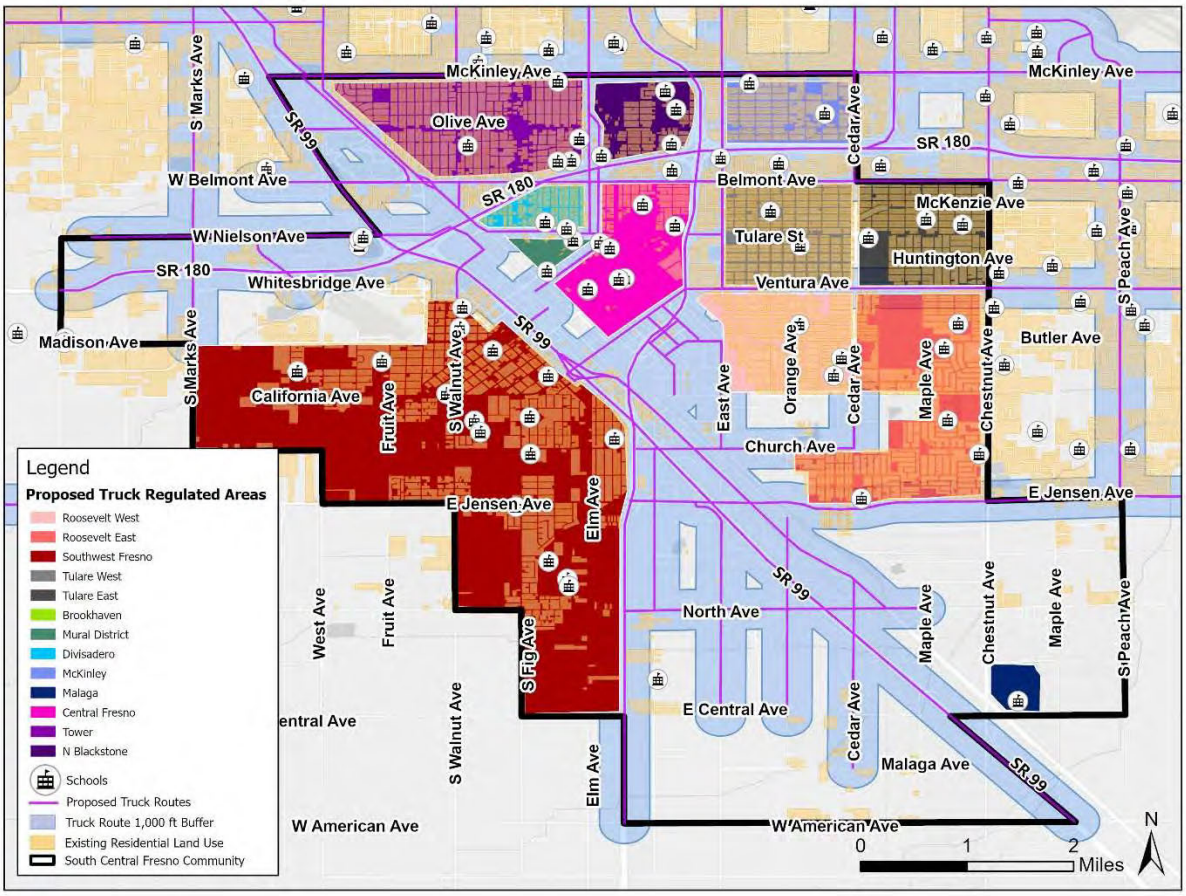
Four truck reroutes have been proposed in alignment with truck route removals and the thirteen recommended truck regulated areas in South Central Fresno. As mentioned above, truck regulated areas would prohibit trucks from entering local roadways within the designated areas. The implementation of these areas require some existing truck routes to be removed and re-routed around them. Reroutes are recommended along California Avenue, Kearney Avenue, Fruit Avenue, and E Street. The proposed truck routes and reroutes, as well as the recommended truck regulated areas are reflected in Figure 4 below. The figure also includes the location of the permanent Belmont Avenue interchange closure along SR 99. Caltrans will upgrade the Olive Avenue interchange to accommodate traffic flows and mitigate impacts to freight vehicles traveling on SR 99. Given the existing network, trucks would likely use the McKinley Avenue or Olive Avenue interchanges following the closure.

FIGURE 4: PROPOSED TRUCK ROUTES & TRUCK REGULATED AREAS



For further context, as discussed in Section 2, a 1,000-foot buffer around designated truck routes was used to guide where truck regulated areas would be most beneficial to residential areas based on the findings of the UC Merced Health Impact Assessment. The figure below reflects the South-Central Fresno residential areas, 1,000-foot buffers around designated truck routes, as well as the recommended truck regulated areas. Schools, which are also critical sensitive receptors, are also displayed on the map.

FIGURE 5: PROPOSED TRUCK REGULATED AREAS AND RESIDENTIAL AREAS WITHIN 1,000 FEET OF PROPOSED TRUCK ROUTES



Major diversion streets and sensitive receptors within each truck regulated area are described below:

Central Fresno Truck Regulated Area

- Reduces truck traffic on Tulare Street, Divisadero Street, and Fresno Street
- Reduces truck traffic near Courthouse Park, businesses on Fulton Street, and Chukchansi Park
- Trucks may divert to H Street, Tuolumne Street, Ventura Avenue, and E Street

Mural District Truck Regulated Area

- Reduces truck traffic on Fulton Street, Van Ness Avenue, and Stanislaus Street
- Reduces truck traffic near the Cultural Arts District Park, and residences
- Trucks may divert to Divisadero Street, Stanislaus Street, and H Street

Tower Truck Regulated Area

- Reduces truck traffic on Olive Avenue, Palm Avenue, and Wishon Avenue
- Reduces truck traffic near Muir Elementary School, Susan B Anthony Elementary School, businesses in Olive Avenue, and residences
- Trucks may divert to McKinley Avenue, Weber Avenue, Belmont Avenue, and Blackstone Avenue

Southwest Fresno Truck Regulated Area

- Reduces truck traffic on California Avenue, Church Avenue, B Street, Thorne Avenue, MLK Jr Boulevard, and Annadale Avenue
- Reduces truck traffic near Franklin School, Edison High School, Frank H Ball Center, Lincoln Elementary School, Columbia Elementary School, Cecil C Hinton Community Center, Fresno City College, Rutherford B Gaston Middle School, Computech Middle School, King Elementary School, Maxie L. Parks Community Center, Kirk Elementary School, W.E.B. DuBois Academy, Mary Ella Brown Center and Park, West Fresno Middle/Elementary Schools, and residences
- Trucks may divert to Walnut Avenue, North Avenue, West Avenue, Jensen Avenue, and SR 99

Tulare East A Truck Regulated Area

- Reduces truck traffic on Tulare Avenue, Huntington Boulevard, and Maple Avenue
- Reduces truck traffic near Rowell Elementary School, Jackson Elementary School, and residences
- Trucks may divert to Belmont Avenue, First Street, and Ventura Avenue/ Kings Canyon Road

Tulare East B Truck Regulated Area

- Reduces truck traffic on Tulare Avenue, Huntington Boulevard, and Maple Avenue
- Reduces truck traffic near Roosevelt High School and residences
- Trucks may divert to Belmont Avenue, Chestnut Avenue, and Ventura Avenue/ Kings Canyon Road

Roosevelt East A Truck Regulated Area

- Reduces truck traffic on Butler Avenue Maple Avenue, and Church Avenue
- Reduces truck traffic near Winchell Elementary School, Vang Pao Elementary School, Sequoia Middle School, Aynesworth Elementary School, and residences
- Trucks may divert to Railroad Avenue, East Avenue, California Avenue, and Ventura Avenue/ Kings Canyon Road

Roosevelt East B Truck Regulated Area

- Reduces truck traffic on Butler Avenue Maple Avenue, and Chance Avenue

- Reduces truck traffic near Baldera Elementary School, Aynesworth Elementary School, Calwa Elementary/ Preschool, Mosqueda Complex, and residences
- Trucks may divert to Railroad Avenue, Jensen Avenue Bypass, California Avenue, and Ventura Avenue/ Kings Canyon Road

Malaga Truck Regulated Area

- Reduces truck traffic on Ward Avenue, Calvin Avenue, Hardin Avenue
- Reduces truck traffic near Malaga Elementary School, Malaga Community Park and Recreation Center, and residences
- Trucks may divert to SR 99 and Golden State Boulevard

Divisadero West Regulated Area

- Reduces truck traffic on McKenzie Avenue, Voorman Avenue, and Nevada Avenue
- Reduces truck traffic near Lowell Elementary School and Dickey Park
- Trucks may divert to SR 99, Divisadero Street, and Blackstone Avenue

McKinley East Regulated Area

- Reduces truck traffic on Olive Avenue, Floradora Avenue, and Fisher Street
- Reduces truck traffic near Yosemite Middle School and Mayfair Elementary School
- Trucks may divert to SR 180, N 1st Street, and McKinley Avenue

North Blackstone Regulated Area

- Reduces truck traffic on Olive Avenue, Floradora Avenue, and Fresno Street
- Reduces truck traffic near San Joaquin Memorial High School, Restart Alternative School, and Webster Early Learning Center
- Trucks may divert to N Abby Street, SR 180, SR 41, and McKinley Avenue

6 Non-Infrastructure Strategies

There are numerous truck-related improvements that can be implemented within South-Central Fresno that cannot be placed on a map but are equally important. These improvements can include education and outreach programming, truck fuel-type, emissions and idling standards, truck specific GPS administration, time-of-day restrictions, and enforcement. All of these strategies are beneficial in maximizing the benefit of the draft strategies presented previously.

Education and Outreach Programming

- Education and outreach programming is a critical element in ensuring road safety is maximized while accidents are minimized. Proper education and outreach allows drivers to adapt efficiently to changes, optimizing their routes and supply chain management. The education component allows drivers to understand the wider benefits of rerouting and actively support these initiatives.
- The education component also would provide truck drivers with information on truck restrictions enforced by the City of Fresno that may impact where they are able to travel, park, and load.

Truck Fuel-type, Emissions, and Idling Standards

- These standards allow trucks to operate efficiently to produce fewer emissions, promoting improved air quality in residential areas. This can be achieved through enforcement of stringent maintenance and emission control technologies.

Zero-Emission Trucks

- Currently, commercial trucks are one of the largest contributors of GHG and NOx emissions. These emissions are known to negatively impact the health of communities living alongside high volume truck corridors. The South-Central Fresno Community can significantly lower these harmful emissions by transitioning to zero-emission commercial trucks, which is a recommendation presented in the UC Merced Health Impact Assessment.
- Transitioning to zero-emission commercial trucks is also in line with Executive Order N-79-20, which aims to reach a 100 percent zero-emission drayage truck and off-road equipment population by 2035 and 100 percent zero-emission medium- and heavy-duty vehicle population by 2045, where feasible.[1]

Truck-specific GPS Administration

- Truck-specific GPS devices provide information for crucial route restrictions that allow drivers to avoid sensitive receptors while ensuring safe and efficient navigation. Truck specific GPS technology may need to be implemented in coordination with the City of Fresno to take potential time of day truck restrictions and regulations into consideration. Additionally, this

[1] "Learn Why and How the State Plans to Transition Medium- and Heavy-Duty Vehicles to this New Technology and What the Zero-Emission Vehicle Market Looks Like Today". California Air Resources Board. 2024.

technology should be implemented in coordination with Fresno local businesses to identify key times of day for delivery that will not interfere with curbside access for customers.

- The implementation of truck-specific GPS may require some additional education campaigns for truck drivers that are not familiar with this technology. This can help truck drivers to use GPS devices correctly and ensure they do not violate any truck restrictions enforced by the City of Fresno.

Time-of-Day Restrictions

- Time-of-day restrictions are useful during peak times to minimize congestion and improve safety. These restrictions would be paired with clear considerations for off-peak truck schedules, as to avoid an impact on residents during peak times of personal vehicle traffic.

- This strategy should be implemented in coordination with Fresno local businesses to understand when business areas are busiest. This can help mitigate competition for curb space between truck drivers and customers during peak times.

Enforcement

- Clear mechanisms and penalties for non-compliance helps maintain order and safety on roadways. The regulations and rules should aim to deter violations that could jeopardize safety or disrupt sensitive receptors.

When paired with on-the-ground improvements, implementation of these proposed strategies would result in an efficient and cohesive truck routing program that minimizes excessive and disproportionate negative impacts to South-Central Fresno residents and sensitive receptors.

The City of Fresno's municipal code should also be updated to discuss the proposed truck regulated areas and truck reroutes. More specifically, the municipal code should highlight that truck passthrough traffic is restricted in truck regulated areas and highlight rerouted truck routes that truck drivers should take instead. An update to the municipal code should be made in coordination with local businesses to ensure they are aware of changes in freight flows and to ensure deliveries are not negatively impacted for their businesses. The amended municipal code should be enforced by the City of Fresno's Parking Services. Truck travel and parking violations may come in the form of parking citations.

7 Implementation

This section provides an overview of how projects could be implemented within the South-Central Fresno Study Area. Implementation considerations include funding availability and a recommended prioritization framework.

7.1 Policy Strategies

It is in the best interest of the City of Fresno to adopt an amended truck route ordinance in order to implement the recommendations of the study, namely the proposed modifications to truck routes and truck regulated areas. Residents of the AB 617 Community have highlighted their concern that high volumes of truck traffic have imposed negative air quality, noise, and traffic impacts.

Section 14-1303 of the City of Fresno Municipal Code establishes the designation of an official list of truck routes by City Council. The proposed amended truck ordinance should further regulate truck routes by establishing the truck regulated areas proposed by this study. As discussed above, the thirteen recommended truck regulated areas will regulate truck traffic through the most vulnerable neighborhoods within the South-Central Fresno community, including residential areas, communities near schools and community spaces, and areas prioritized for non-truck travel. Specific truck traffic regulations within each truck regulated area will be recommended based on the needs of the community within each truck regulated area. More specifically, trucks should be restricted from entering truck regulated areas unless trying to reach their origin or destination point, but it should not be used for pass through traffic. Where this approach is not feasible, we recommend implementing alternative strategies like speed and time of day limitations to help mitigate truck impacts to the truck regulated area. For example, in truck regulated areas near schools, truck access should be confined to non-school hours. The regulation of truck access in truck regulated areas will reduce truck emissions, volumes, and idling of heavy-duty trucks near sensitive receptors.

The amended truck ordinance is in alignment with the California Vehicle Code, which provides the legal basis for restricting truck access and providing alternate routes. California Vehicle Codes 35701, 35702, 35703, 35712, 35714 refer to local authorities' abilities to regulate truck access on local roads. These codes also state that restrictions to truck access cannot impede truck access to state highways or from making pick-ups or deliveries. These requirements are in alignment with the recommended truck regulated areas, which only encompass local roads.

The ordinance should specify that truck access within these truck regulated areas will be regulated through signage placed at regular intervals along corridors within truck regulated areas and enforced by law enforcement. Enforcement will occur through occasional patrolling and issuing of tickets from the Fresno Police Department for violations. As part of this new regulation, the City of Fresno will coordinate with the Police Department to conduct enforcement training on the new regulations to ensure law enforcement is aware of the new restrictions. The City should also consider a "grace period" for ticketing while businesses and enforcement staff adjust to the truck regulations. Additionally, the City and law enforcement should meet at the 1-year mark to re-evaluate the truck traffic ticket data and understand if the amended truck ordinance needs modification.

Additionally, the City should consider a policy ordinance requiring a transition to zero-emission commercial trucks. This is in line with California Executive Order N-79-20, which aims to reach a 100 percent zero-emission drayage truck and off-road equipment population by 2035 and 100 percent zero-emission medium- and heavy-duty vehicle population by 2045, where feasible. The City should also implement a policy that designates the necessary funding and space required for implementing charging infrastructure to support zero-emission trucks.

7.2 Funding Strategies

The following section summarizes a comprehensive list of potential funding sources for project implementation. The list includes the agency, funding source, description, eligible projects, eligibility requirements, and application due dates. The list does not preclude the potential for Public-Private Partnerships (P3) as a funding strategy to deliver certain projects.

It should also be noted that due to the recent signing of the Surface Transportation Authorization, with the Infrastructure Investment and Job Act (IIJA), several of the descriptions, project types, eligibility requirements, and application deadlines for the funding sources listed below may be altered. More specifically, federal funding sources associated with the FAST Act may differ with the future implementation of this authorization. These funding sources are listed below:

- RAISE Grant
- Highway Safety Improvement Program (HSIP) – FAST Act
- Surface Transportation Block Grant (STBG)
- INFRA Grant
- New Starts and Small Starts (FTA Section 5309)
- Congestion Mitigation & Air Quality Improvement (CMAQ)
- EPA Office of Sustainable Communities Greening America's Communities Program

State funding source descriptions, project types, eligibility requirements and application deadlines are provided based on the information given for the 2023 grant cycle. Therefore, descriptions, project types, eligibility requirements, and application deadlines are subject to change in the 2024 grant cycle. These funding sources are listed below:

- Active Transportation Program – Cycle 7
- Cap & Trade: Low Carbon Transit Operations Program (LCTOP)
- State Transportation Improvement Program (STIP)
- State Highway Operations Protection Program (SHOPP)
- SB 1 – State of Good Repair
- Trade Corridor Enhancement (TCEP)
- Local Partnership Program (LPP)

Transit & Intercity Rail

- Solutions for Congested Corridors Program
- Measure C – Regional Transportation Program

- San Joaquin Valley Air Quality District – Public Benefit Grant Program

Table 4 below presents a comprehensive summary of potential federal, state, regional, and local funding sources that could be available should any of the recommendations be pursued. As noted previously, any recommendation that progresses into project development would be subject to rigorous traffic impact analysis, engineering and design, associated environmental studies, and permitting.

TABLE 4: RECOMMENDED FUNDING STRATEGIES

Funding Source	Description	Project Types	Eligibility Requirements	Application Deadline
Federal Funding Sources				
RAISE Grant	Provides a unique opportunity for the DOT to invest in road, rail, transit, and port projects that promise to achieve national objectives.	• Highway/Roadway • Transit • Active Transportation	• Activities eligible for funding under RAISE are related to the planning, preparation, or design – including environmental analysis, feasibility studies, and other pre-construction activities – of surface transportation projects, research, demonstration, or pilot projects are eligible only if they will result in long term, permanent surface transportation infrastructure that has an independent utility. • Applications from lead applicant agencies are limited to three projects	02/2024
FTA Research & Innovation Program	Provides funding for safety and mobility innovation research that improves operations, enhances the travelers' experience, and drives economic growth in America's communities through research in safety, mobility innovation, and infrastructure. Programs include the "Safety Research and Demonstration" Program, the "Accelerating Innovative Mobility" Program, and the "Integrated Mobility Innovation" Program.	• Transit Signal Synchronization/ TSM	**Safety Research and Demonstration:** • Operations that will improve the operational safety of rail transit services; • Proposals to prevent and mitigate suicide and trespassing hazards on rail transit systems, and proposals to improve the operational safety of shared corridor fixed guideway systems, including highway-rail grade crossing safety. **Accelerating Innovative Mobility**: • Activities leading to the development and testing of innovative mobility, such as planning and developing business models, obtaining equipment and service, acquiring or developing software and hardware interfaces to implement the project, operating or implementing the new service model, and evaluating project results. **Integrated Mobility Innovation:** • Activities leading to the demonstration, such as planning and developing business models, obtaining equipment and service, acquiring, or developing software and hardware interfaces to implement the project, operating the demonstration, and providing data to support performance measurement and evaluation	02/2024
Highway Safety Improvement Program (HSIP) – FAST Act	Provides funding for projects that focus on safety improvements. These include installation of pedestrian hybrid beacons, medians, pedestrian crossing islands, and other physical infrastructure projects.	• Highway/ Roadway • Active Transportation	• Any strategy, activity or project on a public road that is consistent with the data-driven State Strategic Highway Safety Plan (SHSP) and corrects or improves a hazardous road location or feature or addresses a highway safety problem, including active transportation projects • Funding is prohibited for the purchase, operation, or maintenance of an automated traffic enforcement system; workforce development, training, and education activities are eligible uses of HSIP funds.	09/24
Surface Transportation Block Grant (STBG)	Provides flexible funding that may be used by States and localities for projects to preserve and improve the conditions and	• Highway/ Roadway	• Construction, reconstruction, rehabilitation, resurfacing, restoration, preservation, or operational improvements for highways	01/24

Funding Source	Description	Project Types	Eligibility Requirements	Application Deadline
	performance on any Federal-aid highway, bridge and tunnel projects on any public road, pedestrian and bicycle infrastructure, and transit capital projects, including intercity bus terminals.	• Transit • Rail • Active Transportation	• Capital costs for transit projects eligible under chapter 53 of Title 49, including vehicles and facilities used to provide intercity passenger bus service. • Carpool projects, fringe and corridor parking facilities and programs including electric and natural gas vehicle charging, bicycle and pedestrian walkways, and Americans with Disabilities Act (ADA) sidewalk modification. • Highway and transit safety infrastructure improvements and programs, hazard eliminations, railroad/highway grade crossings. • Transportation alternatives, intersections with high accident rates or levels of congestion, infrastructure based ITS capital improvements, congestion pricing projects and strategies, and truck parking facilities. • Environmental restoration and pollution abatement	
INFRA	Advance the Administration's priorities of rebuilding America's infrastructure and creating jobs by funding highway and rail projects of regional and national economic significance that position America to win the 21st century.	• Highway/ Roadway • Transit • Rail	• National Highway Freight Network (NHFN) • National Highway System (NHS) • Railway-highway grade crossing or grade separation projects • Construction of intermodal or freight rail, freight projects within the boundaries of a public or private freight rail, water (including ports), or intermodal facility • INFRA grants may not exceed 60% of the total eligible project costs. An additional 20% of project costs may be funded with other Federal assistance, bringing total Federal participation in the project to a maximum of 80%. • For a larger project (project cost exceeding $100 million), an INFRA grant must be at least $25 million. For a smaller project, the grant must be at least $5 million.	08/24
New Starts & Small Starts (FTA Section 5309)	This FTA discretionary grant program funds transit capital investments, including heavy rail, commuter rail, light rail, streetcars, and bus rapid transit. For New Starts and Core Capacity projects, the law requires completion of two phases in advance of receipt of a construction grant agreement – Project Development and Engineering. For Small Starts projects, the law requires completion of one phase in advance of receipt of a construction grant agreement – Project Development.	• Rail • Transit	• New fixed-guideways or extensions to fixed guideways; • Bus rapid transit projects operating in mixed traffic that represent significant investment in the corridor; • Projects that improve capacity on an existing fixed-guideway system • Core capacity projects that expand capacity by at least 10% in existing fixed guideway transit corridors that are at or above capacity today or will be at or above capacity within 5 years	Rolling Application Cycle

Funding Source	Description	Project Types	Eligibility Requirements	Application Deadline
Congestion Mitigation & Air Quality Improvement (CMAQ)	Provides funding to areas in nonattainment or maintenance for ozone, carbon monoxide, and/or particulate matter to help meet the requirements of the Clean Air Act. Funds may be used for any transit capital expenditures otherwise eligible for FTA funding as long as they have an air quality benefit.	• Highway/ Roadway • Transit • Signal Synchronization/ TSM • Active Transportation • TDM	• Funds must be invested in a State's nonattainment or maintenance areas, on projects that reduce ozone precursors, volatile organic compounds, nitrogen oxides, carbon monoxide, or particular matter; • CMAQ projects must come from a transportation plan and transportation improvement program (TIP); • Include quantified emission benefits; • Include emission tradeoffs	09/24
EPA Office of Sustainable Communities Greening America's Communities Program	Greening America's Communities (formerly known as Greening America's Capitals) is an EPA program to help cities and towns develop an implementable vision of environmentally friendly neighborhoods that incorporate innovative green infrastructure and other sustainable design strategies.	• Sustainability	• Dependent on grant available	Rolling application when funding is available
State Funding Sources				
Active Transportation Program – Cycle 5	The Active Transportation Program (ATP) is a competitive statewide program created to encourage increased use of active modes of transportation, such as biking and walking. Funds can be used to fund the development of communitywide active transportation plans within or, for area-wide plans, encompassing disadvantaged communities, including bicycle, pedestrian, safe routes to schools, or comprehensive active transportation plans.	• Active Transportation	**Active Transportation Program Cycle 5 Guidelines** • Consistency with an adopted regional transportation plan • Use of appropriate application • Supplanting funds • Eligibility of project (infrastructure projects, plans, non-infrastructure projects, infrastructure projects with non-infrastructure components, and quick-build project pilot programs) • Note exceptions listed in Cycle 5 Policy Guidelines • Request of at least the minimum request amount as outline in the Cycle 5 Policy Guidelines • Projects that are already fully funded or projects that are a capital improvement required as a condition for private development approval or permits are not eligible for ATP funding; • A project applicant found to have purposefully misrepresented information that could affect a project's score may result in the applicant being excluded from the program	09/24
Cap & Trade: Low Carbon Transit Operations Program (LCTOP)	Provides funding for projects that have a goal of reducing GHG emissions, improving mobility, and prioritize disadvantaged communities. This program uses funding from 5 percent of cap-and-trade auction proceeds deposited to	• Transit	• Projects that increase transit mode share • Projects that replace conventional vehicles with zero emission vehicle projects	10/24

Funding Source	Description	Project Types	Eligibility Requirements	Application Deadline
	the Greenhouse Gas Reduction Funds (GGRF).		• Projects that support new or expanded bus or rail services; • Projects that support expansions to intermodal transit facilities, equipment acquisition, fueling, and maintenance and other costs to operate above services or facilities.	
State Transportation Improvement Program (STIP)	Provides funding for capital improvements on and off the State Highway System that increase the capacity or improve the state of good repair of the transportation system. The STIP consists of two broad programs – the regional program (RIP) funded from 75% of new STIP funding and the interregional program (IIP) funded from 25% of new STIP funding.	• Active Transportation	• The CTC must approve each County's STIP in its entirety; • CTC allocation is required by the end of the fiscal year that the project is listed in the STIP	12/24
State Highway Operations Protection Program (SHOPP)	Provides funding to maintain the safety and integrity of the State Highway System. Most of the projects are for pavement and bridge rehabilitation and traffic safety improvements. CTC allocates to the individual projects.	• Highway/ Roadway • Transit	• Capital improvements relative to maintenance and safety of state highways and bridges; • Rehabilitates state highways and bridges that do not add a new traffic lane	February of odd numbered years
SB 1 – State of Good Repair	Provides road safety improvements, repair local streets, expand public transit, improve highways, and build bridges and overpasses.	• Roadway • Active Transportation • Sustainability	• Transit capital projects or services to maintain or repair a transit operator's existing transit vehicle fleet or transit facilities, including the rehabilitation or modernization of the existing vehicles or facilities • The design, acquisition and construction of new vehicles or facilities that improve existing transit services; • Transit services that complement local efforts for repair and improvement of local transportation infrastructure. • Replacement or rehabilitation of rolling stock, passenger stations and terminal, security equipment and systems, maintenance facilities and equipment, ferry vessels, and rail • Preventative maintenance • New maintenance facilities or maintenance equipment if needed to maintain the existing transit service	09/24
Trade Corridor Enhancement (TCEP)	Provides funding for infrastructure improvements along corridors with high volumes of freight movement.	• Highway • Freight	• Freight System Factors – Throughput, Velocity, and Reliability, • Transportation System Factors – Safety, Congestion Reduction/Mitigation, Key Transportation Bottleneck Relief, Multi-Modal Strategy, Interregional Benefits, and Advanced Technology;	Agency submits a request to Caltrans at least 60 days prior to the meeting in which they wish to have

Funding Source	Description	Project Types	Eligibility Requirements	Application Deadline
			• Community Impact Factors – Air Quality Impact, Community Impact Mitigation, and Economic/Jobs Growth; • The overall need, benefits, and cost of the project • Project Readiness – ability to complete the project in a timely manner; • Demonstration of the required 30% matching funds; • The leveraging and coordination of funds from multiple sources; and jointly nominated and/or jointly funded.	the allocation approved
Local Partnership Program (LPP)	Provides local and regional agencies that have passed sales tax measures, tolls, or fees or that have imposed fees which are dedicated solely to transportation improvements with a continuous appropriation of $200 million annually (Statewide) to fund road maintenance and rehabilitation, sound walls, and other transportation improvement projects.	• Highway/ Roadway • Transit • Active Transportation • Paratransit	• Improves the state highway system • Improves transit facilities that expand transit facilities; • Increases ridership; • Improves safety; • Acquisition of new or rehabilitation of rolling stock, buses, or other transit equipment; • Improves the local road system; • Improves bicycle and pedestrian safety or mobility; • Mitigates the environmental impact of new transportation infrastructure on a locality's or region's air quality or water quality; • Road maintenance and rehabilitation	11/24
Transit and Intercity Rail	Provides grants for capital improvements and operational investments that will modernize California's transit systems and intercity, commuter, and urban rail systems to reduce emissions of greenhouse gases by reducing vehicle miles traveled throughout California.	• Transit	• Enhances and improves existing rail systems, includes new rail cars to increase ridership and service levels; • Improves transit reliability • Improves existing and future rail systems; • Includes high speed rail; • Increases integration of rail and transit services; • Includes integrated ticketing and bus transit investments that increase ridership and reduce GHG emissions	12/24
Solutions for Congested Corridors Program	The Sustainable Communities Program provides direct technical assistance to SCAG member jurisdictions to complete planning and policy efforts that enable implementation of the regional	• Highway/ Roadway • Transit	• Projects that reduce congestion to highly traveled and congested corridors through performance improvements that balance transportation improvements, community impacts, and provide environmental benefits;	08/24

Funding Source	Description	Project Types	Eligibility Requirements	Application Deadline
	SCS. Call for applications for smart cities & mobility innovations, housing & sustainable development, active transportation & safety.	• Active Transportation • Goods Movement	• Projects must be included in a qualifying Comprehensive Multimodal Corridor Plan consistent with the CTC's Comprehensive Multimodal Corridor Plan Guidelines	
Regional/ Local Funding Sources				
Measure C – Regional Transportation Program	The core or vision of the Measure C plan is to provide mobility options for all of Fresno County's residents, helping to maintain Fresno County's quality-of-life in its amenities and transportation options.	• Transit • Sustainability	• Projects must be made to one of the following categories: • State highways • County roadways • City streets	Rolling application submissions
San Joaquin Valley Air Quality District – Public Benefit Grant Program		• Sustainability	• Mobile source projects. Eligibility continues through either the Moyer Program or the Proposition 1B Program, with a focus on zero-emission equipment. • Zero-emission charging infrastructure projects. Eligibility continues with a focus on medium- and heavy-duty vehicle infrastructure. • Stationary source projects. New eligibility for the replacement of equipment at locations of stationary sources of air pollution not subject to the Cap-and-Trade Program, which will result in direct reductions of TACs or criteria air pollutants.	Rolling application submissions

7.3 Prioritization Framework

To understand the potential benefits of the projects and programs presented and create a prioritization framework, each strategy is analyzed using a set of evaluation criteria that are derived from the project goals identified in earlier tasks. Criteria used to evaluate the strategies are summarized in the table below:

TABLE 5: EVALUATION CRITERIA SUMMARY TABLE

Criterion	Description
Reduced VMT	The project is expected to reduce the number of vehicle miles traveled (VMT) within the study area. Reduced VMT is also used as a proxy for identifying reduced greenhouse gas (GHG) emissions from vehicles. More specifically, if a project is successful at reducing the number of VMT, then it is likely to also reduce GHG emissions. Additionally, VMT can also correlate with traffic congestion, as more vehicles travel more miles over the transportation network, the potential for traffic congestion can increase.
Improves Air Quality	The project will reduce emissions from transportation vehicles to improve air quality for communities living within the study area.
Improved V/C Ratio	The project is expected to improve the volume/capacity (V/C) ratio, thus indicating that the project will reduce traffic congestion.
Intersection Improvement	The project is an intersection improvement that will streamline traffic flows for freight trucks, personal vehicles, bicycles, and pedestrians. Ultimately, this intersection improvement will minimize queuing and reduce traffic congestion along corridors.
Targeted Safety Projects	The project specifically aims to improve safety at a location that has been identified by the public or through existing conditions. The project has the potential to reduce the number of collisions occurring at this location.
Complete Streets Project	The project will help to create a “complete street” where all modes can travel safely along.
Pedestrian Safety Project	The project specifically aims to improve the safety of pedestrians along corridors or at intersections by reducing crossing distances, adding protected infrastructure, and ultimately reducing the number of collisions between pedestrians and motorists.

The performance metrics listed above were then given a score ranging from one to three based on the project’s anticipated impact. The project’s impact may be localized to the recommended intersection, corridor, or truck regulated area. However, the cumulative impact of the recommended strategies is expected to produce a more significant positive impact for the South-Central Fresno Community. Descriptions for potential scores are summarized below in Table 6.

TABLE 6: EVALUATION CRITERIA SCORING SUMMARY

Level of Impact	Description
High (3)	Project produces moderate to significant benefits.
Moderate (2)	Project produces moderate benefits.
Low or No (1)	Project produces low or no benefits.

Table 7 below reflects the recommended performance metrics and scoring for each proposed strategy, as well as their total score.

TABLE 7: PRIORITIZATION MATRIX

ID	Strategy	Location	Cross Street	Potential Reduction in VMT	Improves Air Quality	Potential Reduction in Traffic Congestion	Intersection Improvement	Targeted Safety Projects	Complete Streets Project	Pedestrian Safety Project	Total
1	New Crosswalks	Cedar	Kaviland	1	1	1	3	3	3	3	15
2	New Crosswalks	Rowell	Kaviland	1	1	1	3	3	3	3	15
3	New Crosswalks	Jensen	Cedar	1	1	1	3	3	3	3	15
4	New Crosswalks	Jensen	Holloway	1	1	1	3	3	3	3	15
5	New Crosswalks	Jensen	Rowell	1	1	1	3	3	3	3	15
6	New Crosswalks	Jensen Bypass	Cedar	1	1	1	3	3	3	3	15
7	New Crosswalks	Jensen	Golden State	1	1	1	3	3	3	3	15
8	New Crosswalks	Jensen	East (South)	1	1	1	3	3	3	3	15
9	New Crosswalks	Jensen	East (North)	1	1	1	3	3	3	3	15
10	New Crosswalks	Jensen	Cherry	1	1	1	3	3	3	3	15
11	New Crosswalks	Jensen	Elm	1	1	1	3	3	3	3	15
12	New Crosswalks	Jensen	MLK Jr	1	1	1	3	3	3	3	15
13	New Crosswalks	Jensen	Walnut	1	1	1	3	3	3	3	15
14	New Crosswalks	Jensen	Fruit	1	1	1	3	3	3	3	15
15	New Crosswalks	Jensen	West	1	1	1	3	3	3	3	15
16	New Crosswalks	North	Walnut	1	1	1	3	3	3	3	15

17	New Crosswalks	North	MLK Jr	1	1	1	3	3	3	3	15
18	New Crosswalks	North	Elm	1	1	1	3	3	3	3	15
19	New Crosswalks	North	Cedar	1	1	1	3	3	3	3	15
20	New Crosswalks	North	Maple	1	1	1	3	3	3	3	15
21	New Crosswalks	North	Chestnut	1	1	1	3	3	3	3	15
22	New Crosswalks	North	Peach	1	1	1	3	3	3	3	15
23	New Crosswalks	Central	Peach	1	1	1	3	3	3	3	15
24	New Crosswalks	Central	Willow	1	1	1	3	3	3	3	15
25	New Crosswalks	Central	Golden State	1	1	1	3	3	3	3	15
26	New Crosswalks	Central	Maple	1	1	1	3	3	3	3	15
27	New Crosswalks	Central	Cedar	1	1	1	3	3	3	3	15
28	New Crosswalks	Central	Orange	1	1	1	3	3	3	3	15
29	New Crosswalks	Central	East	1	1	1	3	3	3	3	15
30	New Crosswalks	Central	Cherry	1	1	1	3	3	3	3	15
31	New Crosswalks	Fwy41	Central	1	1	1	3	3	3	3	15
32	New Crosswalks	Central	Elm	1	1	1	3	3	3	3	15
33	New Crosswalks	Central	MLK Jr	1	1	1	3	3	3	3	15
34	New Crosswalks	Fwy41	American	1	1	1	3	3	3	3	15
35	New Crosswalks	American	Cedar	1	1	1	3	3	3	3	15
36	New Crosswalks	North	Cherry	1	1	1	3	3	3	3	15
37	New Crosswalks	Golden State	Railroad	1	1	1	3	3	3	3	15

38	New Crosswalks	Golden State	Orange	1	1	1	3	3	3	3	15
39	New Crosswalks	Golden State	East	1	1	1	3	3	3	3	15
40	New Crosswalks	Golden State	Church	1	1	1	3	3	3	3	15
41	New Crosswalks	G	Church	1	1	1	3	3	3	3	15
42	New Crosswalks	Church	Railroad	1	1	1	3	3	3	3	15
43	New Crosswalks	Church	Cedar	1	1	1	3	3	3	3	15
44	New Crosswalks	Church	Chestnut	1	1	1	3	3	3	3	15
45	New Crosswalks	Church	East	1	1	1	3	3	3	3	15
46	New Crosswalks	Church	Cherry	1	1	1	3	3	3	3	15
47	New Crosswalks	Church	MLK Jr	1	1	1	3	3	3	3	15
48	New Crosswalks	Church	Clara	1	1	1	3	3	3	3	15
49	New Crosswalks	Church	Fairview	1	1	1	3	3	3	3	15
50	New Crosswalks	Church	Walnut	1	1	1	3	3	3	3	15
51	New Crosswalks	Church	Fruit	1	1	1	3	3	3	3	15
52	New Crosswalks	Church	West	1	1	1	3	3	3	3	15
53	New Crosswalks	Church	Marks	1	1	1	3	3	3	3	15
54	New Crosswalks	Jensen	Chestnut	1	1	1	3	3	3	3	15
55	New Crosswalks	Jensen	Peach	1	1	1	3	3	3	3	15
56	New Crosswalks	Chestnut	Butler	1	1	1	3	3	3	3	15
57	New Crosswalks	Cedar	California	1	1	1	3	3	3	3	15
58	New Crosswalks	Cedar	Hamilton	1	1	1	3	3	3	3	15

59	New Crosswalks	Cedar	Heaton	1	1	1	3	3	3	3	15
60	New Crosswalks	Butler	East	1	1	1	3	3	3	3	15
61	New Crosswalks	Butler	O	1	1	1	3	3	3	3	15
62	New Crosswalks	Los Angeles	M	1	1	1	3	3	3	3	15
63	New Crosswalks	Los Angeles	Van Ness	1	1	1	3	3	3	3	15
64	New Crosswalks	Van Ness	Hamilton	1	1	1	3	3	3	3	15
65	New Crosswalks	Van Ness	California	1	1	1	3	3	3	3	15
66	New Crosswalks	Van Ness	Railroad	1	1	1	3	3	3	3	15
67	New Crosswalks	Railroad	G	1	1	1	3	3	3	3	15
68	New Crosswalks	Ventura	C	1	1	1	3	3	3	3	15
69	New Crosswalks	C	Mono	1	1	1	3	3	3	3	15
70	New Crosswalks	C	Inyo	1	1	1	3	3	3	3	15
71	New Crosswalks	C	Kern	1	1	1	3	3	3	3	15
72	New Crosswalks	C	Tulare	1	1	1	3	3	3	3	15
73	New Crosswalks	C	Fresno	1	1	1	3	3	3	3	15
74	New Crosswalks	B	Stanislaus	1	1	1	3	3	3	3	15
75	New Crosswalks	B	Amador	1	1	1	3	3	3	3	15
76	New Crosswalks	Whites Bridge	Thorne	1	1	1	3	3	3	3	15
77	New Crosswalks	Thorne	Kearney	1	1	1	3	3	3	3	15
78	New Crosswalks	G	El Dorado	1	1	1	3	3	3	3	15
79	New Crosswalks	O	Santa Clara	1	1	1	3	3	3	3	15

80	New Crosswalks	O	Butler	1	1	1	3	3	3	3	15
81	New Crosswalks	Nielsen	Hughes	1	1	1	3	3	3	3	15
82	New Crosswalks	Ventura	Cedar	1	1	1	3	3	3	3	15
83	New Crosswalks	Belmont	1st	1	1	1	3	3	3	3	15
84	New Crosswalks	Tulare	6th	1	1	1	3	3	3	3	15
85	New Crosswalks	Tulare	1st	1	1	1	3	3	3	3	15
86	New Crosswalks	Belmont	Cedar	1	1	1	3	3	3	3	15
87	New Crosswalks	Belmont	Blackstone	1	1	1	3	3	3	3	15
88	New Crosswalks	Blackstone	Olive	1	1	1	3	3	3	3	15
89	New Crosswalks	Belmont	Weber	1	1	1	3	3	3	3	15
90	New Crosswalks	Belmont	Wesley	1	1	1	3	3	3	3	15
91	New Crosswalks	Belmont	Butler	1	1	1	3	3	3	3	15
92	New Crosswalks	Olive	Weber	1	1	1	3	3	3	3	15
93	New Crosswalks	Golden State	McKinley	1	1	1	3	3	3	3	15
94	New Crosswalks	McKinley	Echo	1	1	1	3	3	3	3	15
95	New Crosswalks	McKinley	Palm	1	1	1	3	3	3	3	15
96	New Crosswalks	McKinley	Fresno	1	1	1	3	3	3	3	15
97	New Crosswalks	McKinley	Millbrook	1	1	1	3	3	3	3	15
98	New Crosswalks	Central	Chestnut	1	1	1	3	3	3	3	15
99	New Crosswalks	R	Huntington	1	1	1	3	3	3	3	15
100	New Crosswalks	Thorne	California	1	1	1	3	3	3	3	15

101	New Crosswalks	Kearney	Fruit	1	1	1	3	3	3	3	15
102	New Crosswalks	9th	Ventura	1	1	1	3	3	3	3	15
103	Roadway Reconfiguration	North	Willow	2	2	2	3	2	2	1	14
104	Roadway Reconfiguration	Butler	Hazelwood	2	2	3	3	3	3	1	17
105	Roadway Reconfiguration	California	Plumas	2	2	3	3	3	3	2	18
106	Roadway Reconfiguration	Belmont	Palm	2	2	3	3	3	3	1	17
107	Roadway Reconfiguration	Fwy99	North	2	2	3	3	3	2	1	16
108	Roadway Reconfiguration	North	Golden State Frontage	2	2	3	3	3	3	1	17
109	Roadway Reconfiguration	Broadway	Santa Clara	2	2	3	3	3	3	1	17
110	Roadway Reconfiguration	Palm	Yale	2	2	3	3	3	3	1	17
111	Roadway Reconfiguration	Cedar	Thomas	2	2	3	3	3	3	1	17
112	Roadway Reconfiguration	Cedar	Floradora	2	2	3	3	3	3	1	17
113	Roadway Reconfiguration	G	Stanislaus	2	2	3	3	3	3	1	17
114	Roadway Reconfiguration	Kearney	Thorne	2	2	3	3	3	3	1	17

115	Traffic Signalization Improvement	Central	Chestnut	2	3	3	3	3	3	2	19
116	Traffic Signalization Improvement	B	Stanislaus	2	3	3	3	3	3	3	20
117	Traffic Signalization Improvement	California	West	2	3	3	3	3	3	2	19
118	Traffic Signalization Improvement	B	Rev Chester Riggins	2	3	3	3	3	3	1	18
119	Traffic Signalization Improvement	Divisadero	Glenn	2	3	3	3	3	3	3	20
120	Traffic Signalization Improvement	Divisadero	Calaveras	2	3	3	3	3	3	3	20
121	Traffic Signalization Improvement	M	Santa Clara	2	3	3	3	3	3	2	19
122	Traffic Signalization Improvement	O	San Benito	2	3	3	3	3	3	2	19
123	Traffic Signalization Improvement	Ventura	10th	2	3	3	3	3	3	3	20
124	Traffic Signalization Improvement	Abby	Harvey	2	3	3	3	3	3	3	20
125	Traffic Signalization Improvement	Belmont	Stafford	2	3	3	3	3	3	1	18
126	Traffic Signalization Improvement	McKinley	San Pablo	2	3	3	3	3	3	3	20
127	Traffic Signalization Improvement	Golden State	Church	2	3	3	3	3	3	3	20
128	Traffic Signalization Improvement	North	Parkway	2	3	3	3	3	3	3	20
129	Traffic Signalization Improvement	C	Walnut/ Martin	2	3	3	3	3	3	1	18

130	Traffic Signalization Improvement	Clinton	Marks	2	3	3	3	3	3	1	18
131	Truck Focused Signage	Fwy99	Chestnut	1	1	1	3	3	3	1	13
132	Truck Focused Signage	Fwy99	North	1	1	1	3	3	3	1	13
133	Truck Focused Signage	Fwy99	Orange	1	1	1	3	3	3	1	13
134	Truck Focused Signage	Fwy99	Jensen	1	1	1	3	3	3	1	13
135	Truck Focused Signage	Fwy99	Fwy41	1	1	1	3	3	3	1	13
136	Truck Focused Signage	Fwy99	Ventura	1	1	1	3	3	3	1	13
137	Truck Focused Signage	Fwy99	Fresno	1	1	1	3	3	3	1	13
138	Truck Focused Signage	Fwy99	Fwy180	1	1	1	3	3	3	1	13
139	Truck Focused Signage	Fwy 99	Belmont	1	1	1	3	3	3	1	13
140	Truck Focused Signage	Fwy99	Olive	1	1	1	3	3	3	1	13
141	Truck Focused Signage	Fwy 99	McKinely	1	1	1	3	3	3	1	13
142	Truck Focused Signage	Fwy180	Marks	1	1	1	3	3	3	1	13
143	Truck Focused Signage	Fwy180	Fwy99	1	1	1	3	3	3	1	13
144	Truck Focused Signage	Fwy180	Fwy99	1	1	1	3	3	3	1	13
145	Truck Focused Signage	Fwy180	Abby	1	1	1	3	3	3	1	13
146	Truck Focused Signage	Fwy180	Fwy41	1	1	1	3	3	3	1	13
147	Truck Focused Signage	Fwy180	Cedar	1	1	1	3	3	3	1	13
148	Truck Focused Signage	Fwy41	Central	1	1	1	3	3	3	1	13
149	Truck Focused Signage	Fwy41	North	1	1	1	3	3	3	1	13

150	Truck Focused Signage	Fwy41	Jensen	1	1	1	3	3	3	1	13
151	Truck Focused Signage	Fwy41	San Benito	1	1	1	3	3	3	1	13
152	Truck Focused Signage	Fwy41	O	1	1	1	3	3	3	1	13
153	Truck Focused Signage	Fwy41	Tulare	1	1	1	3	3	3	1	13
154	Truck Focused Signage	Fwy41	Fwy180	1	1	1	3	3	3	1	13
155	Truck Focused Signage	Fwy41	Fwy180	1	1	1	3	3	3	1	13
156	Truck Focused Signage	Golden State	Olive	1	1	1	3	3	3	1	13

ID	Strategy	Location	Extents	Length	Potential Reduction in VMT	Improves Air Quality	Potential Reduction in Traffic Congestion	Intersection Improvement	Targeted Safety Projects	Complete Streets Project	Pedestrian Safety Project	Total
157	New Sidewalks	Willow	Jensen - Central	2.0	1	1	1	3	3	3	3	15
158	New Sidewalks	Cherry	North - Central	1.0	1	1	1	3	3	3	3	15
159	New Sidewalks	Chestnut	Jensen - Central	2.0	1	1	1	3	3	3	3	15
160	New Sidewalks	American	Fwy41 - Fwy99	3.4	1	1	1	3	3	3	3	15
161	New Sidewalks	Central	Fwy41 - Peach	3.8	1	1	1	3	3	3	3	15
162	New Sidewalks	Orange	Railroad - American	2.8	1	1	1	3	3	3	3	15
163	New Sidewalks	Golden State	California - Central	4.1	1	1	1	3	3	3	3	15
164	New Sidewalks	California	Kern - Mono	0.2	1	1	1	3	3	3	3	15
165	New Sidewalks	Church	Marks - MLK Jr	2.5	1	1	1	3	3	3	3	15
166	New Sidewalks	Elm	North - Central	1.0	1	1	1	3	3	3	3	15
167	New Sidewalks	Cedar	Parkway - American	1.6	1	1	1	3	3	3	3	15
168	New Sidewalks	North	Parkway - Peach	2.4	1	1	1	3	3	3	3	15
169	New Sidewalks	Jensen	Maple - Peach	1.5	1	1	1	3	3	3	3	15

170	New Sidewalks	California	Marks - West	1.0	1	1	1	3	3	3	3	15
171	New Sidewalks	Church	Cherry - 10th	1.4	1	1	1	3	3	3	3	15
172	New Sidewalks	Walnut	Church - North	1.5	1	1	1	3	3	3	3	15
173	New Bike Lanes	Chestnut	Jensen - Central	2.0	3	3	2	2	3	3	2	18
174	New Bike Lanes	American	Fwy41 - Fwy99	3.4	3	3	2	2	3	3	2	18
175	New Bike Lanes	Olive	Fwy99 - Cedar	4.2	3	3	2	2	3	3	2	18
176	New Bike Lanes	Orange	Ventura - Butler	0.5	3	3	2	2	3	3	2	18
177	New Bike Lanes	Golden State	California - Central	4.1	3	3	2	2	3	3	2	18
178	New Bike Lanes	Belmont	Fwy99 - Chestnut	4.9	3	3	2	2	3	3	2	18
179	New Bike Lanes	Palm	McKinley - H	1.2	3	3	2	2	3	3	2	18
180	New Bike Lanes	Tulare	Fwy41 - Cedar	1.2	3	3	2	2	3	3	2	18
181	New Bike Lanes	Church	Marks - MLK Jr	2.5	3	3	2	2	3	3	2	18
182	New Bike Lanes	North	Walnut - Peach	1.5	3	3	2	2	3	3	2	18
183	New Bike Lanes	Cedar	Woodward - Jensen	1.1	3	3	2	2	3	3	2	18
184	New Bike Lanes	McKinley	Blackstone - Cedar	2.0	3	3	2	2	3	3	2	18
185	New Bike Lanes	First	Tulare - Hazelwood	0.8	3	3	2	2	3	3	2	18
186	New Bike Lanes	Abby	Blackstone - Divisadero	1.1	3	3	2	2	3	3	2	18
187	New Bike Lanes	Blackstone	McKinley - Divisadero	1.5	3	3	2	2	3	3	2	18
188	New Bike Lanes	H	Belmont - Divisadero	0.8	3	3	2	2	3	3	2	18
189	New Bike Lanes	Ventura	C - H	0.4	3	3	2	2	3	3	2	18
190	New Bike Lanes	Ventura	O - Parallel	0.3	3	3	2	2	3	3	2	18

191	New Bike Lanes	P	Divisadero - Ventura	0.8	3	3	2	2	3	3	2	18
192	New Bike Lanes	O	Ventura - Butler	0.4	3	3	2	2	3	3	2	18
193	New Bike Lanes	Los Angeles/ Butler	Van Ness - Hazelwood	0.7	3	3	2	2	3	3	2	18
194	New Bike Lanes	Van Ness	Ventura - Los Angeles	0.4	3	3	2	2	3	3	2	18
195	New Bike Lanes	Tuolumne	A - E	0.3	3	3	2	2	3	3	2	18
196	New Bike Lanes	Walnut	Church - North	1.5	3	3	2	2	3	3	2	18
197	Roadway Reconfiguration	Willow	Jensen - Central	2.0	2	3	3	3	3	3	3	20
198	Roadway Reconfiguration	Olive	Fwy99 - Cedar	4.2	2	3	3	3	3	3	1	18
199	Roadway Repaving	Railroad	Church - Golden State	1.6	1	1	1	2	2	3	1	11
200	Roadway Repaving	Jensen	Cedar - Barton	0.3	1	1	1	2	2	3	1	11
201	Roadway Repaving	Kings Canyon	Maple - Chestnut	0.5	1	1	1	2	2	3	1	11
202	Roadway Repaving	Jensen	West - Cedar	4.0	1	1	1	2	2	3	1	11
203	Roadway Repaving	KcKinley	Fwy99 - West	0.4	1	1	1	2	2	3	1	11
204	Roadway Repaving	A	Kern - Ventura	0.3	1	1	1	2	2	3	1	11
205	Roadway Repaving	Church	Thorne - Walnut	0.2	1	1	1	2	2	3	1	11
206	Roadway Repaving	Parkway	North - Cedar	0.5	1	1	1	2	2	3	1	11
207	Roadway Repaving	Cedar	North - Parkway	0.3	1	1	1	2	2	3	1	11
208	Roadway Repaving	Cedar	Woodward - Jensen	1.1	1	1	1	2	2	3	1	11
209	Roadway Repaving	Cedar	Fwy180 - Belmont	0.3	1	1	1	2	2	3	1	11

210	Roadway Repaving	Weber	McKinley - Belmont	1.3	1	1	1	2	2	3	1	11
211	Roadway Repaving	H	Belmont - Divisadero	0.8	1	1	1	2	2	3	1	11
212	Traffic Calming	Cherry	North - Central	1.0	1	1	1	3	3	3	3	15
213	Traffic Calming	Central	Fwy41 - Peach	3.8	1	1	1	3	3	3	3	15
214	Traffic Calming	Orange	Ventura - Butler	0.5	1	1	1	3	3	3	3	15
215	Traffic Calming	Orange	Butler - Jensen	1.4	1	1	1	3	3	3	3	15
216	Traffic Calming	Belmont	Fwy99 - Chestnut	4.9	1	1	1	3	3	3	3	15
217	Traffic Calming	McKinely	Palm - Blackston e	1.0	1	1	1	3	3	3	3	15
218	Traffic Calming	Weber	McKinley - Belmont	1.3	1	1	1	3	3	3	3	15
219	Traffic Calming	Abby	Blackston e - Divisader o	1.1	1	1	1	3	3	3	3	15
220	Traffic Calming	Blackston e	McKinley - Divisader o	1.5	1	1	1	3	3	3	3	15
221	Traffic Calming	American	Elm – Peach	3.34	1	1	1	3	3	3	3	15
222	Traffic Calming	North	Walnut – Peach	4.5	1	1	1	3	3	3	3	15
ID	**Strategy**	**Location**		**Area**	**Potential Reduction in VMT**	**Improves Air Quality**	**Potential Reduction in Traffic Congestion**	**Intersection Improvement**	**Targeted Safety Projects**	**Complete Streets Project**	**Pedestrian Safety Project**	**Total**
223	Truck Regulated				3	3	3	3	3	3	1	19
	Area	Central Fresno		0.4								
224	Truck Regulated Area	Mural District		0.1	3	3	3	3	3	3	1	19

225	Truck Regulated Area	SW Fresno	2.5	3	3	3	3	3	3	1	19
226	Truck Regulated Area	Tower	1.3	3	3	3	3	3	3	1	19
227	Truck Regulated Area	Tulare West	0.9	3	3	3	3	3	3	1	19
228	Truck Regulated Area	Tulare East	0.9								
228	Truck Regulated Area	Roosevelt West	0.92	3	3	3	3	3	3	1	19
229	Truck Regulated Area	Roosevelt East	1.8								
230	Truck Regulated Area	Brookhaven	0.8	3	3	3	3	3	3	1	19
231	Truck Regulated Area	Malaga	0.2	3	3	3	3	3	3	1	19
232	Truck Regulated Area	Jefferson	0.4	3	3	3	3	3	3	1	19
233	Truck Regulated Area	Lowell	0.2	3	3	3	3	3	3	1	19
234	Truck Regulated Area	Cincotta	0.5	3	3	3	3	3	3	1	19
235	Truck Regulated Area	Hammond	0.4	3	3	3	3	3	3	1	19
236	Truck Regulated Area	McKinley	0.5	3	3	3	3	3	3	1	19

237	Truck Regulated Area	Divisadero	0.2	3	3	3	3	3	3	1	19
238	Truck Regulated Area	N Blackstone	0.5	3	3	3	3	3	3	1	19

8 Next Steps

This report provided a comprehensive toolkit and list of both infrastructure and non-infrastructure strategies that aim to mitigate the negative impacts of freight truck travel within South-Central Fresno, as well as the new proposed truck route map. Additionally, the implementation section of this report provided a draft framework for the implementation of the recommended strategies within the study area based on funding availability, performance metrics, and scoring. The draft strategy toolkit and list will be revised to incorporate feedback received from the City, TSC, CAG, and community in Spring 2024. The final strategy toolkit, list, and map will be provided in the final report.

Attachment D

FRESNO COMMUNITY ENVIRONMENTAL HEALTH IMPACT ASSESSMENT

APRIL 2024

COMMUNITY AND LABOR CENTER
UC MERCED

UNIVERSITY OF CALIFORNIA, MERCED

TABLE OF CONTENTS

List of tables 3
List of figures 4
Contributors and acknowledgements 6
Principal investigator 6
Contributors 6
Funding and acknowledgements 6
Executive summary (English) 7
Executive summary (Spanish) - Resumen ejecutivo 10
Introduction and background 13
Study objectives 14
Chapter 1. Pollution and adverse birth outcomes in Fresno, California 16
1.1 Background 16
1.2 Methods 17
1.2.1 Participants 17
1.2.2 Exposure assessment 17
1.2.3 Outcome assessment 19
1.2.4 Statistical analyses 19
1.3 Results 21
1.3.1 Descriptive statistics 21
1.3.2 Effects of proximity to freeways, major roads, and truck routes 26
1.3.3 Effects of cumulative exposures to diesel, traffic, and air pollution 31
1.3.4 Acute exposures to $PM_{2.5}$ and ozone 31
1.4 Summary 33
1.5 Recommendations 34
Chapter 2. Air pollution and asthma in Fresno, California 35
2.1 Background 35
2.2 Methods 36
2.2.1 Data and participants 36
2.2.2 Exposure assessment 36
2.2.3 Outcome assessment 36
2.2.4 Statistical analyses 37
2.3 Results 37
2.3.1 Descriptive statistics 37

2.3.2 Impacts of air pollution on asthma 39
2.3.3 Excess asthma events due to air pollution exposures 44
2.4 Summary 46
2.5 Recommendations 46
Chapter 3. Air pollution and cardio-cerebrovascular disease in Fresno, California 47
3.1 Background 47
3.2 Methods 48
3.2.1 Data and participants 48
3.2.2 Exposure assessment 48
3.2.3 Outcome assessment 49
3.2.4 Statistical analysis 49
3.3 Results 50
3.3.1 Descriptive statistics 50
3.3.2 Effects of air pollution on cardio-cerebral vascular events 53
3.3.3 Excess cardio-cerebral vascular events associated with air pollution. 58
3.4 Summary 60
3.5 Recommendations 61
Chapter 4. Community-based health survey in South Fresno AB 617 communities 62
4.1 Background 62
4.2 Methods 62
4.3 Results 64
4.3.1 Study participants 64
4.3.2 Residents' environmental health concerns 65
4.3.3 Health conditions 69
4.3.4 Civic engagement 77
4.4 Summary 77
4.5 Recommendations 78
Glossary 79
Appendices 82
References 84

LIST OF TABLES

Table 1.1 Data sources 18
Table 1.2. Characteristics of singleton live births in Fresno, California, 2009-2019 21
Table 1.3. Long-term exposures by community boundaries 25
Table 1.4. Associations between proximity to freeways, major roads, and truck routes and perinatal outcomes 30
Table 1.5. Associations between cumulative exposures and birth outcomes 31
Table 1.6. Associations between chronic exposures and infant mortality by race/ethnicity 31
Table 1.7. Associations between acute air pollution and adverse perinatal outcomes 32
Table 1.8. Excess cases of PTB and IM in relation to pollution exposure 33
Table 2.1. Characteristics of emergency department visits and hospitalizations related to asthma in Fresno, 2011-2020 38
Table 2.2. Rates of asthma ED visits within and outside of the South Fresno community boundaries 39
Table 2.3. Estimates for associations between pollution and asthma ED visits and hospitalizations 41
Table 2.4. Associations between air pollution and asthma within and outside South Fresno AB 617 Community boundaries 42
Table 2.5. Associations between air pollution and asthma ED visits by race/ethnicity 43
Table 2.6. Associations between air pollution and asthma hospitalization by race/ethnicity 43
Table 2.7. Excess cases of asthma-related ED visits and hospitalizations associated with each 5-unit increase in air pollution exposures 45
Table 3.1. ICD codes to identify cardio-cerebral vascular diseases 49
Table 3.2. Characteristics of emergency department visits and hospitalizations related to cardiovascular diseases in Fresno, 2011-2020 50
Table 3.3. Rates of CCVD within and outside of the Fresno AB 617 community boundaries 52
Table 3.4. Associations between pollution and cardio-cerebral vascular ED visits and hospitalizations 55
Table 3.5. Associations between air pollution and cardio-cerebral vascular diseases within and outside the South Fresno community boundaries 56
Table 3.6. Associations between air pollution and cardio-cerebral vascular ED visits by race/ethnicity 57
Table 3.7. Associations between air pollution and cardio-cerebral vascular disease hospitalizations by race/ethnicity 57
Table 3.8. Excess CCVD cases associated with pollutants 58
Table 4.1. Comparison of study sample and target population 64
Table 4.2. Characteristics of survey participants (n=1,766) 65

LIST OF FIGURES

Figure 1.1. Road features in Fresno (Source: Fresno GIS Hub) 19
Figure 1.2. Case-crossover study design schematic 20
Figure 1.3. Spatial distribution of preterm birth (rates per 100) and infant mortality (rates per 1,000) by zip code in Fresno, California, 2009-2019 23
Figure 1.4. Rates of preterm birth (A) and infant mortality (B) by time in Fresno, 2009-2019 24
Figure 1.5. Temporal distribution of $PM_{2.5}$ and ozone during the study period 24
Figure 1.6. Spatial distribution of cumulative air pollution indicators in Fresno (source: CalEnviroScreen 4.0) 25
Figure 1.7. Relationship between residential distance to freeways and air pollution exposures 26
Figure 1.8. Relationship between residential distance to truck routes and air pollution exposures 27
Figure 1.9. Relationship between residential distance to major roads and air pollution exposures 28
Figure 1.10. Graphical correlation between residential proximity to road sources and adverse pregnancy outcomes 29
Figure 2.1. Rates of asthma ED visits (A) and hospitalization (B) in Fresno, 2011-2020 39
Figure 2.2. Associations between air pollution and asthma ED visits by season and lag 40
Figure 2.3. Associations between air pollution and asthma hospitalization by season and lag 40
Figure 2.4. Excess asthma associated with air pollution exposure in Fresno during the study period 45
Figure 3.1. Distribution of CCVD ED visits by zip codes 51
Figure 3.2. Distribution of CCVD hospitalizations by zip codes 52
Figure 3.3. Associations between air pollution and ED visits (A) and hospitalizations (B) for all cardio-cerebral vascular events 53
Figure 3.4. Associations between air pollution and ED visits (A) and hospitalizations (B) for stroke 53
Figure 3.5. Associations between air pollution and ED visits (A) and hospitalizations (B) for acute myocardial infarction (heart attack) 54
Figure 3.6. Associations between air pollution and ED visits (A) and hospitalizations (B) for cardiac arrest 54
Figure 3.7. Associations between air pollution and ED visit (A) and hospitalization (B) for heart failure 55
Figure 3.8. Excess number of ED visits (A) and hospitalizations (B) associated with air pollution in Fresno during the study period 58
Figure 4.1. Survey area 63
Figure 4.2. Residents' concerns about the environment in their community 66
Figure 4.3. Importance of local government to address environmental issues within the next few years 67
Figure 4.4. Residents' preference for new roads that direct truck traffic away from local streets 67
Figure 4.5. Impacts of heat on rest and work 68
Figure 4.6. Impacts of air pollution and traffic noise on home rest 69
Figure 4.7. South Fresno Residents' chronic health conditions 70
Figure 4.8. Self-reported health conditions by race/ethnicity 70
Figure 4.9. Self-reported chronic health conditions by age 71
Figure 4.10. Self-reported chronic health condition by sex 71
Figure 4.11. Self-reported chronic health condition by educational attainment 72
Figure 4.12. Self-reported chronic health condition by annual income 72

Figure 4.13. Chronic health condition by environmental health concerns 73
Figure 4.14. Prevalence of having one or more chronic health conditions by proximity to pollution sources 73
Figure 4.15. Prevalence of selected pregnancy outcomes among reproductive-aged women 74
Figure 4.16. Adverse pregnancy outcomes by race/ethnicity 75
Figure 4.17. Adverse pregnancy outcome by maternal age 75
Figure 4.18. Adverse pregnancy outcomes by educational attainment 76
Figure 4.19. Adverse pregnancy outcomes by income 76
Figure 4.20. Prevalence of having any adverse pregnancy outcome by proximity to pollution sources ... 77

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Lastly, we thank the California Department of Public Health Office of Vital Statistics and the California Department of Health Care Access and Information for granting us permission to use their data, as well as the Fresno residents who contributed to these data.

EXECUTIVE SUMMARY

Fresno County has some of the nation's greatest environmental inequalities. In 2022, Fresno had the highest short-term particle pollution, second highest year-round particle pollution, and fourth highest ozone pollution in the nation. Assembly Bill 617, effective in 2017, created the Community Air Protection Program (CAPP), to more effectively reduce pollution exposure and preserve public health. This bill directs the California Air Resources Board (CARB) and all local air districts, including the San Joaquin Valley Air Pollution Control District, to take measures to protect communities who are disproportionately impacted by air pollution.

In 2022, the San Joaquin Valley Air Pollution Control District (hereafter the Air District) and the City of Fresno collaborated to undertake the South-Central Fresno AB 617 Community Truck Reroute Study. The aim of the study is to identify, analyze, and evaluate potential strategies that the city might implement, in cooperation with freight-impacted communities, to abate truck impacts (e.g., health, pollution, noise, etc.). In the same year, the City of Fresno commissioned the UC Merced Community and Labor Center to conduct a Health Impact Assessment (HIA) in Fresno. The results of the Fresno HIA, presented in this report, are intended to inform the ongoing South Fresno Truck Reroute Study

The Fresno HIA has two main components. The first is a large, city-wide assessment. This assessment contains air district data, birth data, emergency department visits, as well as all Fresno patient discharge data. The second Fresno HIA component is the South Fresno Community Survey, which is a representative, community-based survey of South Fresno residents' health, wellbeing, and concerns with local environmental issues.

KEY FINDINGS:

Part 1: Population-Based Assessment

» South Fresno residents were, on average, more likely to live closer to a major street, truck route, or freeway.

» Exposures to air pollutants such as fine particles <2.5 microns ($PM_{2.5}$), ozone, and diesel, were associated with higher risk of the following: preterm birth, infant mortality, and emergency room visits or hospitalization due to asthma, or diseases related to the blood vessels of the heart and brain (e.g. heart attack, stroke, etc.).

» Pregnant people who lived within 1,000 feet of a freeway, 1,000 feet of a truck route, or 300 feet of a major road had significantly higher risk of adverse pregnancy outcomes, including preterm birth and infant mortality.[1]

» Preterm birth, infant mortality, and asthma rates were higher among residents in the South Fresno community boundaries compared to the rest of the city.

» Even at the same level of exposure, residents within the South Fresno community boundaries and communities of color experienced higher health risks.

» The effects of $PM_{2.5}$ were stronger in the cold season (November-April) whereas the effects of ozone were stronger in the warm season (May-October).

Part 2: South Fresno Community Survey

» Among residents within the South Fresno community boundaries, there is a high level of environmental health concern related to road conditions, pollution, and climate change.

» Most South Fresno residents support local efforts to direct trucks away from local residential areas.

» Almost half of residents (43%) reported having at least one chronic health condition.

» Over a quarter of women of reproductive age (18-46 years) reported having an adverse pregnancy outcome, such as miscarriage (22%), stillbirth (3%), infant mortality (0.8%), or having a child with a birth defect (1.6%).

» A significant proportion of residents reported that they “sometimes, “often,” or “always” were unable to rest because of air pollution (61%) and traffic/truck noise (49%). These residents were more likely to have health problems.

» Residents who lived within 1,000 feet of a truck route, freeway, or major road had a higher prevalence of chronic health conditions and adverse pregnancy outcomes.[1]

[1] These distances best distinguish the risks among residents inside and outside the buffers. As such, our findings do not suggest those living outside of this buffer have negligible risks.

KEY RECOMMENDATIONS:

» The South-Central Fresno AB 617 Community Truck Reroute Study should propose options that minimize, to the greatest degree possible, truck routes and traffic within 1,000 feet of residential areas.

» A more conservative buffer should be considered, given that residents within the South Fresno AB 617 community, and communities of color, bear higher health risks for the same exposures to pollution.

» Implement season-specific strategies to mitigate truck emissions. Acute exposure was shown to have significant health impacts. The summer presented the greatest risk for exposure to ozone, while the winter presented the greatest risk for exposure to $PM_{2.5}$ particles.

» The use of zero-emission commercial trucks is also recommended to reduce population exposures to air pollution.

RESUMEN EJECUTIVO

El condado de Fresno tiene algunas de las mayores desigualdades medioambientales del país. En 2022, Fresno tenía la mayor contaminación por partículas a corto plazo, la segunda mayor contaminación por partículas durante todo el año y la cuarta mayor contaminación por ozono de la nación. El Proyecto de Ley de la Asamblea 617, aplicada en 2017, creó el Programa de Protección del Aire de la Comunidad (CAPP por sus siglas en inglés), para reducir ser expuesto a la contaminación y cuidar la salud pública. Este proyecto de ley ordena a El Consejo de Recursos del Aire de California (CARB por sus siglas en inglés) y a todos los distritos locales del aire, incluido el Distrito de Control de la Contaminación del Aire del Valle de San Joaquín (en adelante, Distrito del Aire), que tomen medidas para proteger a las comunidades que se ven desproporcionadamente afectadas por la contaminación del aire.

En 2022, el Distrito de Aire y la ciudad de Fresno trabajaron juntos en el Estudio de Desvío de Camiones de la comunidad AB 617 del sur-centro de Fresno, con el fin de identificar, analizar y evaluar las posibles estrategias que la ciudad podría aplicar, con la ayuda de las comunidades afectadas por el transporte de carga, para reducir los impactos de los camiones (por ejemplo, la salud, la contaminación, el ruido, etc.). Ese mismo año, la ciudad de Fresno encargó al Centro Comunitario y Laboral de UC Merced que realizara una Evaluación del Impacto sobre la Salud (EIS) en Fresno. El propósito de los resultados de la EIS de Fresno, presentados aquí son para informar el estudio sobre la desviación de camiones del sur de Fresno.

La EIS de Fresno tenía dos secciones principales: 1) una evaluación amplia en toda la ciudad sobre los datos del distrito del aire, datos de nacimientos y visitas al departamento de urgencias y datos de altas

de pacientes entre todos los residentes de Fresno; y 2) una encuesta representativa, basada en la comunidad 617, sobre la salud, el bienestar y las preocupaciones de los residentes del sur de Fresno con respecto a los problemas medioambientales locales.

PRINCIPALES RESULTADOS:

Parte 1: Evaluación de la Salud de la Población

» Los residentes del sur de Fresno tenían una mayor probabilidad de vivir cerca de una calle principal, una ruta de camiones o una autopista.

» Ser expuesto a contaminantes de aire como las $PM_{2.5}$, el ozono y el diésel son asociados con un mayor riesgo de parto prematuro, mortalidad infantil y más visitas de urgencias u hospitalización por asma o enfermedades relacionadas con los vasos sanguíneos del corazón y el cerebro (por ejemplo, infarto de miocardio, accidente cerebrovascular, etc.).

» Las personas embarazadas que vivían entre 1,000 pies de una autopista, 1,000 pies de una ruta de camiones o 300 pies de una carretera principal tenían un riesgo significativamente mayor de sufrir un embarazo adverso, incluso el parto prematuro y la mortalidad infantil.[2]

» Las tasas de nacimientos prematuros, mortalidad infantil y asma eran más altas entre los residentes de los límites de la comunidad del Sur de Fresno en comparación con el resto de la ciudad.

» Incluso con el mismo nivel de ser expuesto a la contaminación del aire, los residentes dentro de los límites de la comunidad del Sur de Fresno y las comunidades de color sufrieron mayores riesgos de salud.

» Los efectos de $PM_{2.5}$ fueron más elevados durante la temporada de frio (noviembre-abril) mientras que los efectos del ozono fueron más elevados durante la temporada de calor (mayo-octubre).

Parte 2: Encuesta Comunitaria del Sur Fresno

» Los residentes dentro de los límites de la comunidad del Sur de Fresno, expresaron un alto nivel de preocupación por la salud ambiental relacionada con las condiciones de las carreteras, la contaminación y el cambio climático.

» La mayoría de los residentes del Sur de Fresno apoyan los esfuerzos locales para alejar los camiones de las zonas residenciales locales.

» Casi la mitad de los residentes (43%) declararon tener al menos un problema de salud crónico, y más de una cuarta parte de las mujeres en edad reproductiva (18-46 años) declararon haber tenido un resultado adverso en el embarazo, como aborto espontáneo (22%), muerte fetal (3%), mortalidad infantil (0.8%) o haber tenido un hijo con un defecto congénito (1.6%).

» La mayoría de los residentes declararon que "a veces", "a menudo" o "siempre" no poder descansar debido a la contaminación de aire (61%) y el ruido del tráfico/camiones (49%). Estos residentes son más probables de tener problemas de salud.

[2] Estos límites son los que mejor distinguen los riesgos entre los residentes dentro y fuera. Por tanto, nuestros resultados no sugieren que los que viven fuera de esta zona tengan riesgos insignificantes.

» Los que vivían entre 1,000 pies de un ruta de camiones, autopista o carretera principal tenían una mayor prevalencia de problemas de salud crónicos y resultados adversos del embarazo.[3]

RECOMENDACIONES CLAVE:

» El Estudio de Desvió de Camiones del Sur de Fresno debe proponer opciones que minimicen, de la mayor manera posible, las rutas de camiones y el tráfico dentro de 1,000 pies de las zonas residenciales.

» Se debe considerar una zona de mayor protección, dado que los residentes dentro de la comunidad AB617 del Sur de Fresno, y las comunidades de color, corren mayores riesgos de salud por ser expuestos a los mismos niveles de contaminación

» Aplicar estrategias basada en las temporadas específicas para reducir las emisiones de los camiones. Se demostró que la exposición aguda tiene importantes consecuencias para la salud; y mientras que el verano presenta el mayor riesgo de exposición al ozono, el invierno presenta el mayor riesgo de exposición a las partículas $PM_{2.5}$.

» También se recomienda el use de camiones comerciales de cero emisiones para reducir la exposición de la población a la contaminación de aire.

[3] Estos límites son los que mejor distinguen los riesgos entre los residentes dentro y fuera. Por tanto, nuestros resultados no sugieren que los que viven fuera de esta zona tengan riesgos insignificantes.

INTRODUCTION AND BACKGROUND

Air pollutants, including fine particles and ozone, have been consistently linked to many health outcomes across the lifespan, ranging from minor respiratory irritation to cardiorespiratory complications and even premature death.[1-6] Biologic mechanisms linking air pollution to adverse health outcomes include oxidative stress, systemic inflammation, and endocrine disruption.[7,8] Despite a significant body of work, very few studies have comprehensively evaluated the health impacts of air pollution in Central California, an area with significant air pollution levels, marked health disparities, and severely limited access to care.[9,10]

Fresno, home to almost 545,000 residents, is the fifth largest city of California and is located in the San Joaquin Valley (SJV). It is characterized by some of the nation's greatest environmental inequalities. In 2022, Fresno ranked highest for short-term particle pollution, second highest for year-round particle pollution, and fourth highest for ozone pollution in the nation.[11] Reasons contributing to the high pollution levels in the SJV include topography and, more importantly, the numerous pollution sources. The SJV is surrounded by mountain ranges that can trap air pollutants for an extended time. The weather conditions (e.g., heat, sunlight) are conducive to pollution formation and retention. The area also has heavy truck traffic, many diesel-burning locomotives, and other sources of pollution on I-5 and Highway 99 as well as other sources. These sources emit significant amounts of fine particles and precursors to ozone including nitrogen oxides (NO_x) and volatile organic compounds (VOC). These precursors react with heat and sunlight to form harmful ground-level ozone, which often exceeds recommended standards. Although the levels of ozone and fine particles in the SJV have generally declined in recent years, these pollutants remain significant public health concerns.[12] As such, continued efforts to reduce emission and population exposure are critical.

In 2017, the California governor signed Assembly Bill 617, which aims to develop a new community-focused program to more effectively reduce exposure to air pollution and preserve public health. This bill directs the CARB and all local air districts, including the Air District, to take measures to protect communities disproportionally impacted by air pollution.

In 2022, The Air District and the City of Fresno joined forces to undertake the South-Central Fresno AB 617 Community Truck Reroute Study, which will identify, analyze, and evaluate potential strategies that freight-impacted communities might implement to abate truck impacts (e.g., health, pollution, noise, etc.). In the same year, UC Merced was commissioned by the City of Fresno to conduct a Health Impact Assessment (HIA) within the city. The results of the Fresno HIA are intended to inform the ongoing South Fresno Truck Reroute Study.

STUDY OBJECTIVES

The primary objective of the Fresno HIA is to **assess the impact of air pollution (and proximity to truck traffic) on the risk of common health outcomes across the lifespan**. These health outcomes include infant mortality, preterm delivery, asthma, and cardio cerebral vascular events in the city of Fresno from 2009 to 2020. Second, to inform policy and planning efforts, we also calculated the excess number of cases that are attributed to air pollution in the region. Stated differently, these estimates refer to the number of cases that could be prevented if air pollution levels are minimized. Additionally, we also explored how the health impacts of air pollution differ within subgroups of the Fresno population. Third, we conducted **a South Fresno community-based health survey** to understand residents' concerns, health outcomes, and health needs that are relevant to the South Fresno Truck Reroute Study.

The HIA utilizes both large population-based datasets from the Department of Health Care Access and Information (HCAi) and a representative sample community-based survey. The study also makes use of publicly available data. Detailed data sources associated with each study component are described in **Table 1**.

Table 1. Data sources used in the Fresno Health Impact Assessment

Study component	Data sources	Type of Data	Geography	Specificity
Chapter 1: Adverse Pregnancy Outcomes (preterm birth and infant mortality)	California Department of Health Vital Statistics	Birth certificates	City of Fresno	Zip Code
	SJV Air Pollution Control District	$PM_{2.5}$, ozone	City of Fresno	Zip Code
	California Air Resource Board (CARB)	AB 617 community boundaries	South Fresno	N/A
	Fresno GIS Hub	Distance from truck route, major road, freeway	City of Fresno	Geocodable address
	CalEnviroscreen 4.0, California Office of Environmental Health Hazard Assessment (OEHHA)	cumulative traffic, diesel, $PM_{2.5}$, ozone; other neighborhood indicators	City of Fresno	Census Tract boundaries
Chapter 2: Asthma	California Department of Health Care Access and Information	Emergency department visit and hospitalization	City of Fresno	Zip Code
	SJV Air Pollution Control District	$PM_{2.5}$, ozone	City of Fresno	Zip Code
Chapter 3: Cardio cerebral vascular diseases	Department of Health Care Access and Information	Emergency department visit and hospitalization	City of Fresno	Zip Code
	SJV Air Pollution Control District	$PM_{2.5}$, ozone	City of Fresno	Zip Code
Chapter 4: Community-based survey	Primary data collection, UC Merced, Community and Labor Center	Representative community survey	Fresno AB 617 area	Geocodable address
	Fresno GIS Hub	Distance from truck route, major road, freeway	City of Fresno	Geocodable address

This assessment is designed to be consistent with the World Health Organization's general principles of health risk assessment of air pollution,[13] while incorporating important information that is relevant to the city of Fresno.

Objectives are listed below:

1. Determine the impacts of proximity to major road and truck routes on risks of preterm birth and infant mortality in the City of Fresno from 2009 to 2019
2. Determine the impacts of air pollution exposures on risks of preterm birth, infant mortality, childhood asthma, and adult cardiovascular diseases in the City of Fresno from 2011 to 2020
3. Estimate the excess number of preterm births, infant mortality, asthma, and cardiovascular disease cases that were potentially attributed to air pollution exposures
4. Conduct a community-based survey to further understand environmental concerns in South Central Fresno, an area identified by the State under AB 617 to be disproportionately affected by pollution

CHAPTER 1. POLLUTION AND ADVERSE BIRTH OUTCOMES IN FRESNO, CALIFORNIA

1.1 BACKGROUND

Pregnant women and their unborn fetuses are extremely vulnerable to environmental pollution. [14-16] Due to the rapid and complex changes, pregnancy is considered the ultimate stress test.[17,18] During a normal pregnancy, bodily organs and systems change in different ways at different times in a tightly coordinated manner to accommodate the growing fetus.[19] Thus, exposure to hazardous environmental factors during pregnancy result in both immediate and cascading long-term effects, especially for the growing fetus. Meanwhile, the placenta supports exchanges of nutrients, gases, and metabolites while gatekeeping the transfer of harmful pathogens and environmental chemicals to the growing fetus. However, recent studies have shown that fine particles can cross the placental barriers and reach the developing fetus.[20,21] These concerning effects of air pollution on pregnancy merit further attention, especially in regions with high pollution and a high burden of adverse pregnancy outcomes.

Preterm birth (PTB), defined as a birth occurring before 37 weeks of gestation, is a common and serious pregnancy outcome. In 2021, PTB occurred in approximately 9% of all pregnancies in California, but the rate is higher in Fresno, affecting about 11% of pregnancies.[22] In the same year, PTB rates were highest for American Indian/Alaskan Natives (15.2%), followed by Black (14.8%), multi-race (11.3%), Hispanic (10.1%), Asian (9.7), and White (9.3%).[23] PTB is known to be associated with multiple immediate and long-term health complications for affected babies. Because babies need the final weeks in the womb to further develop, PTB results in many problems, including issues related to breathing, temperature

control, digestion, and metabolic and immune functions.[24] Due to these health complications, a delivery affected by PTB, on average, costs about four times more than a healthy delivery.[22] More importantly, babies born preterm have a significantly higher risk of developing many health complications later in life, including asthma, obesity, cardiovascular disease, mental health complications, learning disabilities, poorer academic performance, and even cancer.[25-33] Another devastating birth outcome is infant mortality (IM), defined as death occurring to a live birth within the first year of life. Although IM is rarer, occurring at 3.9 per 1,000 live births in 2020 in California, it is a devastating outcome affecting families in unimaginable ways.[34]

Air pollutants, including fine particulate matter less than 2.5 microns in diameter ($PM_{2.5}$) and ozone, have been consistently linked to adverse pregnancy outcomes including pregnancy loss, restricted fetal growth, preterm birth, and infant death[35-41] through biologic mechanisms including oxidative stress, systemic inflammation, and endocrine disruption.[7,8] Studies also suggest that living close to major air pollution sources such as freeway, major roads, and truck routes are also associated with health risks.[42-46]

Despite a significant body of work, no existing studies have evaluated risks of adverse pregnancy outcomes in relation to air pollution exposures in Fresno, an area with significant air pollution, marked health disparities, and severely limited access to care.[9,10]

The aims of Chapter 1 are as follows:

1. Assess the distribution/patterns of PTB and IM in Fresno.
2. Assess the distribution of pollution burden in Fresno.
3. Evaluate the relationship between residential proximity to freeways, major roads, and truck routes and PTB and IM.
4. Evaluate the effects of acute as well as cumulative exposures to air pollution on PTB/IM. Estimate the number of PTB and IM that can be attributed to short-term air pollution.

1.2 METHODS

1.2.1 PARTICIPANTS

We obtained birth certificate data from the California Department of Health Vital Statistics Office for 106,411 babies born in the city of Fresno from 2009-2019. These birth certificates were also deterministically linked to death certificates if a live birth died within one year. Given the fact that multiple gestations (i.e., twins, triplets, etc.) are predisposed to additional risks of preterm birth and infant mortality, we excluded these births from our analysis. The final analyses included 103,566 singleton babies born in the city of Fresno from 2009 to 2019. Our study has been approved by the Institutional Review Boards from the State of California and the University of California, Merced.

1.2.2 EXPOSURE ASSESSMENT

We obtained daily concentration of two common **air pollutants**—fine particulate matter less than 5 microns ($PM_{2.5}$, 24-hr. average) and ozone (maximum 8-hr. average)—from the Air District. These daily concentrations were estimated by the Air District using a regression-based mathematical model with

inputs from local air monitors and the Community Multilevel Air Quality (CMAQ) model output from the California Air Resources Board.[47,48] These data were estimated at the zip code level for spatiotemporal linkages to the birth data described above. Second, **major street, freeway and truck route** data were obtained from the Fresno GIS Hub. This dataset provides information on the location, length, and type of road features within the city of Fresno.

We also obtained **census tract characteristics,** including long-term/cumulative exposures to fine particulate matter, ozone, diesel pollution and traffic from CalEnviroScreen 4.0, which was developed by the California Environmental Protection Agency (CalEPA) and its Office of Environmental Health Hazard Assessment (OEHHA).[49] CalEnviroScreen is a mapping tool that analyzes data regarding environmental, health, and socioeconomic conditions to provide a clear picture of cumulative pollution burdens and vulnerabilities across California's census tracts.

In CalEnviroScreen 4.0, we used four cumulative exposures at the census tract level including traffic, diesel particle emission, annual $PM_{2.5}$ concentration, and average amount of daily maximum 8-hour ozone concentration. Traffic was defined in CalEnviroScreen as traffic density in vehicle-kilometers per hour per road length, within 150 meters of the census tract boundary. Diesel particle exposure was measured as diesel emissions from on-road and non-road sources (in $\mu g/m^3$). Ozone was measured as an annual amount of daily maximum 8-hour ozone concentration (in parts per million), and long-term $PM_{2.5}$ exposure was measured as annual mean $PM_{2.5}$ concentrations (in $\mu g/m^3$).

Table 1.1 provides more details about each of the datasets used in the study.

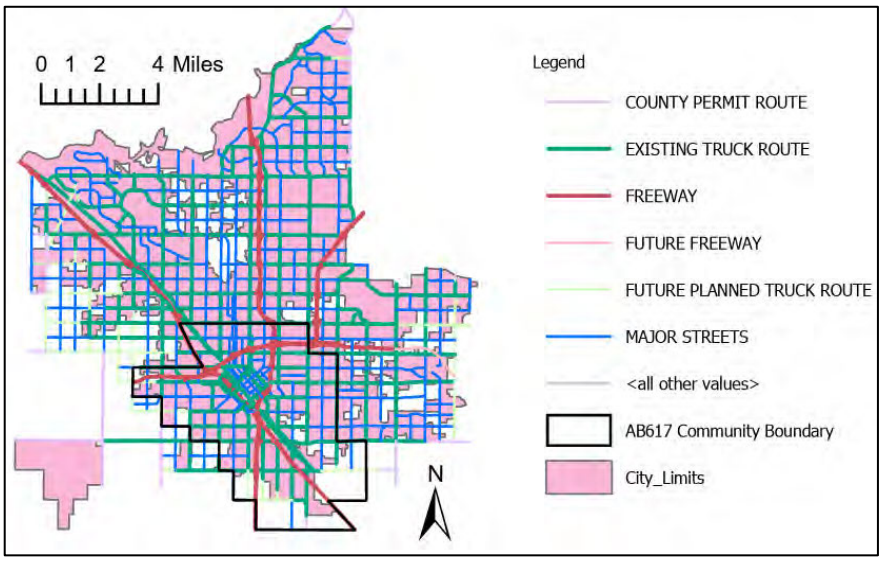
Table 1.1 Data sources

	Data	Sources	URL
Health outcomes	Infant mortality and preterm birth	California Department of Public Health Office of Vital Statistics	https://www.cdph.ca.gov/Programs/CHSI/Pages/Data-and-Statistics-.aspx
Exposures	Daily air pollution exposures	SJV Air District	https://www.valleyair.org/waaqs/
	Neighborhood characteristics including long-term cumulative exposures	California CalEnviroScreen 4.0	https://oehha.ca.gov/calenviroscreen/report/calenviroscreen-40
	Distance from truck routes, freeways, and major roads	Fresno GIS Hub	https://gis4u.fresno.gov/downloads/

The addresses of mothers at the time of birth were geocoded and overlaid with the environmental data described above. Daily air pollution exposures were estimated for each pregnant person as the concentration of the zip code within which their residential address fell. Other census tract characteristics were assigned to individuals based on their residential census tract at the time of birth. Distance from freeways, major roads, and existing truck routes were measured using ArcGIS as the

Euclidian distance from each address to the nearest existing road feature. Euclidean distance can be thought of as distance from bird's-eye view. **Figure 1.1** provides a map of road features in the city of Fresno. We note here that "freeway" here includes what locals refer to as "highway" (e.g., Highway 99), as indicated in red. We use this language to be consistent with city documents.

Figure 1.1. Road features in Fresno (source: Fresno GIS Hub)



Note: some features may overlap

1.2.3 OUTCOME ASSESSMENT

The main pregnancy outcomes of interest in this study include preterm birth and infant mortality. Both outcomes were ascertained using birth and death certificates. Specifically, preterm birth (PTB) was defined as a birth occurring before 37 completed weeks of gestation, and infant mortality (IM) was defined as death within the first year of a live birth.

1.2.4 STATISTICAL ANALYSES

Basic statistical tests including t-tests and chi-square tests were used to describe and compare study participant characteristics. Briefly, t-tests and chi-square tests are common statistical methods used to compare two averages (means) and two or more proportions, respectively. We also used basic plots and heat maps to describe the distributions of exposures and outcomes among participants.

To determine the impacts of air pollution and residential proximity to freeways, major streets, and truck routes on adverse pregnancy outcomes, we implemented two different methods. First, we used mixed models to determine the relationship between each pregnancy outcome (PTB and IM) with residential proximity to freeway, major streets, truck routes, diesel emission, traffic, and long-term $PM_{2.5}$ and ozone exposures. In these analyses of cumulative exposures, we compared the risks of PTB and IM between those with varying levels of exposure. We considered potential confounders such as maternal age, race, education, and neighborhood income.

Second, to investigate the impacts of time-varying air pollution on adverse pregnancy outcomes, we used a time-stratified case-crossover analysis.[50] This strategy is a preferred method to examine the short-term relationship between transient exposures (i.e., air pollution) and acute health outcomes (i.e., preterm birth and infant death) due to its ability to allow complete control for non-time-varying confounders.[51] More specifically, in this analysis, we only selected cases who were impacted by the health outcomes of interest. We then compared exposures (i.e., $PM_{2.5}$ and ozone) during a hazard period shortly before the event (preterm birth or infant death) to exposures during control periods during which the event did not happen. The hazard period was defined as the day of event (lag 0) and each of the six days before the event (lags 1-6). Control periods were selected using the time-stratified approach, where controls were selected as the same day of the week within the same month as the case period.[52] For example, if a pregnant person had a preterm birth on Monday, March 12, 2018, then this will be the case period (lag 0). The control periods for this person would be selected as Mondays the 5th, the 19th, and the 26th of the same month of March **(Figure 1.2)**. This approach allows control for days of the week and month and minimizes time-trend bias. Since the comparisons were made within the same person, this approach allows complete control for non-time-varying confounders (or factors that could explain the observed associations). Conditional logistic regression models were used to estimate the risks of adverse pregnancy outcomes associated with 5-unit increase in air pollution exposures.

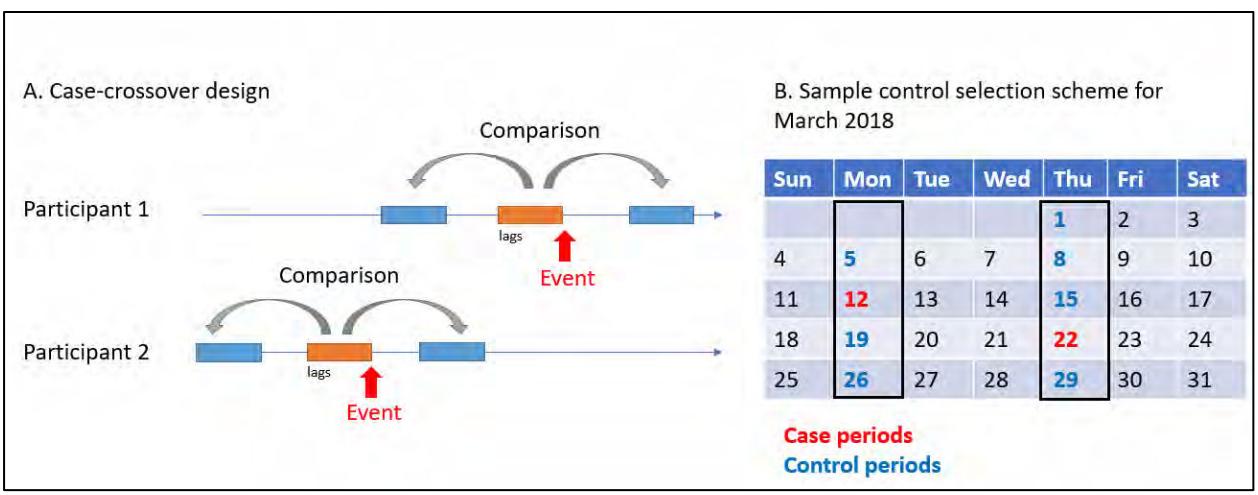
To calculate excess cases of PTB due to air pollution, also known as the attributable risk (AR), we used the formula:

$$AR = I_e - I_u$$

where I_u is the average rate of event in the study population (i.e., background rate), and I_e is the incidence of event among those exposed to the higher pollutants and is calculated as I_u times the odds ratio. I_u represents the background risks (i.e., average in the population) and was calculated as the total number of PTB in the city of Fresno divided by the total annual number of births.

We also stratified our analyses by season (warm: May-October, cold: November – April), maternal characteristics, and residential area (within vs. outside of AB 617 community boundaries) to explore the potential differential effects between different groups. All analyses were performed using SAS 4.0 (Cary, NC), and ArcGIS Pro (Redlands, CA).

Figure 1.2. Case-crossover study design schematic



1.3 RESULTS

1.3.1 DESCRIPTIVE STATISTICS

The analyses included a total of 103,566 singleton live births who were geocoded to the city of Fresno during the study period (2009-2019). The prevalence of PTB and IM among our singleton participants were 8.8 per 100 births and 6.7 per 1,000 live births, respectively (**Table 1.2**). The composition of the study population is presented in the Table under "All". The rates of PTB and IM were higher among mothers with more extreme reproductive ages, lower education, no prenatal care, low/high BMI, more children, and/or no private insurance. Those who smoked during pregnancy or had gestational complications also had higher risk. Mothers who are Black, Hawaiian/Pacific Islander or multi-race and those who lived in poorer neighborhood also had higher PTB rates.

The risks of PTB and IM were also slightly higher among mothers who lived within 1,000 feet of a freeway or truck route. Mothers of babies impacted by PTB and IM were also more likely to live in areas with higher cumulative exposures to traffic and diesel particles (**Table 1.2**).

Table 1.2. Characteristics of singleton live births in Fresno, California, 2009-2019

Characteristics	All (n=103,566) [n (%) or mean (SD)]	Preterm birth (n=9087, 8.8%)	Term birth (n=94479, 91.2%)	Infant mortality (n=698, 0.67%)	No infant mortality (n=102868, 99.3%)
Fetal sex					
Male	52,610 (50.8)	4,937 (9.3)	47,673 (90.6)	370 (0.70)	52,340 (99.3)
Female	50,953 (49.2)	4,184 (8.1)	46,805 (91.8)	325 (0.64)	50,628 (99.3)
Undetermined	3 (0.0)	2 (66.6)	1 (33.3)	3 (100)	0 (0)
Maternal age (years)					
<18	3176 (3.1)	299 (9.4)	2,877 (90.5)	24 (0.76)	3,152 (99.2)
18-24	33220 (32.1)	2,710 (8.1)	30,510 (91.8)	217 (0.65)	33,003 (99.35)
25-29	30437 (29.4)	2,463 (8.0)	27,974 (91.9)	194 (0.64)	30,243 (99.36)
30-34	23416 (22.6)	2,132 (9.1)	21,284 (90.9)	157 (0.67)	23,259 (99.33)
≥35	13315 (12.9)	1,482 (11.1)	11,833 (88.8)	105 (0.79)	13,210 (99.2)
Unknown	2 (0)	1 (50)	1 (50)	1 (50)	1 (50)
Maternal education					
<High School	24,692 (23.8)	2,499 (10.1)	22,193 (89.8)	199 (0.81)	24,493 (99.1)
High School/GED	28,327 (27.4)	2,509 (8.8)	25,818 (91.1)	195 (0.60)	28,132 (99.3)
At least some college	40,946 (39.5)	3,376 (8.2)	37,570 (91.7)	236 (0.58)	40,710 (99.4)
Advanced degree	4,249 (4.1)	266 (6.2)	3,983 (93.7)	20 (0.47)	4,229 (99.5)
Unknown	5,352 (5.2)	437 (8.1)	4,915 (91.8)	48 (0.90)	5,304 (99.1)
Maternal race/ethnicity					
Non-Hispanic White	18,602 (18.0)	1,364 (7.3)	17,238 (92.6)	111 (0.6)	18,491 (99.4)
Non-Hispanic Black	7,450 (7.2)	968 (12.9)	6,482 (87.0)	91 (1.2)	7,359 (98.7)
Hispanic	55,575 (53.7)	4,805 (8.6)	50,770 (91.3)	353 (0.6)	55,223 (99.3)
American Indian/Alaskan Natives	1,047 (1.0)	122 (11.6)	925 (88.3)	2 (0.1)	1,045 (99.8)
Asian	15,555 (15.0)	1,353 (8.7)	14,202 (91.3)	90 (0.5)	15,465 (99.4)
Hawaiian/Pacific Islanders	148 (0.14)	15 (10.1)	133 (89.8)	3 (2.0)	145 (97.9)

Characteristics	All (n=103,566) [n (%) or mean (SD)]	Preterm birth (n=9087, 8.8%)	Term birth (n=94479, 91.2%)	Infant mortality (n=698, 0.67%)	No infant mortality (n=102868, 99.3%)
Others	817 (0.8)	70 (8.5)	747 (91.4)	3 (0.3)	814 (99.6)
Unknown	1,641 (1.6)	117 (7.1)	1,524 (92.8)	14 (0.8)	1,627 (99.1)
Multi-race	2,731 (2.6)	273 (10.0)	2,458 (90.0)	32 (1.1)	2,699 (98.8)
Insurance at delivery					
Not expected to be medically attended	215 (0.2)	29 (13.4)	186 (86.5)	3 (1.4)	212 (98.6)
Public	73,093 (70.6)	6,698 (9.1)	66,395 (90.8)	528 (0.7)	72,565 (99.2)
Private	28,927 (29.9)	2,069 (7.1)	26,858 (92.8)	138 (0.4)	28,789 (99.5)
Self-pay	1,180 (1.1)	273 (23.1)	907 (76.8)	27 (2.2)	1,153 (97.7)
Other	98 (0.1)	9 (9.1)	89 (90.8)	1 (1.0)	97 (98.9)
Unknown	53 (0.1)	9 (16.9)	44 (83.0)	1 (1.8)	52 (98.1)
WIC eligible					
No	28,416 (27.4)	2,570 (9.0)	25,846 (90.9)	229 (0.8)	28,187 (99.1)
Yes	73,613 (71.1)	6,385 (8.6)	67,228 (91.3)	447 (0.6)	73,166 (99.3)
Unknown	1,537 (1.5)	132 (8.5)	1,405 (91.4)	22 (1.4)	1,515 (98.5)
Census tract poverty percentile					
≤25 (least poverty)	6,006 (5.8)	386 (6.43)	5,620 (93.5)	22 (0.3)	5,984 (99.6)
26-50	8,577 (8.3)	637 (7.43)	7,940 (92.5)	32 (0.3)	8,545 (99.6)
51-75	19,751 (19.1)	1,649 (8.3)	18,102 (91.6)	115 (0.6)	19,636 (99.4)
76-100 (most poverty)	69,232 (66.9)	6,415 (9.2)	62,817 (90.7)	529 (0.7)	68,703 (99.2)
Parity					
1	34,162 (33)	2,807 (8.2)	31,355 (91.7)	235 (0.6)	33,927 (99.3)
2	29,160 (28.2)	2,244 (7.7)	26,916 (92.3)	158 (0.5)	29,002 (99.4)
3	19,318 (18.7)	1,625 (8.4)	17,693 (91.5)	115 (0.6)	19,203 (99.4)
4 or more	20,528 (19.8)	2,382 (11.6)	18,146 (88.4)	185 (0.9)	20,343 (99.1)
Unknown	398 (0.4)	29 (7.29)	369 (92.7)	5 (1.2)	393 (98.7)
Pre-pregnancy BMI					
<18.50	2,860 (2.8)	333 (11.6)	2,527 (88.3)	26 (0.9)	2,384 (99.0)
18.50-24.99	37,614 (36.3)	3,059 (8.1)	34,555 (91.8)	208 (0.5)	37,406 (99.4)
25.00-29.00	27,959 (27)	2,267 (8.1)	25,692 (91.8)	165 (0.5)	27,794 (99.4)
>30	30,190 (29.2)	2,849 (9.4)	27,341 (90.5)	244 (0.8)	29,946 (99.1)
Unknown	4,943 (4.8)	579 (11.7)	4,364 (88.2)	55 (1.1)	4,888 (98.8)
Prenatal smoking					
No	98,764 (95.4)	8,587 (8.69)	90,177 (91.31)	638 (0.6)	98,126 (99.3)
Yes	2,199 (2.1)	270 (12.2)	1,929 (87.7)	32 (1.4)	2,167 (98.5)
Unknown	2,603 (2.5)	230 (8.8)	2,373 (91.1)	28 (1.0)	2,575 (98.9)
Gestational complications					
None	66,892 (64.6)	4,070 (6.08)	62,822 (93.92)	263 (0.3)	66,629 (99.6)
Yes	36,667 (35.4)	5,016 (13.6)	31,651 (86.3)	434 (1.1)	36,233 (98.8)
Unknown	7 (0)	1 (14.2)	6 (85.7)	1 (14.2)	6 (85.7)
Prenatal care					
None	900 (0.9)	385 (42.7)	515 (57.2)	23 (2.5)	877 (97.4)
Early	88,291 (85.3)	7,226 (8.1)	81,065 (91.8)	526 (0.6)	87,765 (99.4)
Late	11,087 (10.7)	1,041 (9.3)	10,046 (90.6)	105 (0.9)	10,982 (99.0)

Characteristics	All (n=103,566) [n (%) or mean (SD)]	Preterm birth (n=9087, 8.8%)	Term birth (n=94479, 91.2%)	Infant mortality (n=698, 0.67%)	No infant mortality (n=102868, 99.3%)
Unknown	3,288 (3.2)	435 (13.2)	2,853 (86.7)	44 (1.3)	3,244 (98.6)
Low birthweight					
No	96,651 (93.3)	4,367 (4.5)	92,284 (95.4)	211 (0.2)	96,440 (99.7)
Yes	6,915 (6.7)	4,720 (68.2)	2,195 (31.7)	487 (7.0)	6,428 (92.9)
Season of birth					
Cold (November-April)	50,083 (48.4)	4,575 (8.7)	47,931 (91.2)	372 (0.7)	52,134 (99.2)
Warm (May – October)	53,483 (51.6)	4,512 (8.8)	46,548 (91.1)	326 (0.6)	50,734 (99.3)
Distance from freeway (ft.)					
≤1,000	13,644 (13.2)	1,308 (9.5)	12,336 (90.4)	125 (0.9)	13,519 (99.0)
>1,000	89,922 (86.8)	7,779 (8.6)	82,143 (91.3)	573 (0.6)	89,349 (99.3)
Distance from major roads (ft.)					
≤1,000	63,243 (61.1)	5,532 (8.7)	57,711 (91.2)	414 (0.6)	62,829 (99.3)
>1,000	40,323 (38.9)	3,555 (8.8)	36,768 (91.1)	284 (0.7)	40,039 (99.3)
Distance from truck routes (ft.)					
≤1,000	5959 (57.9)	5,372 (8.9)	54,586 (91.0)	407 (0.6)	59,552 (99.3)
>1,000	43,607 (42.1)	3,715 (8.5)	39,892 (91.4)	291 (0.6)	43,316 (99.3)
Cumulative traffic exposures (percentile)	43.2 (25.6)	43.4 (25.9)	43.2 (25.6)	44.1 (26.6)	43.2 (25.6)
Cumulative diesel PM exposures (percentile)	54.3 (26.5)	55.5 (26.6)	54.1 (26.5)	57.2 (26.9)	54.2 (26.5)
Cumulative $PM_{2.5}$ (percentile)	96.3 (1.4)	96.3 (1.4)	96.2 (1.4)	96.4 (1.4)	96.3 (1.4)
Cumulative ozone (percentile)	83.3 (3.2)	83.2 (3.1)	83.3 (3.2)	83 (3)	83.3 (3.2)

Abbreviations: BMI, body mass index; PM, particulate matter

When aggregated at the zip code levels, the rates of PTB and IM varied spatially across the city of Fresno, with evidence of the highest concentration in the south-central region (**Figure 1.3**). Rates of PTB and IM were consistently higher among those who lived in zip codes within the South Fresno AB 617 Community boundaries compared to the rest of the city during the entire study period (**Figure 1.4**). More specifically, the rates of PTB were 9.7% inside the AB 617 community boundaries and 8.5 for the rest of the city. Similarly, the rates of IM were 8.9 per 1,000 inside and 6.0 per 1,000 outside of the boundaries.

Figure 1.3. Spatial distribution of preterm birth (rates per 100) and infant mortality (rates per 1,000) by zip code in Fresno, California, 2009-2019

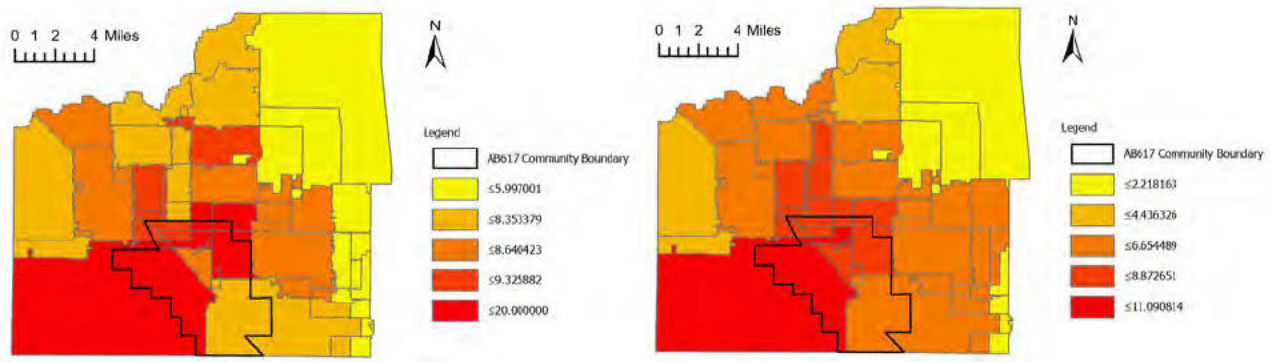
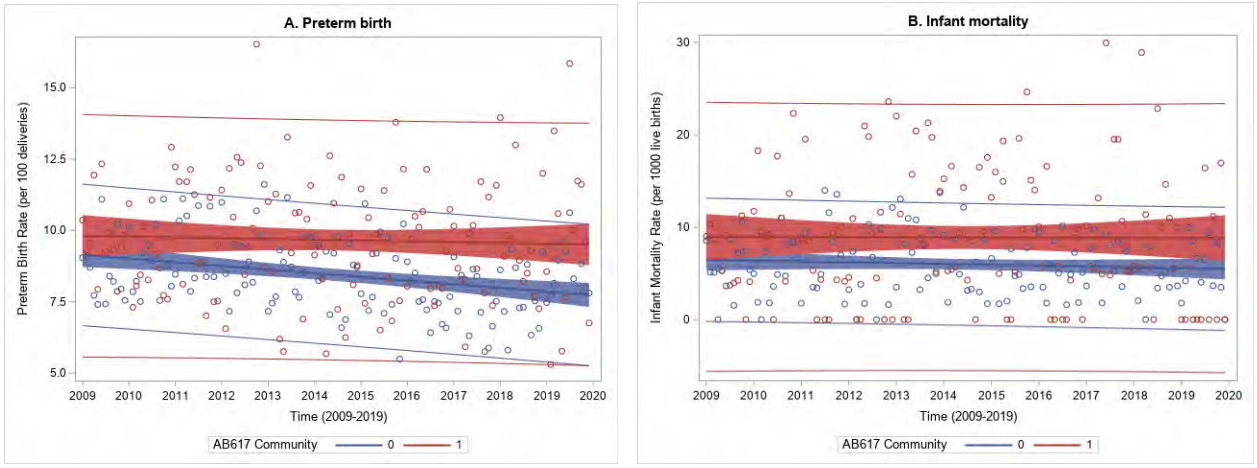


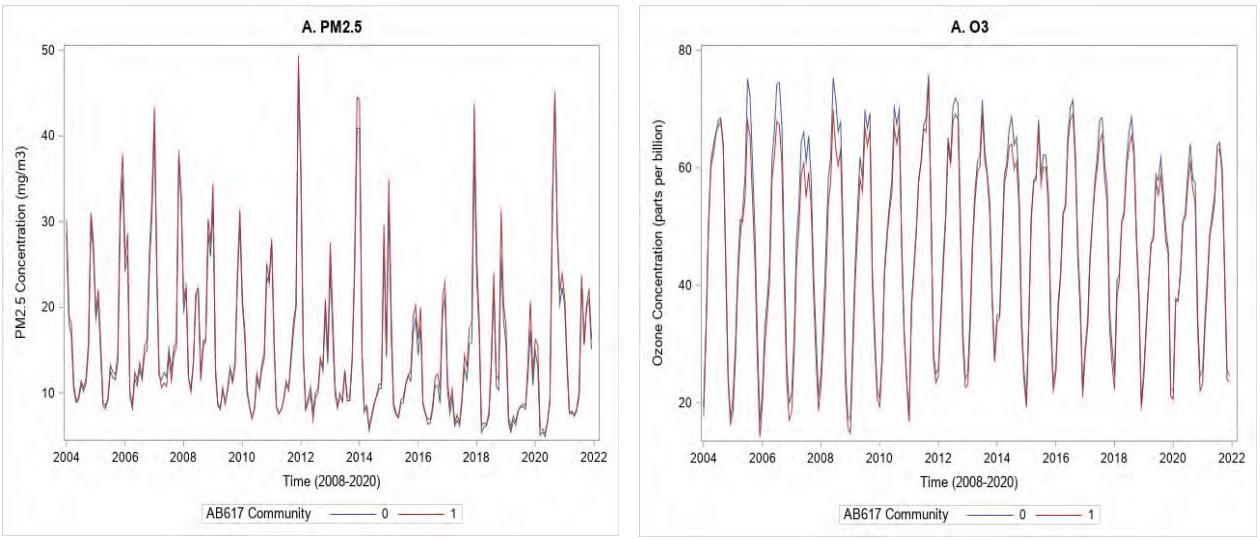
Figure 1.4. Rates of preterm birth (A) and infant mortality (B) by time in Fresno, 2009-2019



The red-shaded region represents the rates within South Fresno and the blue-shaded region represents the rates for the rest of the city.

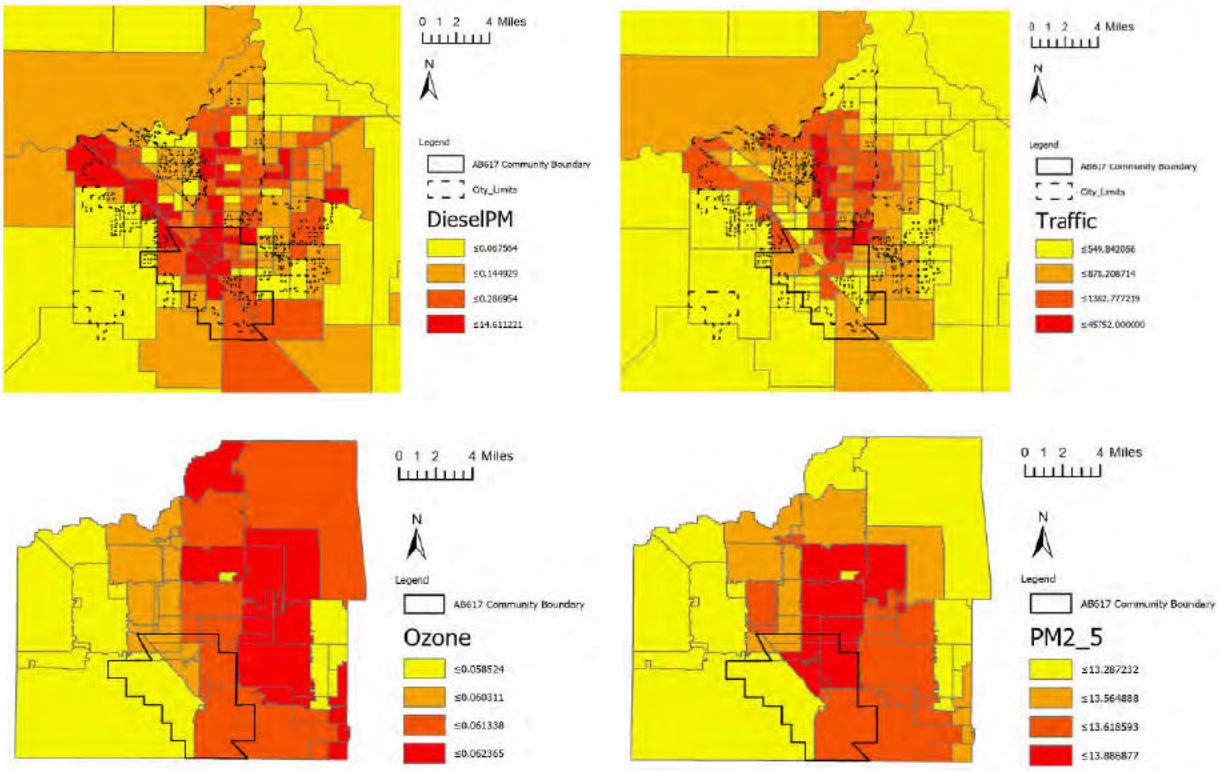
During the study period, daily $PM_{2.5}$ and ozone concentrations varied by season as expected. $PM_{2.5}$ concentrations were higher during the colder months and ozone concentrations were higher during the warmer months. They appeared to be similar within and outside of the South Fresno AB 617 Community boundaries (**Figure 1.5**). Annual average concentrations of $PM_{2.5}$ decreased slightly but concentrations of ozone remained consistent.

Figure 1.5. Temporal distribution of $PM_{2.5}$ and ozone during the study period



Meanwhile, there is spatial variation in cumulative diesel, traffic, $PM_{2.5}$ and ozone levels (**Figure 1.6**). More specifically, diesel particle and traffic exposures were higher in census tracts along freeways and areas with more roads. Cumulative $PM_{2.5}$ and ozone exposures were higher in the western part of the city compared to the rest. Data also show that traffic levels (972.2 vs. 845.7), diesel emissions (0.36 vs. 0.20), and cumulative $PM_{2.5}$ concentrations (13.8 vs. 13.5) were higher in zip codes within the South Fresno AB 617 Community boundaries compared to the rest of the city (**Table 1.3**).

Figure 1.6. Spatial distribution of cumulative air pollution indicators in Fresno (source: CalEnviroScreen 4.0)



Diesel particles are measured as diesel emissions from on-road and non-road sources (ug/m³); traffic is measured as traffic density in vehicle-kilometers per hour per road length, within 150 meters of the census tract boundary; ozone is measured as annual amount of daily maximum 8-hour ozone concentration (ppm); $PM_{2.5}$ is measured as annual mean $PM_{2.5}$ concentrations (µg/m³).

Data also suggests that pregnant people in zip codes within the South Fresno AB 617 Community boundaries, on average, were closer to freeways, truck routes, and major streets compared to pregnant people outside of this community (Table 1.3).

Table 1.3. Long-term exposures by community boundaries

	Mean (SD)	
Exposures	**Within South Fresno AB 617 Community**	**Outside South Fresno AB 617 Community**
Traffic	972.2 (717.9)	845.7 (452.0)
Diesel particles	0.4 (0.3)	0.2 (0.2)
$PM_{2.5}$	13.8 (0.1)	13.5 (0.3)
Ozone	60.5 (0.5)	60.6 (1.4)
Distance from freeway (feet, mean, SD)	3451.2 (2651.5)	5885.3 (4410.3)
Distance from major road (feet, mean, SD)	970.7 (779.3)	1064.7 (1350.6)
Distance from truck route (feet, mean, SD)	843.3 (702.0)	1266.6 (1624.3)

Diesel particles are measured as diesel emissions from on-road and non-road sources (ug/m³); traffic is measured as traffic density in vehicle-kilometers per hour per road length, within 150 meters of the census tract boundary; ozone is measured as annual amount of daily maximum 8-hour ozone concentration (ppm); $PM_{2.5}$ is measured as annual mean $PM_{2.5}$ concentrations (ug/m³).
Abbreviations: PM, particulate matter; SD, standard deviation.

1.3.2 EFFECTS OF PROXIMITY TO FREEWAYS, MAJOR ROADS, AND TRUCK ROUTES

On average, pregnant people who lived closer to freeways, truck routes, or major streets were exposed to higher concentrations of pollutants (**Figure 1.7 – Figure 1.9**). More specifically, the closer pregnant people lived to freeways, the greater the exposures to $PM_{2.5}$, diesel, and traffic they were exposed (**Figure 1.7**). Similarly, people living closer to truck routes (**Figure 1.8**) and major streets (**Figure 1.9**) were exposed to higher $PM_{2.5}$, ozone, diesel emissions, and traffic.

Figure 1.7. Relationship between residential distance to freeways and air pollution exposures

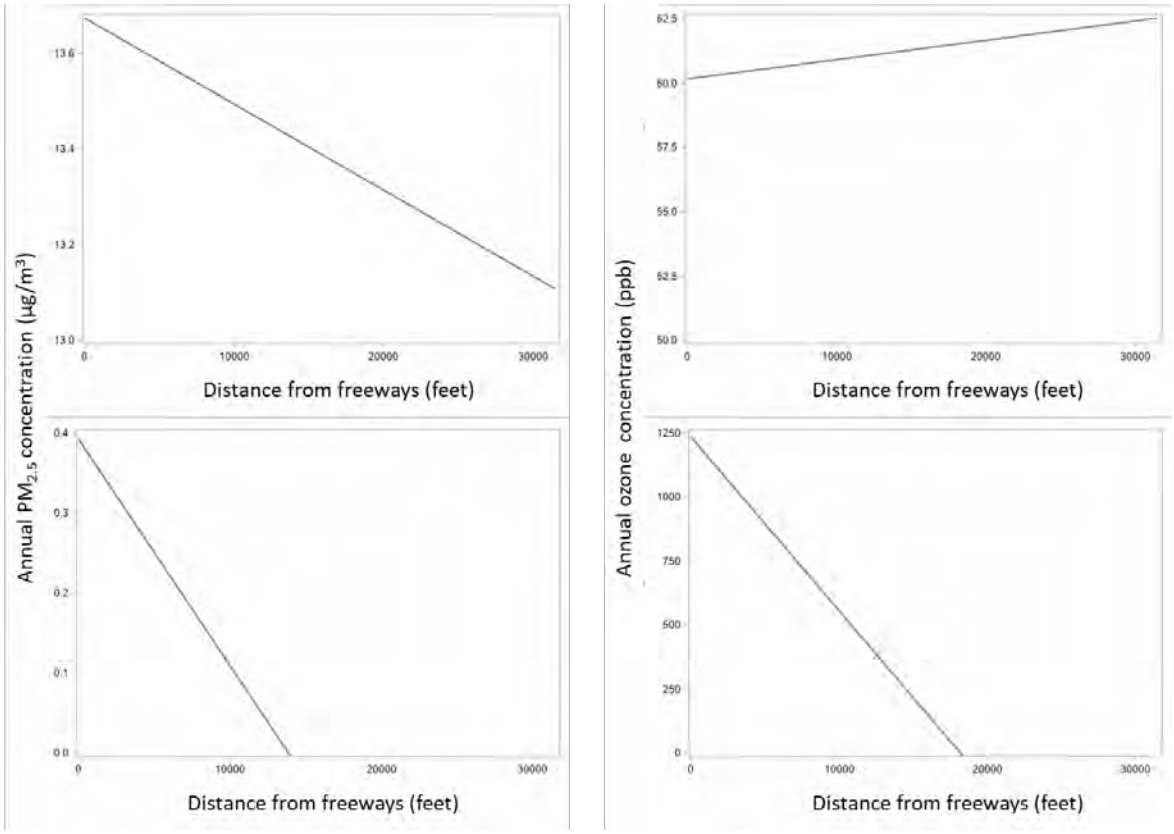


Figure 1.8. Relationship between residential distance to truck routes and air pollution exposures

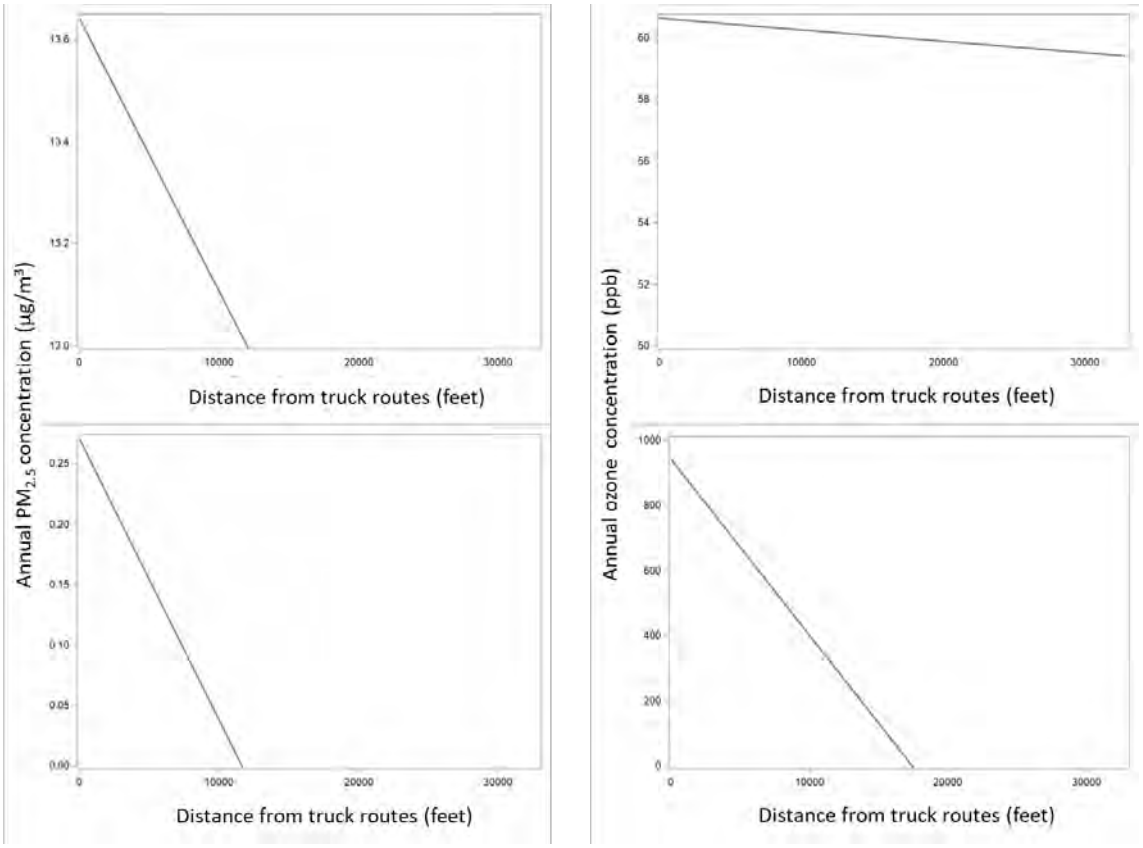
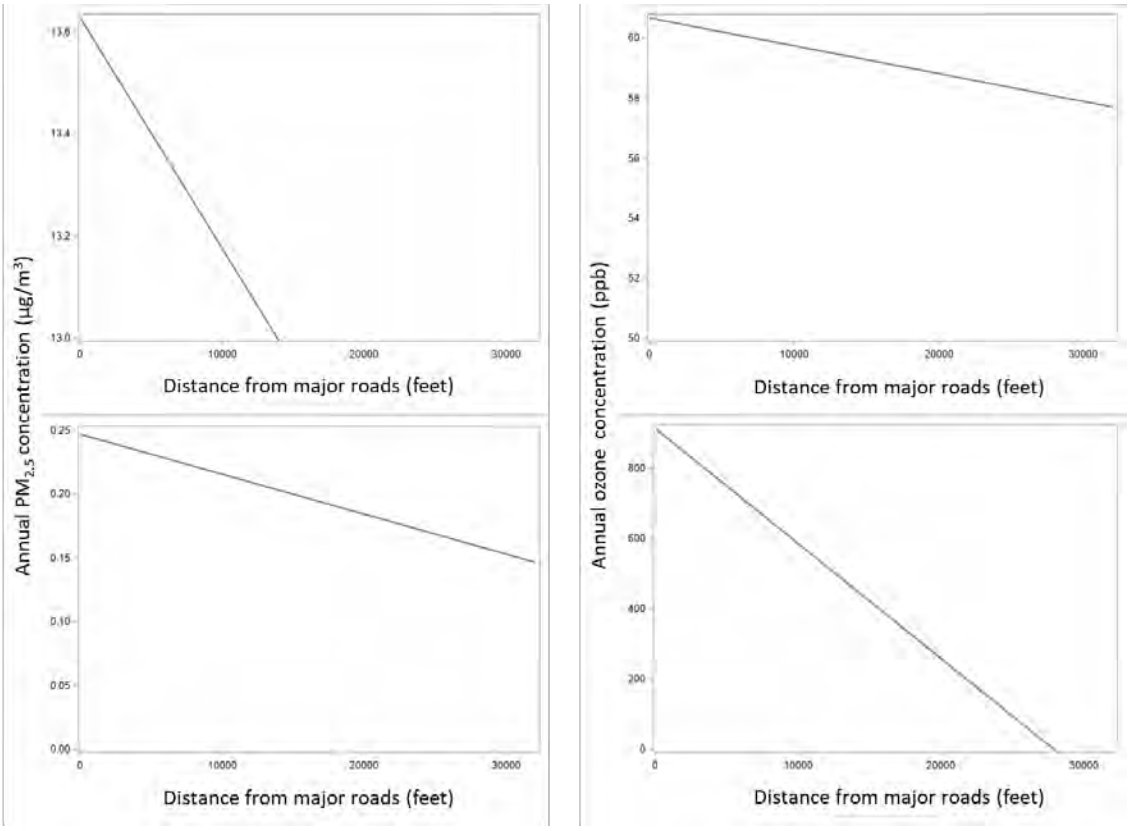
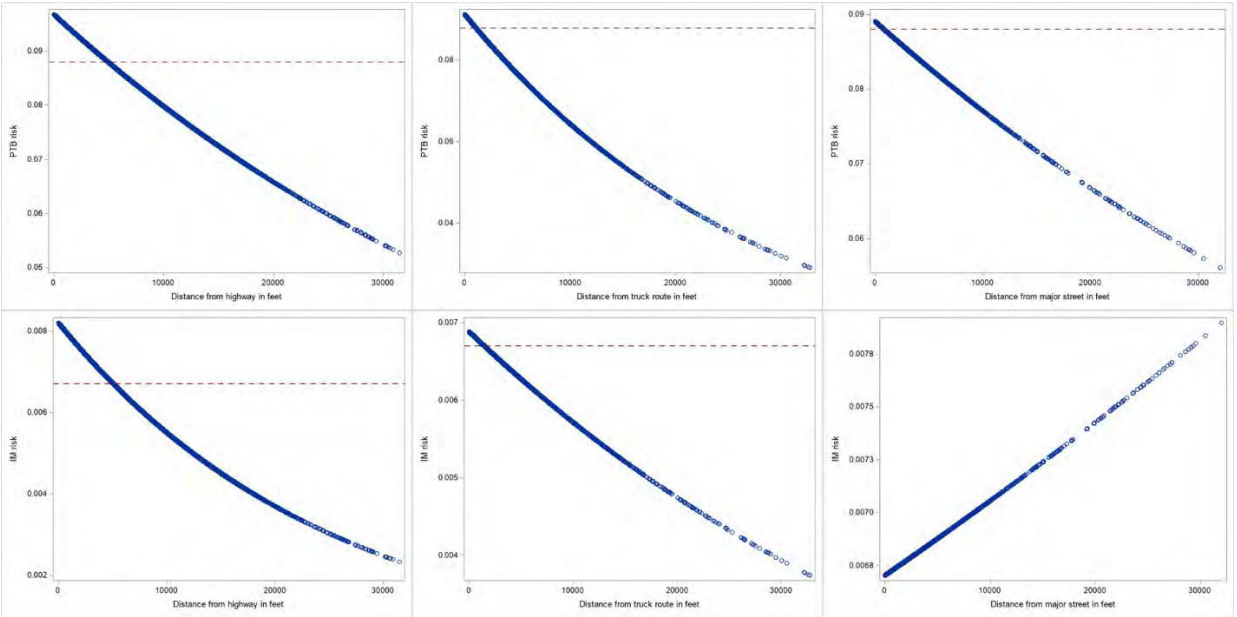


Figure 1.9. Relationship between residential distance to major roads and air pollution exposures



In general, proximity to freeways, truck routes, and major roads were correlated with increased probability of PTB or IM (**Figure 1.10**). More specifically, the predicted risk of both PTB and IM increased as distance from freeways and truck routes decreased. While distance from major streets was negatively correlated with PTB risk, this observation was not seen for IM.

Figure 1.10. Graphical correlation between residential proximity to road sources and adverse pregnancy outcomes



The red dash line represents the average rate in the study population.

Our mixed models suggest that every 500 feet closer to a freeway or major road was associated with a 1% increase in PTB risks. Similarly, 500 feet closer to a truck route was associated with about a 2% increase in PTB risk. Although these estimates are small, the public health impact is substantial given the large population living close to freeways and truck routes (**Table 1.2**). Based on the data above, we also explored the different distance thresholds at which risks of PTB and IM increased substantially. Based on exploratory evidence and the literature, we considered multiple buffers (in feet), including 300, 500, 600, 700, 800, 900, and 1,000 feet.

Compared to those living >1,000 feet from a freeway, those living ≤1,000 feet had 11% increased risk in PTB, and 44% increased risks of IM. These risks remained consistent for smaller buffers. After adjusting for key characteristics including maternal age, race/ethnicity, maternal education, and area level poverty level, the associations remained significant for IM (**Table 1.4**), where infants who lived within 1,000 feet of a freeway had a 23% increased risk of dying within the first year of life.

A similar pattern of association was observed for proximity to truck routes in relation to PTB. More specifically, living within 1,000 feet of a truck route was associated with about 5% increased risk of PTB, and these risks remained consistent for closer buffers. These associations remained elevated after adjusting for covariates, but the estimates were less precise. There appeared to be no association between proximity to truck routes and IM, which could potentially be because of the low number of IM cases.

Those who lived within 300 feet of a major road had about 4-5% increased risk of PTB and IM after adjusting for potential confounders. However, estimates for IM were not precise due to the small number of cases.

We also note that although the 1,000 feet buffer is the proximity that best distinguishes the risks between those inside and outside, we observed that – in most cases – the risk increased as we moved closer to the source. As such, these findings do not suggest that people who live beyond 1,000 feet away from a source are not exposed to risks.

Table 1.4. Associations between proximity to freeways, major roads, and truck routes and perinatal outcomes

	RR (95% CI)			
	Preterm birth		Infant mortality	
	Unadjusted	Adjusted[b]	Unadjusted	Adjusted[b]
Freeway (feet)				
Continuous[a]	**1.01 (1.01,1.01)**	1.00 (1,00,1.01)	**1.02 (1.01,1.03)**	1.00 (0.99,1.02)
≤1,000	**1.11 (1.05,1.17)**	1.04 (0.98,1.10)	**1.44 (1.19,1.74)**	**1.23 (1.01,1.50)**
≤900	**1.10 (1.04,1.16)**	1.03 (0.97,1.09)	1.23 (1.00,1.52)	1.05 (0.85,1.30)
≤800	**1.09 (1.02,1.16)**	1.02 (0.96,1.09)	1.20 (0.96,1.50)	1.03 (0.82,1.29)
≤700	**1.08 (1.01,1.16)**	1.01 (0.95,1.09)	1.17 (0.92,1.50)	1.00 (0.78,1.29)
≤600	1.06 (0.98,1.14)	0.99 (0.92,1.07)	1.05 (0.79,1.39)	0.90 (0.67,1.19)
≤500	**1.09 (1.00,1.18)**	1.02 (0.94,1.11)	1.11 (0.81,1.51)	0.95 (0.69,1.30)
≤300	1.05 (0.93,1.19)	0.99 (0.87,1.12)	1.03 (0.64,1.64)	0.89 (0.56,1.42)
Truck routes (feet)				
Continuous[a]	**1.02 (1.01,1.03)**	**1.01 (1.00,1.02)**	1.01 (0.98,1.04)	0.99 (0.97,1.02)
≤1,000	**1.05 (1.01,1.09)**	1.01 (0.97,1.05)	1.02 (0.88,1.18)	0.92 (0.79,1.07)
≤900	**1.07 (1.03,1.11)**	1.04 (0.99,1.08)	1.02 (0.88,1.18)	0.94 (0.81,1.09)
≤800	**1.07 (1.03,1.12)**	1.03 (0.99,1.08)	1.03 (0.89,1.20)	0.95 (0.82,1.11)
≤700	**1.07 (1.03,1.11)**	1.04 (0.99,1.08)	1.05 (0.91,1.22)	0.98 (0.84,1.14)
≤600	**1.07 (1.03,1.12)**	1.03 (0.99,1.08)	1.10 (0.95,1.28)	1.02 (0.88,1.19)
≤500	**1.07 (1.03,1.12)**	1.04 (0.99,1.08)	1.07 (0.92,1.26)	1.00 (0.85,1.18)
≤300	**1.07 (1.02,1.13)**	1.04 (0.99,1.08)	0.99 (0.81,1.21)	0.94 (0.77,1.15)
Major road (feet)				
Continuous[a]	**1.01 (1.00,1.02)**	**1.01 (1.00,1.02)**	1.00 (0.97,1.03)	0.99 (0.97,1.02)
≤1,000	0.99 (0.95,1.03)	0.99 (0.95,1.03)	0.93 (0.80,1.08)	0.93 (0.80,1.08)
≤900	1.01 (0.97,1.05)	1.01 (0.97,1.05)	0.95 (0.82,1.10)	0.95 (0.82,1.10)
≤800	1.00 (0.96,1.04)	1.00 (0.96,1.04)	0.95 (0.82,1.10)	0.95 (0.82,1.10)
≤700	1.01 (0.97,1.05)	1.00 (0.96,1.04)	0.98 (0.84,1.14)	0.97 (0.84,1.13)
≤600	1.03 (0.98,1.07)	1.02 (0.98,1.06)	0.97 (0.84,1.13)	0.96 (0.82,1.11)
≤500	1.03 (0.99,1.08)	1.03 (0.98,1.07)	0.97 (0.83,1.14)	0.95 (0.82,1.12)
≤300	**1.06 (1.01,1.11)**	**1.05 (1.00,1.11)**	1.06 (0.88,1.27)	1.04 (0.86,1.25)

[a] Estimate is for each 500 feet closer to each feature; [b] Models adjusted for maternal age, race/ethnicity, maternal education, area level poverty level

Boldface font indicates statistical significance at $p<0.05$

Abbreviations: RR, relative risk; CI, confidence intervals.

When stratified by AB 617 community status, we observed that the effects of proximity to truck routes on PTB and major streets on IM were considerably higher within the AB 617 community boundaries. On the other hand, the effects of proximity to freeways were stronger outside the boundaries. Meanwhile, no racial/ethnic differences were detected.

1.3.3 EFFECTS OF CUMULATIVE EXPOSURES TO DIESEL, TRAFFIC, AND AIR POLLUTION

Cumulative (i.e., long-term) exposures to $PM_{2.5}$ and diesel particulate matter were positively associated with risks of both PTB and IM (**Table 1.5**). For each unit increase in cumulative $PM_{2.5}$ exposures, the risks of PTB and IM increased by 26% and 37%, respectively. Similarly, for every unit increase in diesel exposure, risks of PTB and IM increased by 21% and 70%, respectively.

Table 1.5. Associations between cumulative exposures and birth outcomes

	RR (95% CI)	
	Preterm birth	Infant mortality
$PM_{2.5}$	**1.26 (1.14, 1.40)**	**1.37 (1.01, 1.85)**
Ozone	0.99 (0.96, 1.01)	0.94 (0.88, 1.01)
Diesel PM	**1.21 (1.08, 1.35)**	**1.70 (1.26, 2.29)**
Traffic[a]	1.00 (1.00, 1.00)	1.00 (1.00, 1.00)

[a]Traffic density in vehicle-kilometers per hour per road length, within 150 meters of the census tract boundary. Bolded estimates indicate statistical significance at $p<0.05$.
Abbreviations: PM, particulate matter; RR, relative risk; CI, confidence intervals.

In further analyses, we noted that the impacts of cumulative exposures on IM were different across race/ethnicity. More specifically, we observed that American Indian/Alaskan Native communities are more impacted by cumulative exposures compared to other groups. The magnitudes of associations also suggest that Black pregnant people may be more susceptible to $PM_{2.5}$ and Asian/Pacific Islander pregnant people may be more susceptible to diesel. However, due to the low number of IM, our estimates were not precise (**Table 1.6**).

Table 1.6. Associations between chronic exposures and infant mortality by race/ethnicity

Race/ethnicity	RR (95% CI)			
	$PM_{2.5}$	Ozone	Diesel	Traffic
White	0.84 (0.67, 1.05)	0.98 (0.94, 1.03)	1.05 (0.78, 1.42)	0.95 (0.84, 1.08)
Black	1.24 (0.90, 1.70)	1.01 (0.95, 1.08)	0.97 (0.75, 1.24)	0.98 (0.87, 1.11)
Hispanic	1.06 (0.94, 1.19)	0.99 (0.97, 1.02)	0.96 (0.86, 1.07)	0.95 (0.90, 1.00)
American Indian/Alaskan Natives	1.68 (0.70, 4.06)	**1.19 (1.01, 1.40)**	1.91 (0.97, 3.77)	1.30 (0.97, 1.73)
Asians/Pacific Islanders	0.93 (0.75, 1.17)	0.98 (0.94, 1.02)	1.17 (0.91, 1.50)	1.03 (0.93, 1.15)

Models adjusted for maternal age, race/ethnicity, maternal education, area level poverty level. Bolded estimates indicate statistical significance at $p<0.05$.
Abbreviations: PM, particulate matter; RR, relative risk; CI, confidence intervals.

1.3.4 ACUTE EXPOSURES TO $PM_{2.5}$ AND OZONE

$PM_{2.5}$ exposures during the prior week were associated with the onset of IM (**Table 1.7**). For example, for every 5 $\mu g/m^3$ increase in $PM_{2.5}$, the risks of IM increased by approximately 6% within three days, and these risks attenuated but continued until about 5 days after exposure.

When analyses were separated by season, the effects of $PM_{2.5}$ on IM remained consistent and appeared to be more prominent during the cold season when the level was the highest. During the warm season where its concentration was the highest, ozone exposure during the prior week was also associated with PTB risks. Each 5-unit increase in exposure was associated with approximately 3% increase in risk within a 7-day window.

Table 1.7. Associations between acute air pollution and adverse perinatal outcomes

Pollutants	OR (95% CI)	
	Preterm birth	Infant mortality
$PM_{2.5}$		
Lag 0	1.000 (0.995,1.005)	**1.061 (1.025,1.099)**
Lag 1	1.000 (0.995,1.005)	**1.061 (1.025,1.099)**
Lag 2	0.990 (0.985,1.005)	**1.056 (1.020,1.093)**
Lag 3	0.995 (0.985,1.005)	**1.046 (1.005,1.083)**
Lag 4	0.995 (0.985,1.005)	**1.035 (1.000,1.077)**
Lag 5	1.000 (0.990,1.010)	**1.035 (1.000,1.077)**
Lag 6	1.000 (0.990,1.010)	1.030 (0.990,1.067)
Ozone		
Lag 0	1.000 (0.990,1.005)	0.990 (0.961,1.020)
Lag 1	1.000 (0.990,1.005)	0.985 (0.956,1.015)
Lag 2	1.000 (0.990,1.005)	0.985 (0.956,1.015)
Lag 3	1.000 (0.990,1.005)	0.980 (0.951,1.010)
Lag 4	1.000 (0.995,1.010)	0.975 (0.946,1.005)
Lag 5	1.005 (0.995,1.010)	0.980 (0.951,1.010)
Lag 6	1.005 (0.995,1.010)	0.980 (0.951,1.010)
Cold-season $PM_{2.5}$ (November-April)		
Lag 0	1.010 (1.000,1.020)	**1.067 (1.025,1.104)**
Lag 1	1.010 (1.000,1.020)	**1.061 (1.025,1.104)**
Lag 2	1.005 (0.995,1.020)	**1.061 (1.025,1.104)**
Lag 3	1.005 (0.995,1.015)	**1.046 (1.010,1.088)**
Lag 4	1.005 (0.995,1.015)	**1.041 (1.000,1.083)**
Lag 5	1.010 (1.000,1.020)	**1.041 (1.000,1.083)**
Lag 6	1.010 (1.000,1.020)	1.030 (0.990,1.072)
Warm season ozone (May-October)		
Lag 0	**1.030 (1.020,1.041)**	1.010 (0.975,1.046)
Lag 1	**1.030 (1.020,1.041)**	1.010 (0.975,1.046)
Lag 2	**1.030 (1.020,1.041)**	1.010 (0.975,1.041)
Lag 3	**1.030 (1.020,1.041)**	1.000 (0.965,1.035)
Lag 4	**1.030 (1.020,1.041)**	1.000 (0.965,1.030)
Lag 5	**1.030 (1.025,1.041)**	1.000 (0.965,1.035)
Lag 6	**1.035 (1.025,1.041)**	1.000 (0.970,1.035)

OR (odds ratios) were obtained for each 5-unit increase in exposure, and were adjusted for individual characteristics by design, temperature, and humidity. Lag can be interpreted as the number of days after exposure. For example, lag 0 = risk on the day of exposure, lag 1 = risk one day after exposure, etc. Bolded estimates indicate statistical significance at $p<0.05$.

During the study period, acute exposures to ozone may have been responsible for about 3 additional cases of PTB per 1,000 Fresno births (**Table 1.8**). With approximately 13,500 annual births in Fresno, this is equivalent to about 40 additional cases per year during the study period. Given a PTB delivery costs on average about 5 times as much as an unaffected birth, these excess cases have important implications, not only financially but also medically, given the known serious short- and long-term effects of PTB. **Table 1.8** also shows that $PM_{2.5}$ exposures were potentially responsible for up to 6 additional cases of infant mortality per year.

Table 1.8. Excess cases of PTB and IM in relation to pollution exposure

	Ozone and PTB		$PM_{2.5}$ and IM	
	Excess cases per 1,000 births (95% CI)	Excess cases per year[a]	Excess cases per 1,000 births (95% CI)	Excess cases per year[a]
Lag 0	2.67 (1.77,3.57)	36.00 (23.90,48.20)	4.12 (1.69,6.61)	5.60 (2.30,8.90)
Lag 1	2.67 (1.77,3.57)	36.00 (23.90,48.20)	4.12 (1.69,6.61)	5.60 (2.30,8.90)
Lag 2	2.67 (1.77,3.57)	36.00 (23.90,48.20)	3.77 (1.35,6.25)	5.10 (1.80,8.40)
Lag 3	2.67 (1.77,3.57)	36.00 (23.90,48.20)	3.07 (0.34,5.53)	4.10 (0.50,7.50)
Lag 4	2.67 (1.77,3.57)	36.00 (23.90,48.20)	2.38 (0.00,5.18)	3.20 (0.00,7.00)
Lag 5	2.67 (2.22,3.57)	36.00 (29.90,48.20)	2.38 (0.00,5.18)	3.20 (0.00,7.00)
Lag 6	3.12 (2.22,3.57)	42.10 (29.90,48.20)	2.03 (-0.67,4.47)	2.70 (-0.90,6.00)

[a]Fresno has about 13,500 live births per year.
Abbreviations: PTB, preterm birth; $PM_{2.5}$, particulate matter <2.5 microns; IM, infant mortality

1.4 SUMMARY

The research in this chapter suggests that proximity to traffic exposes residents to greater amounts of pollution and, in turn, greater health risks, and that this was true for South Fresno residents living in the AB 617 area—particularly for those from communities of color. Using a birth cohort of all babies born in the city of Fresno from 2009 to 2019, we observed the following key findings:

1. Residential proximity to freeways, truck routes, and major streets were positively associated with the risk of PTB and IM. People who lived within 1,000 feet from a freeway, 1,000 feet from a truck route, or 300 feet from a major road experienced higher risk of pregnancy outcomes.
2. PTB and IM rates were higher in zip codes within the South Fresno AB 617 community boundaries compared to the rest of the city.
3. On average, pregnant people within the South Fresno AB 617 community boundaries had higher long-term exposures to traffic and diesel emissions and lived in closer proximity to pollution sources such as freeways, truck routes, and major streets.
4. Cumulative exposures to $PM_{2.5}$ and diesel PM were more pronounced among pregnant people identifying with communities of color.
5. Acute exposures to ozone and $PM_{2.5}$ were positively associated with PTB and IM. These pollutants were potentially responsible for a significant number of annual excess cases of PTB and IM in Fresno

Although there are few existing studies in Fresno for comparison, our findings are consistent with the literature pertaining to the impacts of pollution on PTB. A recent California statewide study suggested that higher mean levels of $PM_{2.5}$ and diesel particles were associated with higher PTB risks.[53] Like ours, this study also did not find consistent association between proximity to major roads with PTB. Our study is novel, as we additionally evaluated proximity to freeways and truck routes, both of which are major sources of pollution. These findings are consistent with existing knowledge about the higher exposures among people living near freeways and truck routes and their negative impacts on other health outcomes.[54-56]

Our findings are also consistent with a recent analysis on the acute impacts of $PM_{2.5}$ and ozone on PTB in the SJV.[57] This study shows season-specific impacts where ozone was positively associated with PTB in

the summer and $PM_{2.5}$ in the winter season. These observations are consistent with the known seasonal variability of the two pollutants, where ozone is much higher in the warm season due to the abundance of sunlight and heat, and $PM_{2.5}$ is higher in the colder season due to temperature inversion.

This study also has had the notable merit of being the first study in the area to evaluate the impacts of proximity to freeways and truck routes. The modelled air pollution data by the Air District has been validated and shows high accuracy.[58] These data are also used for air pollution forecasts and policy decisions in the area. Thus, findings will have direct implications for policy decision. Lastly, the case-crossover nature of our analyses eliminates confounding, which ensures that the effects of air pollution on PTB are unlikely driven by other characteristics.

In summary, our findings generally suggest that living in areas with more pollution sources and pollution concentration (both long-term and short-term) exposes people to significant risks of developing adverse pregnancy outcomes. With evidence of heightened concerns within our AB 617 community boundaries, and communities of color, we recommend future policies take these risks into account and prioritize efforts to reduce pollution emission overall, but especially in highly impacted areas.

1.5 RECOMMENDATIONS

With respect to the Fresno Truck Reroute Study, we specifically recommend:

1. Developing truck routes outside of a 1,000-foot buffer around residential areas. Where appropriate, a bigger buffer could also be used, especially in areas with more vulnerable populations.
2. Planning future truck routes to be at least 1,000 feet from areas where people live, work and play. It would be prudent to avoid truck routes near locations where vulnerable populations are located, such as schools, daycare, and hospitals.
3. Due to the fact that there is seasonal variation in health effects, creative strategies to address seasonal changes may be helpful. For example, seasonal truck regulation may be considered.
4. We also recommend the use of zero-emission commercial trucks when possible to minimize population exposure

CHAPTER 2. AIR POLLUTION AND ASTHMA IN FRESNO, CALIFORNIA

2.1 BACKGROUND

Asthma is a common but serious respiratory illness in California, occurring to about 8.8% of the population in 2021.[59] For the Fresno population, the prevalence of asthma is about 12.8%.[60] Asthma can cause morbidity, sleep disturbance, loss of productivity (e.g., school, work), and reduced quality of life. If unmanaged, asthma can also lead to severe morbidity, hospitalization, and even death.

Studies around the world have linked air pollution to asthma risk with well-established biologic mechanisms.[61,62] However, very few studies have assessed impacts of air pollution on asthma in the San Joaquin Valley (much less Fresno), an area with known concerns related to pollution and heightened asthma risks.

The purpose of this analysis is to estimate the effects of air pollution on asthma among Fresno residents, with regard to major roads, truck routes, and freeways. In addition, we estimated the amount of asthma that could have been prevented by a given decline in localized air pollution.

2.2 METHODS

2.2.1 DATA AND PARTICIPANTS

In this chapter, we examine California Department of Health Care Access and Information (HCAi) Emergency Department (ED) visits and Patient Discharge Data (PDD) between the years 2011 and 2020.[63] These are the latest available data. ED datasets consist of demographic, clinical, and facility information of all emergency department face-to-face encounters with a healthcare provider in California hospitals licensed to provide emergency medical services. Meanwhile, the PDD dataset consists of records for each inpatient discharge from any California-licensed hospital. Licensed hospitals can include general acute care, acute psychiatric care, chemical dependency recovery facilities, and psychiatric health facilities.

For this study, we only selected ED visits and hospitalization from Fresno zip codes. We further restricted the datasets to ED visits and inpatient visits for those with asthma as the primary diagnosis. We also note that due to the lack of personally identifiable information, we cannot follow individuals longitudinally and we therefore have to treat each ED visit or hospitalization as an independent event. We note that people visit the ED and end up being admitted, they only show up under the hospitalization data. In other words, no person would be counted twice for the same encounter.

2.2.2 EXPOSURE ASSESSMENT

We estimated daily exposures to $PM_{2.5}$ and ozone using a similar approach described in **Chapter 1, Section 1.2.2**. Briefly, we obtained daily concentration of two common **air pollutants**, fine particulate matter less than 5 microns ($PM_{2.5}$, 24-hr. average $PM_{2.5}$) and ozone (maximum 8-hr. average), from the Air District. These daily concentrations were estimated by the Air District using a regression-based mathematical model with inputs from local air monitors and the Community Multilevel Air Quality (CMAQ) model output from the California Air Resources Board.[47,48] These data were estimated at the zip code level for spatiotemporal linkages to the health data. Participants were then spatiotemporally linked to daily air pollution data based on their residential zip code at the time of event. We specifically focused on acute air pollution exposure and its effects within seven days following prior knowledge in the field.

Due to the lack of residential addresses from HCAi datasets, we were unable to geocode participants for detailed spatial analyses more granular than the zip code level (such as those in Chapter 1).

2.2.3 OUTCOME ASSESSMENT

We utilized the 9th and 10th version of the International Classification of Disease codes with clinical modification (ICD-9-CM and ICD-10-CM) to identify asthma ED visits and hospitalizations. More specifically, for data prior to 2015, we identified asthma cases as those who had an ED visit or hospitalization with an ICD-9-CM code starting with 493 as the principal diagnosis code. In 2015 and

later years, we used ICD-10-CM code J45. To ensure that we capture cases more accurately, we used both ICD-9 and ICD-10 codes in the transition year 2015.

2.2.4 STATISTICAL ANALYSES

To determine the impacts of air pollution on asthma in Fresno, we employed the time-stratified case-crossover analysis to minimize confounding by factors that can also explain risks of asthma. A detailed description of this method is described in section **Chapter 1, section 1.2.4** above. Briefly, in this analysis, we only selected cases that were impacted by asthma. We then compared exposures (i.e., $PM_{2.5}$ and ozone) during a hazard period shortly before the event to exposures during control periods during which the event did not happen. The hazard period was defined as the day of the event (lag 0) and each of the six days before the event (lags 1-6). Control periods were selected using the time-stratified approach, where controls were selected as the same day of the week within the same month as the case period.[52] For example, if someone visited the ED or got hospitalized because of asthma on Monday, March 12, 2018, then this will be the case period (lag 0). Their control period will be selected as Mondays the 5th, the 19th, and the 26th of the same month of March **(Figure 1.2)**. This approach allows control for days of the week and month and minimizes time-trend bias. Since the comparisons were made for the same person, this approach allows complete control for non-time-varying confounders (or factors that could explain the observed associations). Conditional logistic regression models were used to estimate the risks of asthma associated with a 5-unit increase in air pollution exposures. We found meaningful seasonal differences and presented results by season (cold: November – April, warm: May-October). We additionally explored effects by AB 617 residence status and race/ethnicity.

We calculated the access number of asthma ED visits and hospitalizations due to pollution, also known as the attributable risk (AR), using the following formula:

$$AR = I_e - I_u$$

where I_u is background rate of event in the population, and I_e is the incidence of events among those exposed to the higher pollutants and is calculated as I_u times the odds ratio. I_u was calculated as the average annual number of events in the city of Fresno divided by the total population estimated by the 2020 Census (n=545,567).[64]

All analyses were completed in ArcGIS Pro (Redlands, CA), SAS 9.2 (Cary, NC) and Microsoft Excel (Redmond, WA).

2.3 RESULTS

2.3.1 DESCRIPTIVE STATISTICS

The analysis included 45,455 asthma ED visits and 7,296 inpatient hospitalizations among participants in Fresno zip codes (**Table 2.1**).

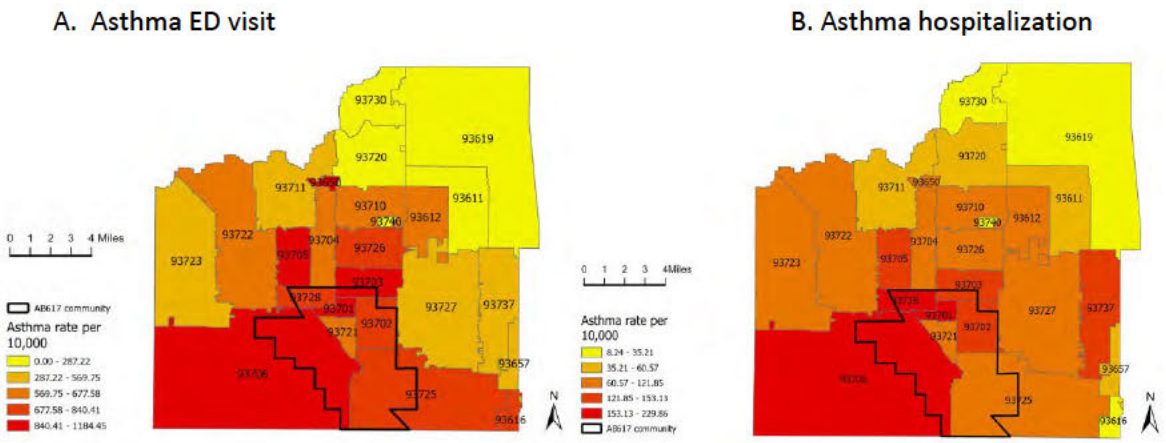
Table 2.1. Characteristics of emergency department visits and hospitalizations related to asthma in Fresno, 2011-2020

Characteristics	Asthma ED visits n= 45455	Asthma hospitalization n= 7479
Age categories (in years)		
0-4	9805 (21.6)	2008 (26.8)
5-17	14374 (31.6)	1843 (24.6)
18-64	19004 (41.8)	2529 (33.8)
65+	2272 (5.0)	1099 (14.6)
Sex		
Female	22674 (49.9)	3735 (49.9)
Male	22781 (50.1)	3744 (50.0)
Race/ethnicity		
Non-Hispanic White	11825 (26.0)	1878 (25.1)
Non-Hispanic Black	5525 (12.1)	1431 (19.1)
Hispanic	25453 (56.0)	2667 (35.6)
Asian/Pacific Islander	1332 (2.9)	489 (6.5)
American Indian/Alaskan Natives	90 (0.2)	17 (0.2)
Other	784 (1.7)	107 (1.4)
Unknown	446 (0.9)	890(11.9)
Principal language		
English	40375 (88.8)	6573 (87.8)
Spanish	4725 (10.4)	621 (8.3)
Other	355 (0.8)	285 (3.8)
Expected source of payment		
Medicare	2034 (4.5)	1370 (18.3)
Medi-Cal	31118 (68.5)	4566 (61.0)
Private	8210 (18.1)	1037 (13.8)
Self-pay	2944 (6.5)	210 (2.6)
Other	1148 (2.5)	304 (4.0)
Unknown	1 (0.00)	1 (0.0)
Season of service		
Warm (May – October)	18879 (41.5)	2971 (39.7)
Cold (November – April)	26576 (58.5)	4508 (60.2)
Year of service		
2011	4637 (10.2)	950 (12.7)
2012	4700 (10.3)	1103 (14.7)
2013	4842 (10.7)	962 (12.9)
2014	5009 (11.0)	999 (13.3)
2015	3983 (8.8)	704 (9.4)
2016	4787 (10.5)	660 (8.8)
2017	5529 (12.2)	615 (8.2)
2018	4885 (10.8)	634 (8.4)
2019	4605 (10.1)	533 (7.1)
2020	2478 (5.5)	311 (4.1)

Abbreviations: ED, emergency department

Cumulative rates of asthma ED visits and hospitalizations across Fresno were observed during the study period, and incidents of asthma appeared to be higher in the south-central region compared to the rest of the city (**Figure 2.1**).

Figure 2.1. Rates of asthma ED visits (A) and hospitalization (B) in Fresno, 2011-2020



Note: Rates were obtained by dividing the total number of asthma ED visits or inpatient hospitalizations by the population size for each zip code from the 2020 census. Abbreviations: ED, emergency department.

Table 2.2. Rates of asthma ED visits within and outside of the South Fresno community boundaries

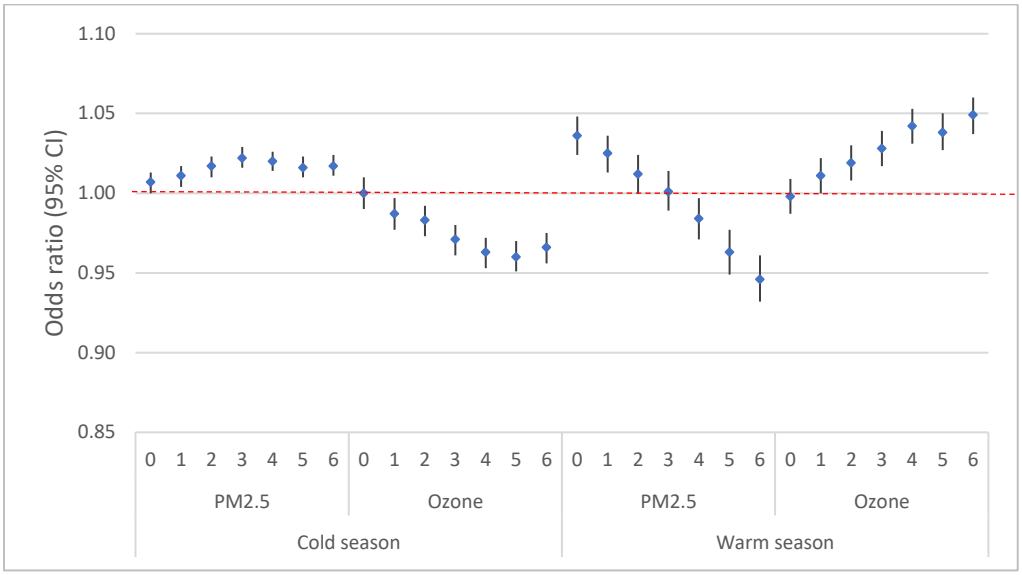
	Rates per 10,000 population (10 years)	
	Within boundaries	Outside boundaries
Asthma ED visits	870.06	521.01
Asthma hospitalization	156.41	78.44

Abbreviations: ED, emergency department.

2.3.2 IMPACTS OF AIR POLLUTION ON ASTHMA

Our case-crossover analyses suggest that exposures to both $PM_{2.5}$ and ozone increased the risk of asthma ED visits, and these effects were season-specific (**Figure 2.2, Figure 2.3, Table 2.3**). During the cold season, a 5-unit increase in $PM_{2.5}$ exposure was associated with approximately a 2% increased risk of having an asthma ED visit 2-6 days later. During the warm season, a 5-unit increase in $PM_{2.5}$ exposures was associated with a 3-4% increased risk of an ED visit within one day of exposure, suggesting more immediate effects when the temperature is hotter (**Figure 2.2**). Ozone appears to only have adverse impacts during the warm season, when its concentration is the highest. Its effects were more pronounced after one day and up to 6 days after exposures. A 5-unit increase in ozone exposure was associated with a 2-5% increased risk of having an asthma ED visit within 1-6 days.

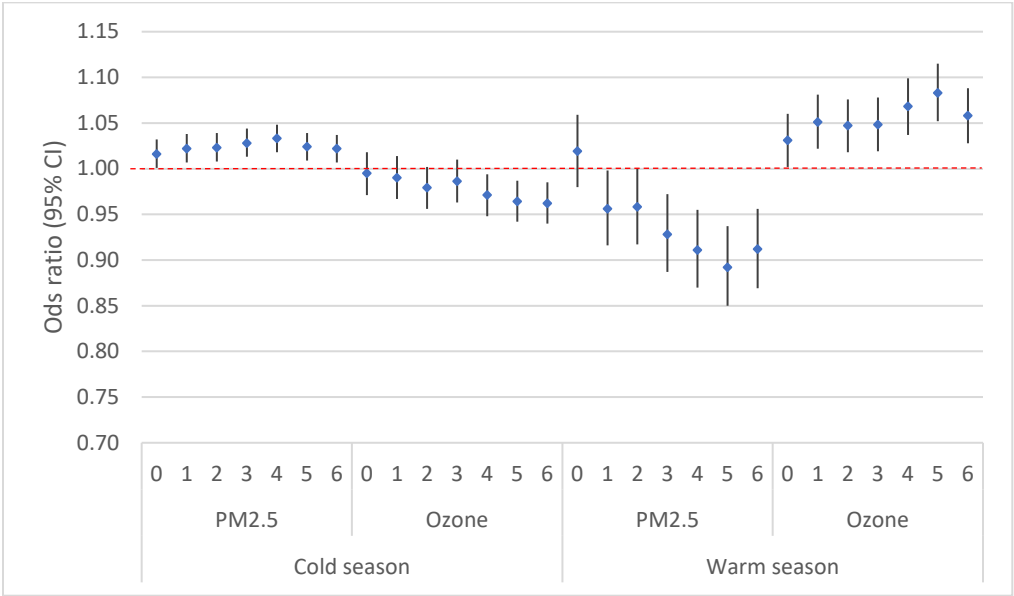
Figure 2.2. Associations between air pollution and asthma ED visits by season and lag



Models adjusted for temperature, humidity, and co-pollutants. Time-unvarying factors were controlled by study design. Estimates were obtained for each 5-unit increase in pollutants. The numbers on the x-axis represent lag, which can be interpreted as the number of days after exposure. For example, lag 0 = risk on the day of exposure, lag 1 = risk one day after exposure, etc. Cold season: Nov. – Apr., warm season: May-Oct. Abbreviations: ED, emergency department; PM, particulate matter; CI, confidence intervals.

The effects of $PM_{2.5}$ and ozone on asthma hospitalization are similar to those of asthma ED visits described above (**Figure 2.3**, **Table 2.3**). A 5-unit increase in $PM_{2.5}$ exposure during the cold season is associated with about 2-3% increase in risk of being hospitalized for asthma within one week. During the warm season, a 5-unit increase in ozone is associated with a 5-8% increased risk of being hospitalized by asthma.

Figure 2.3. Associations between air pollution and asthma hospitalization by season and lag



Models adjusted for temperature, humidity, and co-pollutants. Time-unvarying factors were controlled by study design. Estimates were obtained for each 5-unit increase in pollutants. The numbers on the x-axis represent lag, which can be interpreted as the number of days after exposure. For example, lag 0 = risk on the day of exposure, lag 1 = risk one day after exposure, etc. Cold season: Nov. – Apr., warm season: May-Oct. Abbreviations: ED, emergency department; PM, particulate matter; CI, confidence intervals.

Table 2.3. Estimates for associations between pollution and asthma ED visits and hospitalizations

Season	Pollutants	Lag[b]	OR (95% CI)[a]	
			Asthma ED visits	Asthma hospitalization
Cold	$PM_{2.5}$	0	1.01 (1.00, 1.01)	**1.02 (1.00, 1.03)**
(Nov.-		1	1.01 (1.00, 1.02)	**1.02 (1.01, 1.04)**
Apr.)		2	**1.02 (1.01, 1.02)**	**1.02 (1.01, 1.04)**
		3	**1.02 (1.02, 1.03)**	**1.03 (1.01, 1.04)**
		4	**1.02 (1.01, 1.03)**	**1.03 (1.02, 1.05)**
		5	**1.02 (1.01, 1.02)**	**1.02 (1.01, 1.04)**
		6	**1.02 (1.01, 1.02)**	**1.02 (1.01, 1.04)**
	Ozone	0	1.00 (0.99, 1.01)	1.00 (0.97, 1.02)
		1	0.99 (0.98, 1.00)	0.99 (0.97, 1.01)
		2	0.98 (0.97, 0.99)	0.98 (0.96, 1.00)
		3	0.97 (0.96, 0.98)	0.99 (0.96, 1.01)
		4	0.96 (0.95, 0.97)	0.97 (0.95, 0.99)
		5	0.96 (0.95, 0.97)	0.96 (0.94, 0.99)
		6	0.97 (0.96, 0.98)	0.96 (0.94, 0.99)
Warm	$PM_{2.5}$	0	**1.04 (1.02, 1.05)**	1.02 (0.98, 1.06)
(May-		1	**1.03 (1.01, 1.04)**	0.96 (0.92, 1.00)
Oct.)		2	1.01 (1.00, 1.02)	0.96 (0.92, 1.00)
		3	1.00 (0.99, 1.01)	0.93 (0.89, 0.97)
		4	0.98 (0.97, 1.00)	0.91 (0.87, 0.96)
		5	0.96 (0.95, 0.98)	0.89 (0.85, 0.94)
		6	0.95 (0.93, 0.96)	0.91 (0.87, 0.96)
	Ozone	0	1.00 (0.99, 1.01)	1.03 (1.00, 1.06)
		1	1.01 (1.00, 1.02)	**1.05 (1.02, 1.08)**
		2	**1.02 (1.01, 1.03)**	**1.05 (1.02, 1.08)**
		3	**1.03 (1.02, 1.04)**	**1.05 (1.02, 1.08)**
		4	**1.04 (1.03, 1.05)**	**1.07 (1.04, 1.10)**
		5	**1.04 (1.03, 1.05)**	**1.08 (1.05, 1.12)**
		6	**1.05 (1.04, 1.06)**	**1.06 (1.03, 1.09)**

[a]Models adjusted for temperature, humidity, and co-pollutants. Time-unvarying factors were controlled by study design. Estimates were obtained for each 5-unit increase in pollutants.
[b]Lag can be interpreted as the number of days after exposure. For example, lag 0 = risk on the day of exposure, lag 1 = risk one day after exposure, etc.
Boldface font indicates statistical significance at $p<0.05$.
Abbreviations: ED, emergency department; $PM_{2.5}$, particulate matter <2.5 microns; OR, odds ratio; CI, confidence intervals.

Table 2.4 illustrates the associations between air pollution and asthma stratified by residents within and outside of the South Fresno AB 617 community's boundaries. Even at the same level of exposure, residents within the community boundaries may bear higher risks. For example, during the cold season, each 5-unit in $PM_{2.5}$ exposures increased the risk of asthma hospitalization by 5% for residents within the boundaries, but this exposure was not associated with risks among those outside the boundaries (**Table 2.4**).

Table 2.4. Associations between air pollution and asthma within and outside South Fresno AB 617 Community boundaries

Season	Pollutants	Lag[b]	OR (95% CI)[a]			
			ED visits		Hospitalizations	
			Within AB 617 boundaries	Outside AB 617 boundaries	Within AB 617 boundaries	Outside AB 617 boundaries
Cold	$PM_{2.5}$	0	**1.02 (1.01,1.04)**	1.01 (1.00,1.02)	**1.05 (1.02,1.08)**	0.99 (0.97,1.02)
		1	**1.03 (1.02,1.05)**	**1.01 (1.00,1.02)**	**1.05 (1.02,1.08)**	1.00 (0.98,1.02)
		2	**1.03 (1.02,1.05)**	**1.02 (1.01,1.03)**	**1.05 (1.03,1.08)**	1.01 (0.99,1.03)
		3	**1.03 (1.02,1.05)**	**1.02 (1.01,1.03)**	**1.05 (1.02,1.08)**	**1.02 (1.00,1.04)**
		4	**1.03 (1.01,1.04)**	**1.02 (1.01,1.03)**	**1.06 (1.03,1.09)**	**1.02 (1.00,1.04)**
		5	**1.02 (1.01,1.03)**	**1.01 (1.00,1.02)**	**1.04 (1.01,1.06)**	**1.02 (1.00,1.04)**
		6	**1.02 (1.00,1.03)**	**1.01 (1.00,1.02)**	**1.04 (1.01,1.07)**	**1.02 (1.00,1.04)**
	Ozone	0	1.00 (0.98,1.01)	1.01 (0.99,1.02)	1.01 (0.96,1.05)	0.97 (0.95,1.00)
		1	0.99 (0.98,1.01)	1.00 (0.99,1.01)	1.01 (0.97,1.06)	0.98 (0.96,1.01)
		2	0.99 (0.97,1.01)	1.00 (0.99,1.01)	0.97 (0.93,1.01)	0.99 (0.96,1.02)
		3	1.01 (0.99,1.02)	0.99 (0.98,1.00)	1.01 (0.97,1.05)	0.99 (0.96,1.02)
		4	0.99 (0.97,1.00)	0.99 (0.98,1.00)	1.01 (0.97,1.05)	0.98 (0.95,1.01)
		5	0.98 (0.96,1.00)	0.99 (0.98,1.00)	0.99 (0.95,1.03)	0.98 (0.96,1.01)
		6	0.99 (0.97,1.01)	1.00 (0.99,1.01)	0.98 (0.94,1.03)	0.98 (0.95,1.01)
Warm	$PM_{2.5}$	0	**1.03 (1.01,1.05)**	1.01 (1.00,1.02)	**1.06 (1.01,1.12)**	1.00 (0.96,1.04)
		1	**1.02 (1.01,1.04)**	1.01 (1.00,1.02)	1.01 (0.96,1.07)	1.00 (0.97,1.03)
		2	**1.02 (1.01,1.04)**	1.00 (0.99,1.01)	0.98 (0.92,1.03)	0.98 (0.95,1.02)
		3	1.02 (1.00,1.03)	1.01 (1.00,1.02)	0.94 (0.89,1.00)	0.98 (0.95,1.01)
		4	1.02 (0.98,1.02)	1.01 (1.00,1.02)	0.98 (0.93,1.04)	0.97 (0.94,1.00)
		5	1.00 (0.99,1.02)	1.00 (0.99,1.01)	0.97 (0.91,1.02)	0.96 (0.93,1.00)
		6	1.00 (0.99,1.02)	1.00 (0.99,1.01)	0.94 (0.89,1.00)	0.97 (0.94,1.01)
	Ozone	0	1.00 (0.97,1.02)	1.00 (0.99,1.01)	1.00 (0.95,1.06)	**1.05 (1.02,1.08)**
		1	1.01 (0.99,1.03)	1.00 (0.99,1.01)	1.02 (0.97,1.07)	**1.06 (1.02,1.09)**
		2	1.01 (0.99,1.03)	1.01 (1.00,1.02)	1.03 (0.98,1.08)	**1.05 (1.02,1.08)**
		3	1.01 (0.99,1.03)	1.01 (1.00,1.02)	1.03 (0.98,1.08)	**1.03 (1.00,1.07)**
		4	**1.02 (1.00,1.04)**	1.01 (1.00,1.02)	**1.06 (1.01,1.12)**	1.03 (1.00,1.06)
		5	1.00 (0.98,1.02)	1.01 (1.00,1.02)	**1.07 (1.02,1.12)**	1.04 (1.00,1.07)
		6	1.01 (0.99,1.03)	1.01 (1.00,1.02)	1.05 (1.00,1.10)	1.02 (0.99,1.05)

[a]Models adjusted for temperature, humidity, and co-pollutants. Time-unvarying factors were controlled by study design. Estimates were obtained for each 5-unit increase in pollutants.
[b]Lag can be interpreted as the number of days after exposure. For example, lag 0 = risk on the day of exposure, lag 1 = risk one day after exposure, etc.
Boldface font indicates statistical significance at $p<0.05$
Abbreviations: ED, emergency department; $PM_{2.5}$, particulate matter <2.5 microns; OR, odds ratio; CI, confidence intervals.
Cold season: Nov. – Apr., warm season: May-Oct.

When stratified by race/ethnicity to explore whether specific groups may be more impacted by air pollution, we consistently observed that American Indian/Alaskan Native communities were more affected, even at the same level of exposure (**Table 2.5**). For example, each 5-unit increase in $PM_{2.5}$ exposures in the colder months increased the risk of ED visits by 40% among American Indian/Alaskan Natives, whereas these risks were about 2-3% in other groups.

A similar pattern was also observed for asthma hospitalization, but the estimates were imprecise due to the small sample size within this group (**Table 2.6**).

Table 2.5. Associations between air pollution and asthma ED visits by race/ethnicity

Season	Pollutants	Lag[b]	OR (95% CI)[a]					
			Non-Hispanic White	Non-Hispanic Black	Hispanic	Asian/PI	American Indian/Alaskan Native	Other
Cold	**$PM_{2.5}$**	**0**	1.01 (1.00,1.03)	1.01 (0.99,1.03)	**1.01 (1.00,1.02)**	1.01 (0.97,1.05)	1.15 (0.85,1.55)	1.00 (0.94,1.05)
		1	**1.02 (1.00,1.03)**	1.02 (1.00,1.04)	**1.02 (1.01,1.03)**	1.00 (0.96,1.03)	1.21 (0.94,1.55)	1.00 (0.95,1.05)
		2	**1.02 (1.01,1.04)**	**1.03 (1.01,1.05)**	**1.02 (1.01,1.03)**	1.02 (0.98,1.05)	**1.40 (1.07,1.82)**	1.04 (0.99,1.09)
		3	**1.03 (1.01,1.04)**	**1.02 (1.00,1.04)**	**1.02 (1.01,1.03)**	1.02 (0.98,1.05)	**1.32 (1.00,1.74)**	**1.05 (1.00,1.10)**
		4	**1.02 (1.01,1.04)**	**1.02 (1.00,1.04)**	**1.02 (1.01,1.03)**	1.01 (0.97,1.04)	1.26 (0.98,1.62)	**1.06 (1.01,1.11)**
		5	**1.02 (1.00,1.03)**	1.00 (0.98,1.02)	**1.02 (1.01,1.03)**	1.00 (0.97,1.04)	1.23 (0.99,1.53)	1.02 (0.97,1.07)
		6	**1.02 (1.00,1.03)**	1.00 (0.98,1.03)	1.01 (1.00,1.02)	1.01 (0.97,1.05)	**1.30 (1.02,1.67)**	1.04 (0.99,1.09)
	Ozone	**0**	1.00 (0.98,1.02)	1.00 (0.97,1.03)	1.00 (0.99,1.02)	1.00 (0.95,1.05)	1.03 (0.74,1.43)	0.97 (0.90,1.04)
		1	0.99 (0.97,1.01)	1.02 (0.99,1.05)	1.00 (0.99,1.01)	1.02 (0.98,1.06)	0.93 (0.72,1.22)	0.99 (0.93,1.06)
		2	0.99 (0.97,1.01)	1.00 (0.98,1.03)	1.00 (0.98,1.01)	1.01 (0.97,1.06)	1.28 (0.91,1.81)	0.99 (0.93,1.05)
		3	0.98 (0.96,1.00)	1.00 (0.98,1.03)	1.00 (0.99,1.01)	1.00 (0.96,1.04)	1.32 (0.93,1.88)	0.97 (0.90,1.03)
		4	0.98 (0.96,1.00)	1.00 (0.97,1.02)	1.00 (0.98,1.01)	0.99 (0.94,1.03)	**1.66 (1.12,2.45)**	1.01 (0.95,1.07)
		5	0.99 (0.97,1.00)	0.98 (0.95,1.00)	0.99 (0.98,1.00)	1.00 (0.95,1.04)	1.08 (0.80,1.46)	1.04 (0.98,1.10)
		6	0.99 (0.98,1.01)	0.98 (0.96,1.01)	1.00 (0.99,1.01)	1.00 (0.96,1.05)	1.18 (0.83,1.67)	1.01 (0.95,1.08)
Warm	**$PM_{2.5}$**	**0**	1.02 (1.00,1.04)	1.01 (0.98,1.04)	**1.02 (.001,1.03)**	1.01 (0.96,1.06)	0.96 (0.77,1.20)	**1.07 (1.00,1.15)**
		1	1.01 (0.99,1.03)	1.02 (0.99,1.04)	1.01 (1.00,1.02)	1.01 (0.96,1.05)	0.92 (0.75,1.12)	**1.07 (1.01,1.14)**
		2	1.00 (0.99,1.02)	1.01 (0.98,1.03)	1.01 (0.99,1.02)	1.02 (0.98,1.06)	0.96 (0.78,1.18)	**1.10 (1.04,1.17)**
		3	1.01 (0.99,1.03)	1.01 (0.98,1.03)	1.01 (0.99,1.02)	1.03 (0.99,1.07)	1.10 (0.93,1.30)	**1.09 (1.03,1.16)**
		4	1.00 (0.98,1.02)	1.00 (0.97,1.03)	1.00 (0.99,1.01)	1.03 (0.99,1.07)	**1.17 (1.01,1.36)**	**1.09 (1.03,1.15)**
		5	1.00 (0.98,1.02)	0.99 (0.96,1.02)	1.00 (0.99,1.01)	1.02 (0.98,1.06)	1.11 (0.95,1.29)	1.06 (1.00,1.12)
		6	0.99 (0.98,1.01)	0.99 (0.96,1.01)	1.00 (0.99,1.01)	1.01 (0.97,1.05)	1.13 (0.96,1.34)	1.08 (1.02,1.14)
	Ozone	**0**	1.01 (0.98,1.03)	1.01 (0.98,1.04)	0.99 (0.98,1.01)	1.00 (0.94,1.05)	1.07 (0.86,1.33)	1.00 (0.92,1.08)
		1	**1.03 (1.00,1.05)**	0.99 (0.96,1.02)	1.00 (0.99,1.02)	0.96 (0.92,1.01)	1.09 (0.89,1.33)	1.00 (0.93,1.08)
		2	**1.02 (1.00,1.05)**	1.01 (0.98,1.04)	1.01 (0.99,1.02)	0.99 (0.94,1.04)	1.01 (0.85,1.20)	1.00 (0.92,1.08)
		3	1.00 (0.98,1.03)	1.00 (0.97,1.03)	**1.02 (1.00,1.03)**	0.98 (0.93,1.03)	1.05 (0.88,1.25)	1.00 (0.92,1.08)
		4	1.02 (1.00,1.04)	1.01 (0.98,1.04)	**1.02 (1.00,1.03)**	0.98 (0.93,1.03)	1.02 (0.84,1.23)	0.97 (0.90,1.04)
		5	1.00 (0.98,1.02)	1.00 (0.97,1.04)	1.01 (1.00,1.03)	0.97 (0.93,1.02)	1.09 (0.90,1.31)	0.95 (0.88,1.02)
		6	1.01 (0.99,1.04)	1.01 (0.98,1.04)	1.01 (1.00,1.03)	1.02 (0.97,1.07)	1.11 (0.93,1.34)	0.91 (0.85,0.99)

[a]Models adjusted for temperature, humidity, and co-pollutants. Time-unvarying factors were controlled by study design. Estimates were obtained for each 5-unit increase in pollutants.

[b]Lag can be interpreted as the number of days after exposure. For example, lag 0 = risk on the day of exposure, lag 1 = risk one day after exposure, etc.

Boldface font indicates statistical significance at $p<0.05$.

Abbreviations: ED, emergency department; $PM_{2.5}$, particulate matter <2.5 microns; OR, odds ratio; CI, confidence intervals.

Cold season: Nov. – Apr., warm season: May-Oct.

Table 2.6. Associations between air pollution and asthma hospitalization by race/ethnicity

Season	Pollutants	Lag[b]	OR (95% CI)[a]					
			Non-Hispanic White	Non-Hispanic Black	Hispanic	Asian/Pacific Islander	American Indian/Alaskan Native	Other
Cold	**$PM_{2.5}$**	**0**	1.01 (0.98,1.05)	1.01 (0.97,1.05)	1.01 (0.98,1.04)	1.01 (0.94,1.07)	1.22 (0.86,1.72)	1.08 (0.94,1.24)
		1	1.02 (0.99,1.05)	1.03 (0.99,1.07)	1.02 (0.99,1.05)	1.00 (0.94,1.07)	1.04 (0.82,1.33)	1.01 (0.89,1.15)
		2	1.02 (0.99,1.05)	1.03 (1.00,1.07)	1.02 (0.99,1.05)	1.05 (0.98,1.12)	1.11 (0.87,1.41)	1.04 (0.92,1.18)
		3	1.02 (0.99,1.05)	**1.06 (1.02,1.10)**	1.02 (1.00,1.05)	1.05 (0.98,1.12)	1.16 (0.85,1.58)	1.01 (0.89,1.14)
		4	1.01 (0.98,1.04)	**1.09 (1.05,1.13)**	1.03 (1.00,1.05)	1.05 (0.99,1.12)	0.99 (0.77,1.28)	0.96 (0.85,1.09)
		5	1.02 (0.99,1.05)	**1.05 (1.01,1.09)**	1.01 (0.99,1.04)	1.06 (1.00,1.12)	0.87 (0.65,1.15)	0.88 (0.77,1.01)
		6	1.02 (0.99,1.05)	1.02 (0.99,1.06)	1.02 (1.00,1.05)	**1.08 (1.02,1.15)**	0.93 (0.74,1.17)	0.90 (0.79,1.03)
	Ozone	**0**	0.97 (0.93,1.02)	0.99 (0.94,1.04)	0.98 (0.94,1.02)	0.92 (0.84,1.01)	1.41 (0.89,2.22)	1.23 (0.96,1.59)
		1	0.96 (0.92,1.00)	0.98 (0.93,1.03)	1.00 (0.96,1.04)	0.98 (0.90,1.08)	1.14 (0.80,1.61)	1.09 (0.89,1.33)
		2	0.97 (0.93,1.02)	0.98 (0.93,1.03)	0.98 (0.94,1.02)	0.96 (0.87,1.06)	0.98 (0.73,1.33)	1.00 (0.84,1.19)
		3	0.99 (0.95,1.04)	1.02 (0.97,1.08)	0.99 (0.96,1.03)	0.95 (0.87,1.05)	0.82 (0.59,1.15)	0.93 (0.77,1.12)

Season	Pollutants	Lag[b]	OR (95% CI)[a]					
			Non-Hispanic White	Non-Hispanic Black	Hispanic	Asian/Pacific Islander	American Indian/Alaskan Native	Other
		4	0.99 (0.95,1.04)	1.00 (0.94,1.05)	0.99 (0.96,1.03)	0.92 (0.84,1.00)	1.11 (0.81,1.51)	0.97 (0.81,1.18)
		5	1.00 (0.96,1.05)	0.96 (0.91,1.01)	1.01 (0.97,1.04)	0.92 (0.84,1.00)	1.35 (0.93,1.97)	0.97 (0.81,1.17)
		6	1.02 (0.98,1.07)	0.96 (0.91,1.01)	0.99 (0.95,1.03)	0.96 (0.88,1.05)	1.07 (0.74,1.55)	1.08 (0.90,1.28)
Warm	**$PM_{2.5}$**	**0**	1.03 (0.96,1.10)	0.97 (0.91,1.05)	1.01 (0.96,1.07)	0.99 (0.87,1.12)	0.35 (0.04,2.87)	0.91 (0.68,1.21)
		1	1.03 (0.97,1.09)	0.97 (0.91,1.03)	1.00 (0.96,1.05)	1.01 (0.90,1.14)	0.60 (0.14,2.69)	0.88 (0.66,1.18)
		2	1.02 (0.96,1.08)	0.92 (0.86,0.99)	0.99 (0.94,1.04)	0.98 (0.88,1.10)	2.34 (0.51,10.85)	0.91 (0.72,1.15)
		3	1.01 (0.95,1.07)	0.94 (0.88,1.00)	0.97 (0.92,1.02)	0.95 (0.84,1.08)	0.93 (0.31,2.83)	1.01 (0.86,1.19)
		4	1.02 (0.95,1.08)	0.95 (0.89,1.02)	0.98 (0.93,1.03)	0.90 (0.80,1.02)	1.62 (0.37,7.13)	0.99 (0.84,1.17)
		5	0.99 (0.93,1.05)	0.94 (0.88,1.01)	0.97 (0.92,1.02)	0.93 (0.83,1.04)	2.03 (0.55,7.40)	0.91 (0.73,1.14)
		6	1.00 (0.94,1.07)	0.93 (0.87,0.99)	0.96 (0.91,1.01)	0.99 (0.89,1.10)	1.09 (0.56,2.13)	0.89 (0.69,1.13)
	Ozone	**0**	**1.09 (1.03,1.15)**	1.04 (0.98,1.11)	1.01 (0.96,1.06)	1.03 (0.93,1.15)	1.03 (0.46,2.30)	1.27 (0.98,1.64)
		1	**1.06 (1.01,1.12)**	**1.08 (1.02,1.14)**	1.03 (0.99,1.08)	1.07 (0.97,1.17)	1.21 (0.52,2.81)	1.07 (0.87,1.31)
		2	1.02 (0.97,1.08)	**1.07 (1.01,1.14)**	**1.06 (1.01,1.11)**	1.00 (0.91,1.10)	0.71 (0.23,2.20)	1.10 (0.90,1.35)
		3	1.02 (0.97,1.07)	1.01 (0.96,1.08)	1.04 (1.00,1.09)	1.01 (0.92,1.11)	2.21 (0.80,6.09)	0.94 (0.77,1.14)
		4	1.04 (0.99,1.09)	1.05 (0.99,1.11)	1.04 (0.99,1.09)	1.06 (0.97,1.17)	1.21 (0.60,2.44)	0.96 (0.78,1.19)
		5	1.03 (0.98,1.09)	1.06 (0.99,1.12)	1.04 (0.99,1.08)	1.04 (0.94,1.14)	1.51 (0.65,3.51)	1.14 (0.92,1.41)
		6	1.00 (0.95,1.05)	1.06 (1.00,1.12)	1.01 (0.97,1.06)	1.02 (0.93,1.12)	0.89 (0.47,1.68)	1.17 (0.93,1.47)

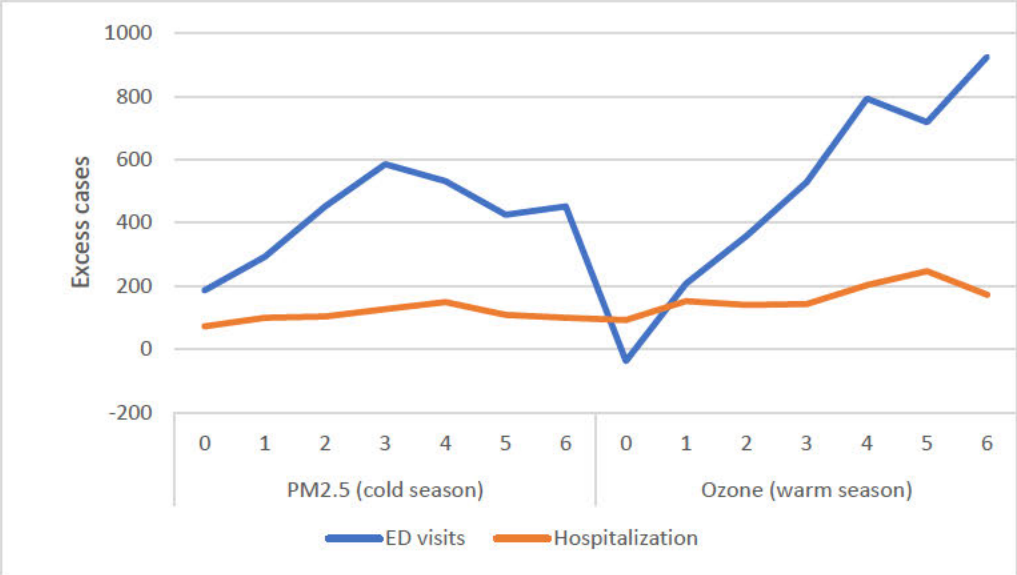
[a]Models adjusted for temperature, humidity, and co-pollutants. Time-unvarying factors were controlled by study design. Estimates were obtained for each 5-unit increase in pollutants.
[b]Lag can be interpreted as the number of days after exposure. For example, lag 0 = risk on the day of exposure, lag 1 = risk one day after exposure, etc.
Boldface font indicates statistical significance at $p<0.05$.
Abbreviations: ED, emergency department; $PM_{2.5}$, particulate matter <2.5 microns; OR, odds ratio; CI, confidence intervals.
Cold season: Nov. – Apr., warm season: May-Oct.

2.3.3 EXCESS ASTHMA EVENTS DUE TO AIR POLLUTION EXPOSURES

Based on the risk estimates above, we also estimated the extent of asthma ED visits and hospitalizations that was attributed to $PM_{2.5}$ and ozone exposures in Fresno (**Figure 2.4**, **Table 2.7**). If people were exposed to 5 $\mu g/m^3$ less $PM_{2.5}$ during the cold season, that could have prevented 5.36-10.72 excess ED visits per 10,000 people, which is equivalent to a total of about293-585 ED visits during the study period. A similar reduction in cold season-$PM_{2.5}$ exposures could also have prevented 1.32-2.73 hospitalizations per 10,000 people, or a total of about 73-149 asthma hospitalizations.

Similarly, if warm-season ozone exposures were lowered by 5 parts per billion, that would have prevented approximately 1.69-4.52 asthma hospitalizations per 10,000 people, or a total of 92-247 cases. The same change in ozone levels would have also averted 6.57-17.0 asthma ED visits per 10,000 persons, equivalent to about 359-925 total cases.

Figure 2.4. Excess asthma associated with air pollution exposure in Fresno during the study period



Cold season: November – April; warm season: May – October. Lag can be interpreted as the number of days after exposure. For example, lag 0 = risk on the day of exposure, lag 1 = risk one day after exposure, etc.
Abbreviations: ED, emergency department; $PM_{2.5}$, particulate matter <2.5 microns. Cold season: Nov. – Apr., warm season: May-Oct.

Table 2.7. Excess cases of asthma-related ED visits and hospitalizations associated with each 5-unit increase in air pollution exposures

			Excess cases per 10,000 people (95% CI)		Total excess cases during study period	
Season	Pollutants	Lag[a]	Asthma ED visits	Asthma hospitalization	Asthma ED visits	Asthma hospitalization
Cold	$PM_{2.5}$	0	3.41 (0.00, 6.33)	**1.32 (0.08, 2.64)**	186.03 (0.00, 345.49)	**72.13 (4.51, 144.26)**
		1	**5.36 (1.95, 8.28)**	**1.82 (0.58, 3.14)**	**292.34 (106.30, 451.79)**	**99.18 (31.56, 171.30)**
		2	**8.28 (4.87, 11.02)**	**1.90 (0.66, 3.22)**	**451.79 (265.76, 611.25)**	**103.68 (36.06, 175.81)**
		3	**10.72 (7.79, 14.13)**	**2.31 (1.07, 3.64)**	**584.67 (425.22, 770.70)**	**126.22 (58.60, 198.35)**
		4	**9.74 (6.82, 12.67)**	**2.73 (1.49, 3.97)**	**531.52 (372.06, 690.98)**	**148.76 (81.14, 216.38)**
		5	**7.79 (4.87, 11.20)**	**1.98 (0.74, 3.22)**	**425.22 (265.76, 611.25)**	**108.19 (40.57, 175.81)**
		6	**8.28 (5.36, 11.69)**	**1.82 (0.58, 3.06)**	**451.79 (292.34, 637.82)**	**99.18 (31.56, 166.80)**
	Ozone	0	0.00 (-4.87, 4.87)	-0.41 (-2.40, 1.49)	0.00 (-265.76, 265.76)	-22.54 (-130.73, 81.14)
		1	-6.33 (-11.20, -1.46)	-0.83 (-2.73, 1.16)	-345.49 (-611.25, -79.73)	-45.08 (-148.76, 63.11)
		2	-8.28 (-13.15, -3.90)	-1.74 (-3.64, 0.17)	-451.79 (-717.55, -212.61)	-94.67 (-198.35, 9.02)
		3	-14.13 (-19.00, -9.74)	-1.16 (-3.06, 0.83)	-770.70 (-1036.46, -531.52)	-63.11 (-166.80, 45.08)
		4	-18.02 (-22.89, -3.64)	-2.40 (-4.30, -0.50)	-983.31 (-1249.07, -744.13)	-130.73 (-234.42, -27.05)
		5	-19.49 (-23.87, -4.61)	-2.97 (-4.79, -1.07)	-1063.04 (-1302.22, -97.28)	-162.29 (-261.46, -58.60)
		6	-16.56 (-21.43, -2.18)	-3.14 (-4.96, -1.24)	-903.58 (-1169.34, -664.40)	-171.30 (-270.48, -67.62)
Warm	$PM_{2.5}$	0	**12.46 (8.31, 16.61)**	1.03 (-1.09, 3.21)	**679.64 (453.10, 906.19)**	56.45 (-59.42, 175.29)
		1	**8.65 (4.50, 12.46)**	-2.40 (-4.57, -0.11)	**471.97 (245.43, 679.64)**	-130.72 (-249.56, -5.94)
		2	4.15 (0.00, 8.31)	-2.29 (-4.52, 0.00)	226.55 (0.00, 453.10)	-124.78 (-246.59, 0.00)
		3	0.35 (-3.81, 4.84)	-3.92 (-6.15, -1.52)	18.88 (-207.67, 264.31)	-213.91 (-335.72, -83.19)
		4	-5.54 (-10.04, -1.04)	-4.85 (-7.08, -2.45)	-302.06 (-547.49, -56.64)	-264.42 (-386.23, -133.70)
		5	-12.80 (-17.65, -7.96)	-5.88 (-8.17, -3.43)	-698.52 (-962.83, -434.22)	-320.87 (-445.65, -187.17)
		6	-18.69 (-23.53, -3.50)	-4.79 (-7.13, -2.40)	-1019.47 (-1283.77, -36.28)	-261.45 (-389.20, -130.72)
	Ozone	0	-0.69 (-4.50, 3.11)	**1.69 (0.11, 3.27)**	-37.76 (-245.43, 169.91)	**92.10 (5.94, 178.26)**
		1	3.81 (0.00, 7.61)	**2.78 (1.20, 4.41)**	207.67 (0.00,415.34)	**151.52 (65.36, 240.65)**
		2	**6.57 (2.77, 10.38)**	**2.56 (0.98, 4.14)**	**358.70 (151.03, 566.37)**	**139.64 (53.48, 225.80)**

Season	Pollutants	Lag[a]	Excess cases per 10,000 people (95% CI)		Total excess cases during study period	
			Asthma ED visits	Asthma hospitalization	Asthma ED visits	Asthma hospitalization
		3	**9.69 (5.88, 13.5)**	**2.61 (1.03, 4.25)**	**528.61 (320.94, 736.28)**	**142.61 (56.45, 231.74)**
		4	**14.53 (10.73, 18.34)**	**3.70 (2.01, 5.39)**	**792.92 (585.25, 1000.59)**	**202.03 (109.93, 294.13)**
		5	**13.15 (9.34, 17.30)**	**4.52 (2.83, 6.26)**	**717.40 (509.73, 943.95)**	**246.59 (154.49, 341.67)**
		6	**16.96 (12.80, 20.76)**	**3.16 (1.52, 4.79)**	**925.07 (698.52, 1132.74)**	**172.32 (83.19, 261.45)**

[a]Lag can be interpreted as the number of days after exposure. For example, lag 0 = risk on the day of exposure, lag 1 = risk one day after exposure, etc.
Boldface font indicates statistical significance at $p<0.05$.
Abbreviations: ED, emergency department; $PM_{2.5}$, particulate matter <2.5 microns; CI, confidence intervals.
Cold season: Nov. – Apr., warm season: May-Oct.

2.4 SUMMARY

We found that exposures to $PM_{2.5}$ and ozone may play a role in the risk of needing emergency care or hospitalization due to asthma. We also observed that while $PM_{2.5}$ had strong impacts all year, the impacts of ozone are more pronounced in the warm season when its concentration is usually high. Given people living close to pollution sources such as truck routes, freeways, and major roads may be exposed to higher concentrations of $PM_{2.5}$ and ozone, efforts to reduce exposures should be strengthened, especially within these areas. If $PM_{2.5}$ and ozone exposures were to be reduced on average by 5-unit, a significant number of asthma ED visits and hospitalizations could be prevented.

We also found that residents living in the South Fresno AB 617 community boundaries may experience higher risk even at the same level of exposure, and that racial/ethnic minorities are particularly more impacted by air pollution, suggesting that efforts to reduce health impacts in the AB 617 area are prudent. Given differences in impacts across areas and across demographics such as race/ethnicity, we expect that the impacts of basin air pollution in the Fresno area may not be uniform for all residents, making efforts to reduce air pollution exposures among those who are more impacted even more critical.

The analyses in this chapter have important strengths. First, HCAi captures all medical encounters; therefore, our cases are representative of cases in the city of Fresno. Second, the case-crossover nature of our analysis ensures minimal confounding by other factors that could also drive the risk of asthma.

2.5 RECOMMENDATIONS

Based on our findings, we offer the following recommendations:

1. Continue and strengthen previously mentioned efforts to reduce $PM_{2.5}$ and ozone (through a 1,000 foot-buffer), especially during their peak seasons.
2. Such efforts should consider communities that are potentially more impacted by air pollution, including those living within the AB 617 area, and particularly communities of color.
3. We also recommend the use of zero-emission commercial trucks when possible to minimize population exposure

CHAPTER 3. AIR POLLUTION AND CARDIO-CEREBROVASCULAR DISEASE IN FRESNO, CALIFORNIA

3.1 BACKGROUND

Cardio-cerebrovascular disease (CCVD) is an overarching category of serious health outcomes encompassing various heart and brain conditions associated with vascular issues, including atherosclerosis, hypertension (high blood pressure), myocardial hypertrophy, and strokes.[65] CCVDs can manifest independently, but can coexist in varying degrees.[66] CCVDs pose significant public health concerns, marked by high morbidity, high disability rate, frequent recurrences, and elevated mortality rates.[66] Roughly one out of three adults in California, equating to more than 8 million individuals, live with some form of CCVD.[67] CCVD is the number one cause of death and disability in California.[68] In Fresno County, heart disease was ranked the number one leading cause of death among residents in 2021.[69]

Studies around the world consistently linked air pollution exposures to CCVD. Recent systematic reviews and meta-analyses have suggested that exposures to both $PM_{2.5}$ and ozone are associated with CCVD risks.[70-75] Despite the high pollution and high burden of CCVD in Fresno, no studies have evaluated these impacts in this region.

The purpose of this chapter is to evaluate the impacts of $PM_{2.5}$ and ozone exposures on the risks of going to the emergency room or being hospitalized due to CCVD in the city of Fresno. We further estimated

the number of excess cases due to air pollution, and explored whether certain subgroups of the population may be more impacted by air pollution.

3.2 METHODS

The approach for this study is similar to that described in Chapter 2.

3.2.1 DATA AND PARTCIPANTS

In this chapter, we examined data from the California Department of Health Care Access and Information (HCAi), including Emergency Department (ED) visits and Patient Discharge Data (PDD) between the years 2011 and 2020.[63] These are the latest available data. ED datasets consist of demographic, clinical, and facility information of all emergency department face-to-face encounters with a healthcare provider in California hospitals licensed to provide emergency medical services. Meanwhile, the PDD dataset consists of records for each inpatient discharge from any California-licensed hospital. Licensed hospitals can include general acute care, acute psychiatric care, chemical dependency recovery facilities, and psychiatric health facilities.

For this study, we only selected ED visits and hospitalizations from Fresno zip codes. We further restricted the datasets to ED visits and inpatient visits for those with the following cardio-cerebral vascular (CCVD) conditions as the primary diagnosis: acute myocardial infarction (stroke), heart failure, cardiac arrest, and cerebral infarction (stroke). We also note that, due to the lack of personally identifiable information, we cannot follow individuals longitudinally and we therefore have to treat each ED visit or hospitalization as an independent event. If someone visits the ED and ends up being admitted, the individual only shows up under the hospitalization data. In other words, no person would be counted twice for the same encounter.

3.2.2 EXPOSURE ASSESSMENT

We estimated daily exposures to $PM_{2.5}$ and ozone using an approach similar to that described in **Chapter 1, Section 1.2.2** and **Chapter 2 section 2.2.2.** Briefly, we obtained data for daily concentration of two common **air pollutants**, fine particulate matter less than 5 microns ($PM_{2.5}$, 24-hr. average $PM_{2.5}$) and ozone (maximum 8-hr. average), from the Air District. These daily concentrations were estimated by the Air District using a regression-based mathematical model with inputs from local air monitors and the Community Multilevel Air Quality (CMAQ) model output from the California Air Resources Board.[47,48] The data was estimated at the zip code level for spatiotemporal linkages to the health data. Participants were then spatiotemporally linked to daily air pollution data based on their residential zip code at the time of the event. We specifically focused on acute air pollution exposure and its effects within 7 days.

Due to the lack of residential addresses from HCAi datasets, we were unable to geocode participants for detailed spatial analyses more granular than the zip code (like those in Chapter 1).

3.2.3 OUTCOME ASSESSMENT

We utilized the 9th and 10th version of the International Classification of Disease codes with clinical modification (ICD-9-CM and ICD-10-CM) to identify cardio-cerebral vascular conditions (CCVD) ED visits and hospitalizations. The codes used to identify specific CCVD conditions are presented in **Table 3.1.**

Table 3.1. ICD codes to identify cardio-cerebral vascular diseases

CCVD conditions	ICD 9 CM	ICD 10 CM
Acute myocardial infarction (heart attack)	"410"	"I21", "I22"
Heart failure	"428"	"I50"
Cardiac arrest	"427"	"I46"
Cerebral infarction (stroke)	"430", "431", "432", "433", "434", "435"	"I60", "I61", "I62", "I63"

Abbreviations: ICD, International Classification of Disease codes; CM, clinical modification; CCVD, cardio cerebral vascular disease.

3.2.4 STATISTICAL ANALYSIS

To determine the impacts of air pollution on CCVD in Fresno, we employed the time-stratified case-crossover analysis to minimize confounding by factors that can also explain risks of asthma. A detailed description of this method is described in **Chapter 1** and **Chapter 2** above. Briefly, in this analysis, we only selected cases that were impacted by CCVD (any, or specific CCVD). We then compared exposures (i.e., $PM_{2.5}$ and ozone) during a hazard period shortly before the event to exposures during control periods during which the event did not happen. The hazard period was defined as the day of event (lag 0) and each of the six days before the event (lags 1-6). Control periods were selected using the time-stratified approach, where controls were selected as the same day of the week within the same month as the case period.[52] For example, if someone visited the ED or got hospitalized because of CCVD on Monday, March 12, 2018, then this will be the case period (lag 0). The control period will be selected as Mondays the 5th, the 19th, and the 26th of the same month of March **(Figure 1.2)**. This approach allows control for days of the week and month and minimizes time-trend bias. Since the comparisons were made for the same person, this approach allows complete control for non-time-varying confounders (or factors that could explain the observed associations). Conditional logistic regression models were used to estimate the risks of CCVD associated with a 5-unitincrease in air pollution exposures. We found meaningful seasonal differences and presented results by season. We additionally explored effects by AB 617 residence status and race/ethnicity.

We then calculated the access number of CCVD ED visits and hospitalizations due to pollution, also known as the attributable risk (AR), using the following formula:

$$AR = I_e - I_u$$

where I_u is the background rate of event in the population, and I_e is the incidence of events among those exposed to higher pollutants and is calculated as I_u times the odds ratio. I_u was calculated as the number of events in Fresno divided by the total population estimated by the 2020 census (n=545,567).[64]

All analyses were completed in ArcGIS Pro (Redlands, CA), SAS 9.2 (Cary, NC) and Microsoft Excel (Redmond, WA).

3.3 RESULTS

3.3.1 DESCRIPTIVE STATISTICS

Table 3.2 describes the characteristics of our study participants. The analyses include 12,843 CCVD ED visits and 40,607 hospitalizations. The majority of CCVD ED visits (~50%) are due to cardiac arrest. ED patients were mostly older, male, non-Hispanic Whites, spoke English, or had private insurance as the principal source of payment. Most patients who ended up being hospitalized were admitted for stroke (37%). Most of them were also older, male, non-Hispanic White, spoke English, or had Medicare as principal source of payment.

Table 3.2. Characteristics of emergency department visits and hospitalizations related to cardiovascular diseases in Fresno, 2011-2020

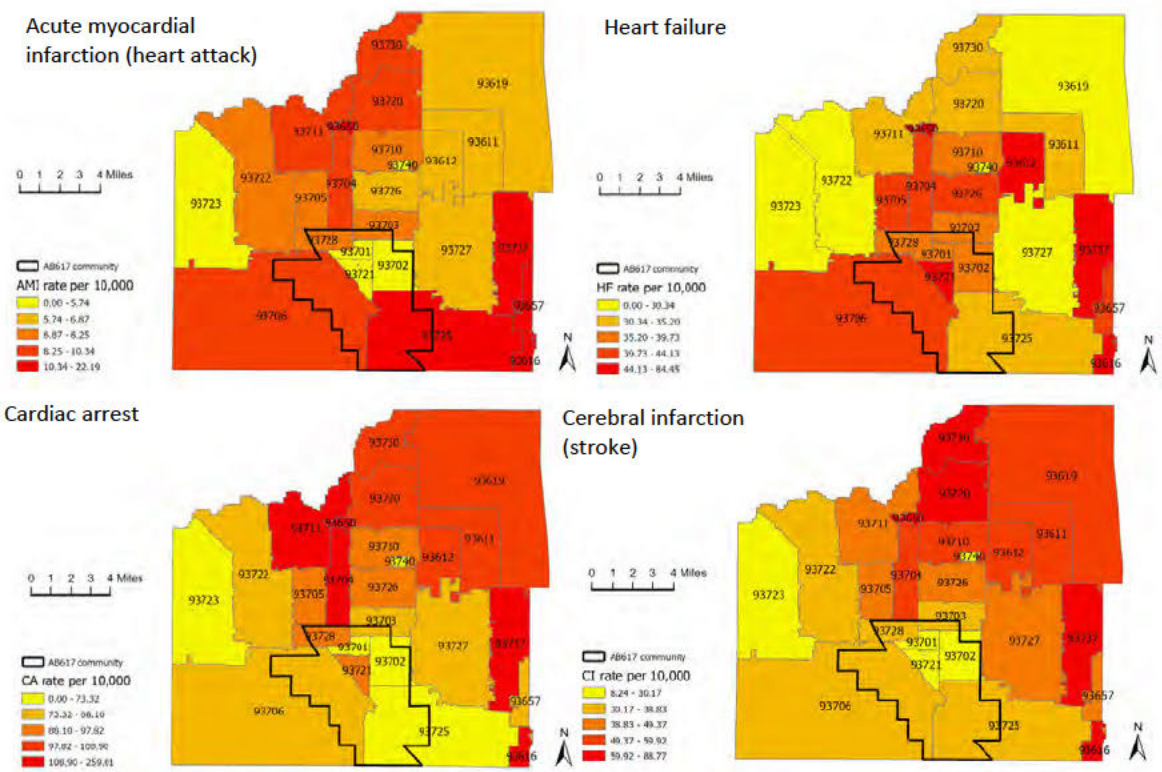
Characteristics	ED visits n= 12842(%)	Hospitalization n= 40607 (%)
CCVD conditions		
Acute myocardial infarction (heart attack)	606 (4.7)	10129 (24.9)
Heart failure	2600 (20.3)	10372 (25.5)
Cardiac arrest	6427 (50.1)	5173 (12.7)
Cerebral infarction (stroke)	3209 (25.0)	14933 (36.7)
Age categories		
0-4	124 (1.0)	67 (0.1)
5-17	151 (1.2)	104 (0.2)
18-64	5734 (44.7)	16231 (39.9)
65+	6833 (53.2)	24205 (59.6)
Sex		
Female	6140 (47.8)	19005 (46.8)
Male	6701 (52.2)	21602 (53.2)
Unknown	1 (0.0)	0 (0.0)
Race/ethnicity		
Non-Hispanic White	6242 (48.6)	18514 (45.5)
Non-Hispanic Black	683 (5.3)	3125 (7.7)
Hispanic	4979 (38.8)	9564 (23.5)
Asian/Pacific Islander	512 (3.9)	3036 (7.4)
American Indian/Alaskan Natives	41 (0.3)	121 (0.3)
Other	217 (1.6)	723 (1.7)
Unknown	168 (1.3)	5524 (13.6)
Principal language		
English	11697 (91.1)	34767 (85.6)
Spanish	752 (5.9)	3495 (8.6)
Other	393 (3.01)	2345 (5.7)
Expected source of payment		
Medicare	4070 (31.7)	24457 (60.2)
Medi-Cal	2404 (18.7)	8328 (20.5)
Private	5167 (40.2)	5635 (13.8)
Self-pay	774 (6.0)	892 (2.2)
Other	427 (3.3)	1294 (3.1)
Unknown	-	1 (0.0)
Season of service		

Characteristics	ED visits n= 12842(%)	Hospitalization n= 40607 (%)
Warm (May – October)	6455 (49.7)	19638 (48.3)
Cold (November – April)	6387 (50.3)	20969 (51.6)
Year of service		
2011	1585 (12.3)	5529 (13.6)
2012	1620 (12.6)	5516 (13.6)
2013	1789 (13.9)	5522 (13.6)
2014	1812 (14.1)	5327 (13.1)
2015	1564 (12.2)	4007 (9.9)
2016	1003 (7.8)	3875 (9.5)
2017	893 (7.0)	2823 (7.0)
2018	957 (7.5)	2804 (6.9)
2019	794 (6.2)	2741 (6.8)
2020	825 (6.4)	2404 (5.9)

Abbreviations: ED, emergency department; CCVD, cardio cerebral vascular disease.

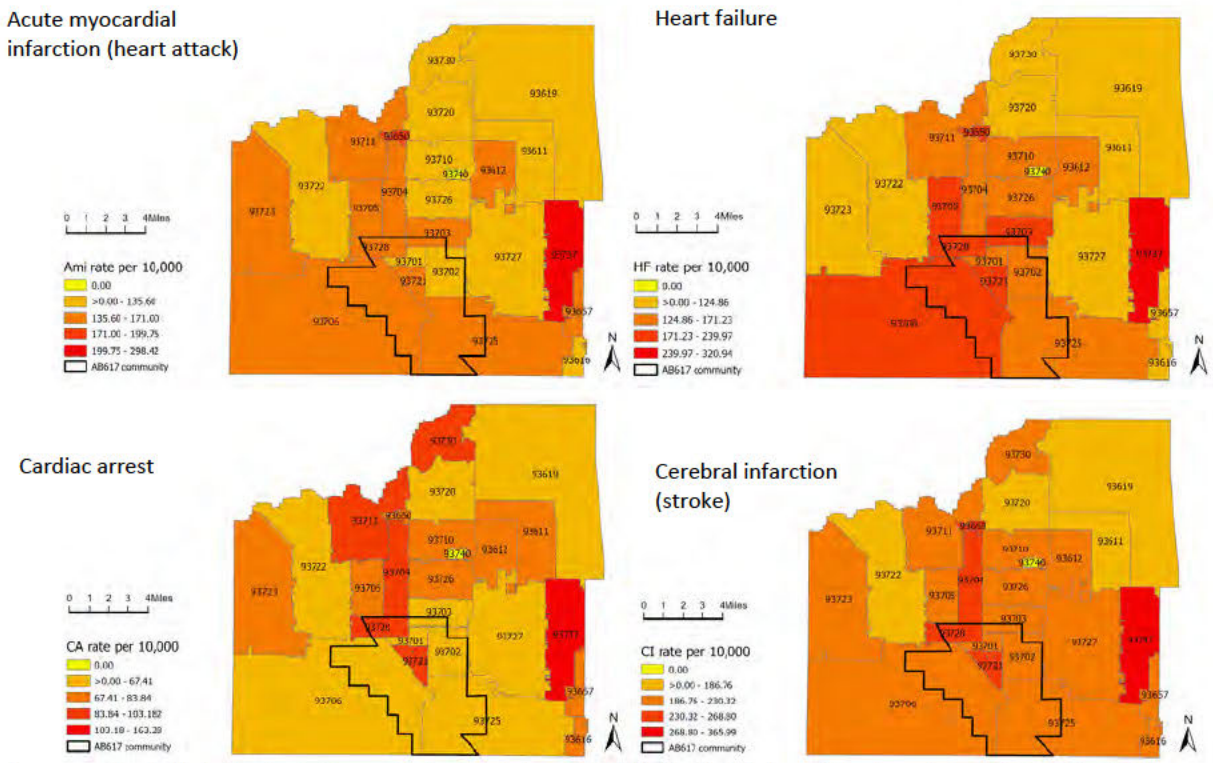
ED visits and hospitalization rates for CCVD ED visits varied by zip code. While rates of cardiac arrest and stroke appeared more pronounced in the northeastern part of the city, rates of heart attack and heart failure were more varied. CCVD hospitalizations appeared generally higher in the central and southwestern region of the city, but rates were also sporadically higher in certain zip codes for reasons we do not have data to investigate.

Figure 3.1. Distribution of CCVD ED visits by zip codes



Rates were estimated by taking the total cases during the study period divided by the total population in each zip code from the 2020 census.
Abbreviations: ED, emergency department; CCVD, cardio cerebral vascular disease.

Figure 3.2. Distribution of CCVD hospitalizations by zip codes



Rates were estimated by taking the total cases during the study period divided by the total population in each zip code from the 2020 census.
Abbreviations: CCVD, cardio cerebral vascular disease.

When rates were calculated separately for zip codes within and outside the AB 617 community boundaries, a few conditions were, on average, slightly higher within the boundaries (Table 3.3).

Table 3.3. Rates of CCVD within and outside of the Fresno AB 617 community boundaries

		Rates per 10,000 population	
		Within boundaries	Outside boundaries
ED visits	Acute myocardial infarction (heart attack)	7.60	9.74
	Heart failure	39.86	37.46
	Cardiac arrest	78.70	102.47
	Cerebral infarction (stroke)	30.32	52.88
Hospitalizations	Acute myocardial infarction (heart attack)	146.88	141.81
	Heart failure	183.95	135.26
	Cardiac arrest	68.97	77.54
	Cerebral infarction (stroke)	227.65	205.33

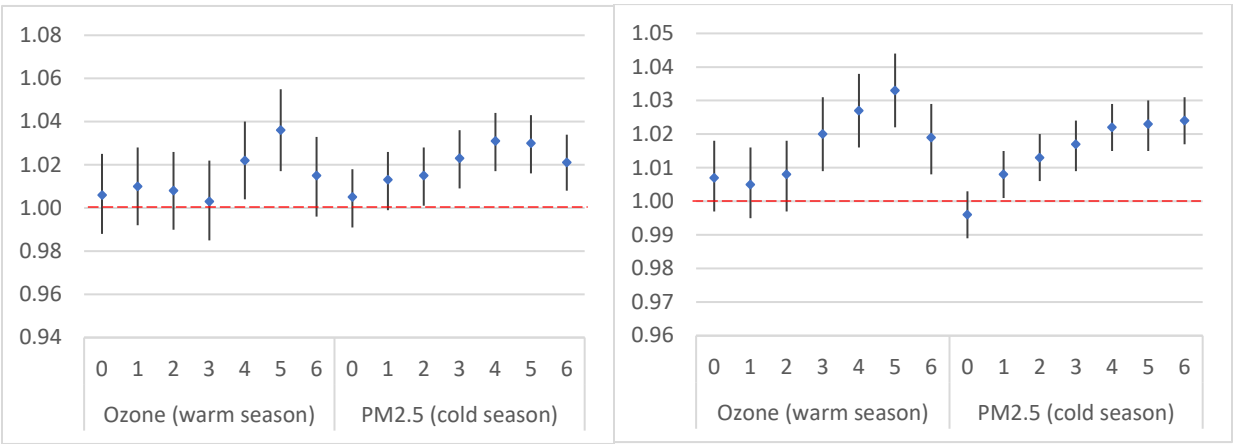
Abbreviations: ED, emergency department.

3.3.2 EFFECTS OF AIR POLLUTION ON CARDIO-CEREBRAL VASCULAR EVENTS

Exposures to $PM_{2.5}$ and ozone were both positively associated with CCVD events, but these associations varied by season, where the detrimental effects of $PM_{2.5}$ and ozone were only observed in the cold and warm season, respectively (**Figure 3.2, Table 3.4**). Each 5-unit increase in ozone was associated with a 2-4% increased risk of CCVD events within 4-6 days. $PM_{2.5}$ was linked to increased incidents of CCVD as soon as one day after exposure and the risks increased over the next few days.

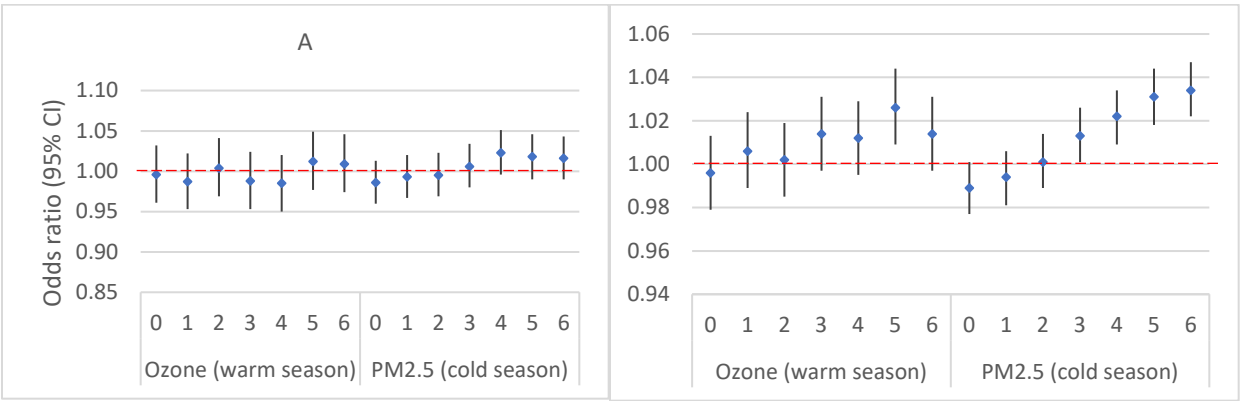
The associations remained consistent when we separated the analyses for specific CCVD types, including stroke (**Figure 3.3**), heart attack (**Figure 3.4**), cardiac arrest (**Figure 3.5**), and heart failure (**Figure 3.6**).

Figure 3.3. Associations between air pollution and ED visits (A) and hospitalizations (B) for all cardio-cerebral vascular events



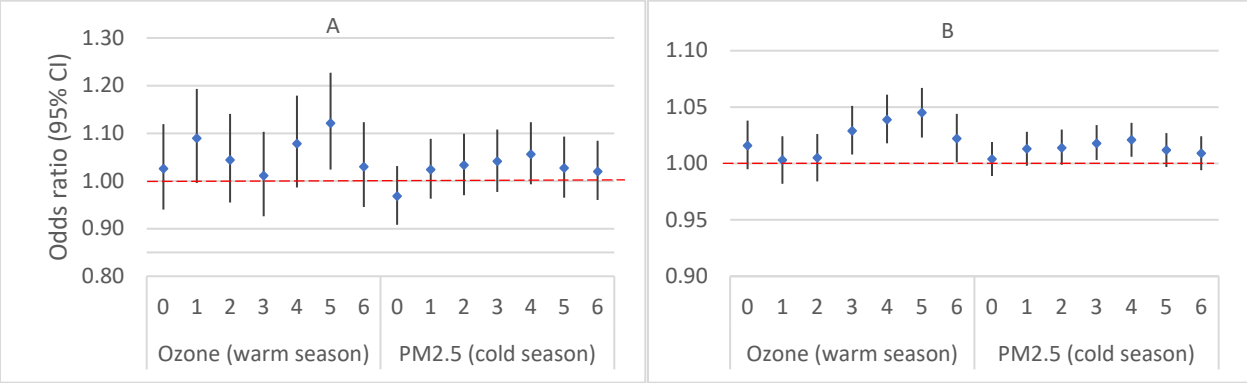
Models adjusted for temperature, humidity, and co-pollutants. Time-unvarying factors were controlled by study design. Estimates were obtained for each 5-unit increase in pollutants. Cold season: Nov. – Apr., warm season: May-Oct. Numbers on x-axis represent lags, which can be interpreted as the number of days after exposure. For example, lag 0 = risk on the day of exposure, lag 1 = risk one day after exposure, etc. Abbreviations: ED, emergency department; $PM_{2.5}$, particulate matter <2.5 microns.

Figure 3.4. Associations between air pollution and ED visits (A) and hospitalizations (B) for stroke



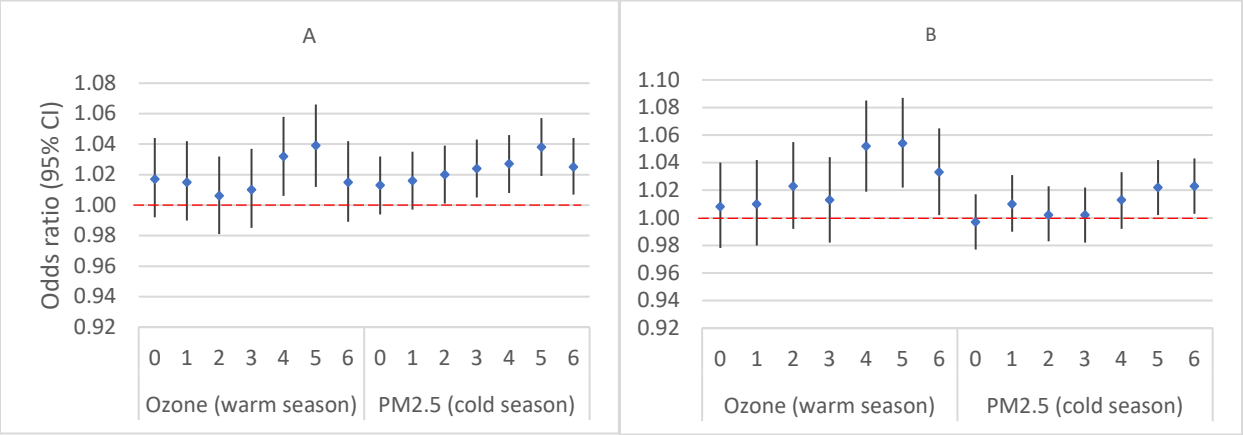
Models adjusted for temperature, humidity, and co-pollutants. Time-unvarying factors were controlled by study design. Estimates were obtained for each 5-unit increase in pollutants. Cold season: Nov. – Apr., warm season: May-Oct. Numbers on x-axis represent lags, which can be interpreted as the number of days after exposure. For example, lag 0 = risk on the day of exposure, lag 1 = risk one day after exposure, etc. Abbreviations: ED, emergency department; $PM_{2.5}$, particulate matter <2.5 microns.

Figure 3.5. Associations between air pollution and ED visits (A) and hospitalizations (B) for acute myocardial infarction (heart attack)



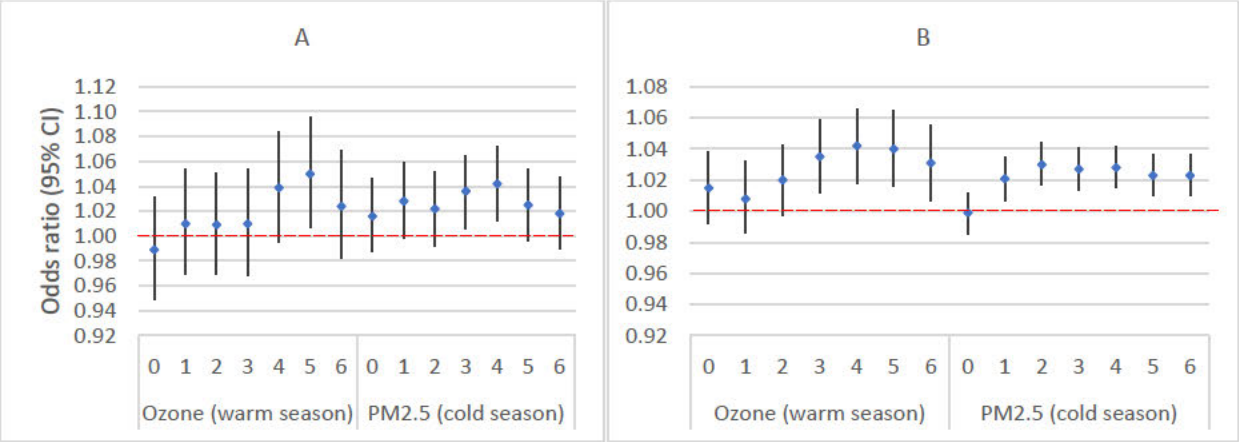
Models adjusted for temperature, humidity, and co-pollutants. Time-unvarying factors were controlled by study design. Estimates were obtained for each 5-unit increase in pollutants. Cold season: Nov. – Apr., warm season: May-Oct. Numbers on x-axis represent lags, which can be interpreted as the number of days after exposure. For example, lag 0 = risk on the day of exposure, lag 1 = risk one day after exposure, etc. Abbreviations: ED, emergency department; $PM_{2.5}$, particulate matter <2.5 microns.

Figure 3.6. Associations between air pollution and ED visits (A) and hospitalizations (B) for cardiac arrest



Models adjusted for temperature, humidity, and co-pollutants. Time-unvarying factors were controlled by study design. Estimates were obtained for each 5-unit increase in pollutants. Cold season: Nov. – Apr., warm season: May-Oct. Numbers on x-axis represent lags, which can be interpreted as the number of days after exposure. For example, lag 0 = risk on the day of exposure, lag 1 = risk one day after exposure, etc. Abbreviations: ED, emergency department; $PM_{2.5}$, particulate matter <2.5 microns.

Figure 3.7. Associations between air pollution and ED visit (A) and hospitalization (B) for heart failure



Models adjusted for temperature, humidity, and co-pollutants. Time-unvarying factors were controlled by study design. Estimates were obtained for each 5-unit increase in pollutants. Cold season: Nov. – Apr., warm season: May-Oct. Numbers on x-axis represent lags, which can be interpreted as the number of days after exposure. For example, lag 0 = risk on the day of exposure, lag 1 = risk one day after exposure, etc. Abbreviations: ED, emergency department; $PM_{2.5}$, particulate matter <2.5 microns.

Table 3.4. Associations between pollution and cardio-cerebral vascular ED visits and hospitalizations

		OR (95% CI)				
	Lag	Any CCVD	Stroke	Heart attack	Cardiac arrest	Heart failure
ED visits						
Ozone (warm season, May-Oct.)	0	1.01 (0.99,1.03)	1.00 (0.96,1.03)	1.03 (0.94,1.12)	1.02 (0.99,1.04)	0.99 (0.95,1.03)
	1	1.01 (0.99,1.03)	0.99 (0.95,1.02)	**1.09 (1.00,1.19)**	1.02 (0.99,1.04)	1.01 (0.97,1.05)
	2	1.01 (0.99,1.03)	1.00 (0.97,1.04)	1.04 (0.96,1.14)	1.01 (0.98,1.03)	1.01 (0.97,1.05)
	3	1.00 (0.99,1.02)	0.99 (0.95,1.02)	1.01 (0.93,1.10)	1.01 (0.99,1.04)	1.01 (0.97,1.05)
	4	**1.02 (1.00,1.04)**	0.99 (0.95,1.02)	1.08 (0.99,1.18)	**1.03 (1.01,1.06)**	1.04 (1.00,1.08)
	5	**1.04 (1.02,1.06)**	1.01 (0.98,1.05)	**1.12 (1.02,1.23)**	**1.04 (1.01,1.07)**	**1.05 (1.01,1.10)**
	6	**1.02 (1.00,1.03)**	1.01 (0.97,1.05)	1.03 (0.95,1.12)	1.02 (0.99,1.04)	1.02 (0.98,1.07)
$PM_{2.5}$ (cold season, Nov.-Apr.)	0	1.01 (0.99,1.02)	0.99 (0.96,1.01)	0.97 (0.91,1.03)	1.01 (0.99,1.03)	1.02 (0.99,1.05)
	1	1.01 (1.00,1.03)	0.99 (0.97,1.02)	1.02 (0.96,1.09)	1.02 (1.00,1.04)	1.03 (1.00,1.06)
	2	1.02 (1.00,1.03)	1.00 (0.97,1.02)	1.03 (0.97,1.10)	1.02 (1.00,1.04)	1.02 (0.99,1.05)
	3	**1.02 (1.01,1.04)**	1.01 (0.98,1.03)	1.04 (0.98,1.11)	**1.02 (1.01,1.04)**	**1.04 (1.01,1.07)**
	4	**1.03 (1.02,1.04)**	**1.02 (1.00,1.05)**	1.06 (0.99,1.12)	**1.03 (1.01,1.05)**	**1.04 (1.01,1.07)**
	5	**1.03 (1.02,1.04)**	1.02 (0.99,1.05)	1.03 (0.97,1.09)	**1.04 (1.02,1.06)**	1.03 (1.00,1.05)
	6	**1.02 (1.01,1.03)**	1.02 (0.99,1.04)	1.02 (0.96,1.08)	**1.03 (1.01,1.04)**	1.02 (0.99,1.05)
Hospitalization						
Ozone (warm season, May – Oct.)	0	1.01 (1.00,1.02)	1.00 (0.98,1.01)	1.02 (.001,1.04)	1.01 (0.98,1.04)	1.02 (0.99,1.04)
	1	1.01 (1.00,1.02)	1.01 (0.99,1.02)	1.00 (0.98,1.02)	1.01 (0.98,1.04)	1.01 (0.99,1.03)
	2	1.01 (1.00,1.02)	1.00 (0.99,1.02)	1.01 (0.98,1.03)	1.02 (0.99,1.06)	1.02 (1.00,1.04)
	3	**1.02 (1.01,1.03)**	1.01 (1.00,1.03)	**1.03 (1.01,1.05)**	1.01 (0.98,1.04)	**1.04 (1.01,1.06)**
	4	**1.03 (1.02,1.04)**	1.01 (1.00,1.03)	**1.04 (1.02,1.06)**	**1.05 (1.02,1.09)**	**1.04 (1.02,1.07)**
	5	**1.03 (1.02,1.04)**	**1.03 (1.01,1.04)**	**1.05 (1.02,1.07)**	**1.05 (1.02,1.09)**	**1.04 (1.02,1.07)**
	6	**1.02 (1.01,1.03)**	1.01 (1.00,1.03)	**1.02 (1.00,1.04)**	**1.03 (1.00,1.07)**	**1.03 (1.01,1.06)**
$PM_{2.5}$ (cold season, Nov.-Apr.)	0	1.00 (0.99,1.00)	0.99 (0.98,1.00)	1.00 (0.99,1.02)	1.00 (0.98,1.02)	1.00 (0.99,1.01)
	1	1.01 (1.00,1.02)	0.99 (0.98,1.01)	1.01 (1.00,1.03)	1.01 (0.99,1.03)	**1.02 (1.01,1.04)**
	2	**1.01 (1.01,1.02)**	1.00 (0.99,1.01)	1.01 (1.00,1.03)	1.00 (0.98,1.02)	**1.03 (1.02,1.04)**
	3	**1.02 (1.01,1.02)**	1.01 (1.00,1.03)	1.02 (1.00,1.03)	1.00 (0.98,1.02)	**1.03 (1.01,1.04)**
	4	**1.02 (1.02,1.03)**	**1.02 (1.01,1.03)**	**1.02 (1.01,1.04)**	1.01 (0.99,1.03)	**1.03 (1.02,1.04)**
	5	**1.02 (1.02,1.03)**	**1.03 (1.02,1.04)**	1.01 (1.00,1.03)	**1.02 (1.00,1.04)**	**1.02 (1.01,1.04)**
	6	**1.02 (1.02,1.03)**	**1.03 (1.02,1.05)**	1.01 (0.99,1.02)	**1.02 (1.00,1.04)**	**1.02 (1.01,1.04)**

Models adjusted for temperature, humidity, and co-pollutants. Time-unvarying factors were controlled by study design. Estimates were obtained for each 5-unit increase in pollutants. Cold season: Nov. – Apr., warm season: May-Oct. Numbers on x-axis represent lags, which can be interpreted as the number of days after exposure. For example, lag 0 = risk on the day of exposure, lag 1 = risk one day after exposure, etc.
Abbreviations: ED, emergency department; $PM_{2.5}$, particulate matter <2.5 microns; CCVD, cardio cerebral vascular disease; OR, odds ration; CI, confidence intervals.
Boldface font indicates statistical significance at p<0.05

When analyzed separately for Fresno residents within and outside of the South Fresno AB 617 community boundaries, we observed that the effects of air pollution on CCVD were more consistent, stronger, and more immediate among those who lived within the boundaries (**Table 3.5**).

Table 3.5. Associations between air pollution and cardio-cerebral vascular diseases within and outside the South Fresno community boundaries

Season	Pollutants	Lag[b]	OR (95% CI)[a]			
			ED visits		Hospitalization	
			Within AB 617 boundaries	Outside AB 617 boundaries	Within AB 617 boundaries	Outside AB 617 boundaries
	$PM_{2.5}$	0	**1.03 (1.00,1.07)**	0.99 (0.98,1.01)	**1.02 (1.00,1.03)**	1.00 (0.99,1.01)
Cold (Nov.-Apr.)		1	**1.04 (1.01,1.07)**	1.00 (0.99,1.02)	**1.02 (1.01,1.04)**	1.01 (1.00,1.02)
		2	**1.04 (1.01,1.07)**	1.01 (0.99,1.02)	**1.02 (1.00,1.03)**	1.01 (1.00,1.02)
		3	**1.04 (1.00,1.07)**	**1.02 (1.00,1.03)**	**1.03 (1.01,1.04)**	**1.01 (1.00,1.02)**
		4	**1.03 (1.00,1.06)**	**1.02 (1.01,1.04)**	1.00 (0.98,1.03)	**1.02 (1.01,1.03)**
		5	0.97 (0.93,1.02)	**1.02 (1.01,1.04)**	1.00 (0.98,1.02)	**1.02 (1.01,1.03)**
		6	1.01 (0.97,1.06)	**1.02 (1.00,1.03)**	1.01 (0.99,1.03)	**1.02 (1.01,1.03)**
Warm (May-Oct.)	Ozone	0	1.04 (1.00,1.08)	1.01 (0.99,1.03)	1.01 (0.99,1.03)	1.01 (1.00,1.02)
		1	1.03 (0.99,1.07)	1.00 (0.98,1.02)	1.00 (0.98,1.02)	1.00 (0.99,1.02)
		2	1.03 (0.99,1.07)	1.00 (0.98,1.01)	**1.02 (1.00,1.05)**	0.99 (0.98,1.00)
		3	1.02 (0.98,1.06)	1.00 (0.98,1.02)	1.00 (0.98,1.03)	1.00 (0.99,1.02)
		4	1.02 (0.98,1.06)	1.00 (0.99,1.02)	**1.02 (1.00,1.03)**	1.02 (1.00,1.03)
		5	**1.03 (1.00,1.07)**	1.01 (0.99,1.03)	**1.02 (1.01,1.04)**	1.01 (1.00,1.02)
		6	**1.04 (1.01,1.07)**	1.00 (0.98,1.02)	**1.02 (1.00,1.03)**	1.01 (1.00,1.02)

[a]Models adjusted for temperature, humidity, and co-pollutants. Time-unvarying factors were controlled by study design. Estimates were obtained for each 5-unit increase in pollutant. [b]Lags can be interpreted as the number of days after exposure. For example, lag 0 = risk on the day of exposure, lag 1 = risk one day after exposure, etc.
Abbreviations: ED, emergency department; $PM_{2.5}$, particulate matter <2.5 microns; OR, odds ration; CI, confidence intervals. Boldface font indicates statistical significance at p<0.05

In further stratified analyses, we observed that while air pollution increased the risk of having a CCVD event, these effects varied by race/ethnicity. We observed that the associations were more apparent among non-Hispanic Black and Hispanic persons (**Table 3.6**, **Table 3.7**). For example, while we observed no association between air pollution and CCVD events among White residents, ozone effects on ED visits were pronounced among Black resident in the warm season, and $PM_{2.5}$ effects were significant among Hispanics in the cold season (**Table 3.6**). We also observed the highest risk estimates among American Indian/Alaskan Native residents, although these effect estimates had wider confidence intervals due to small sample size.

Table 3.6. Associations between air pollution and cardio-cerebral vascular ED visits by race/ethnicity

		OR (95% CI)[a]					
Pollutants	**Lag[b]**	**Non-Hispanic White**	**Non-Hispanic Black**	**Hispanic**	**Asian/Pacific Islander**	**American Indian/Alaskan Native**	**Other**
Cold season $PM_{2.5}$	**0**	0.99 (0.97,1.01)	1.00 (0.93,1.07)	1.00 (0.98,1.03)	1.03 (0.95,1.11)	0.78 (0.34,1.80)	0.94 (0.83,1.07)
	1	1.00 (0.98,1.02)	1.00 (0.94,1.06)	1.01 (0.99,1.03)	1.04 (0.98,1.11)	1.18 (0.82,1.68)	0.94 (0.83,1.06)
	2	1.01 (0.99,1.03)	1.02 (0.95,1.08)	1.01 (0.99,1.04)	1.01 (0.95,1.08)	1.28 (0.82,1.98)	1.02 (0.90,1.15)
	3	1.01 (0.99,1.03)	1.00 (0.95,1.06)	**1.03 (1.01,1.05)**	1.03 (0.96,1.10)	1.43 (0.88,2.32)	1.07 (0.96,1.20)
	4	1.02 (1.00,1.04)	1.01 (0.95,1.07)	**1.03 (1.00,1.05)**	1.05 (0.98,1.12)	1.19 (0.86,1.66)	1.07 (0.96,1.20)
	5	1.02 (1.00,1.04)	0.99 (0.93,1.05)	**1.03 (1.01,1.06)**	1.04 (0.97,1.11)	1.44 (0.85,2.46)	1.07 (0.95,1.19)
	6	1.01 (0.99,1.03)	0.99 (0.93,1.05)	**1.04 (1.02,1.06)**	1.00 (0.94,1.07)	0.89 (0.57,1.38)	1.06 (0.95,1.18)
Warm season ozone	**0**	1.00 (0.97,1.02)	1.05 (0.97,1.13)	0.99 (0.96,1.02)	1.05 (0.96,1.15)	0.91 (0.68,1.22)	1.07 (0.89,1.28)
	1	1.01 (0.98,1.03)	1.06 (0.99,1.14)	1.00 (0.97,1.02)	1.03 (0.95,1.12)	0.85 (0.62,1.16)	1.04 (0.89,1.23)
	2	1.02 (0.99,1.05)	1.00 (0.93,1.08)	0.98 (0.96,1.01)	1.02 (0.95,1.10)	0.97 (0.70,1.34)	1.05 (0.88,1.26)
	3	1.00 (0.97,1.02)	1.01 (0.94,1.08)	1.00 (0.97,1.03)	1.03 (0.95,1.11)	0.86 (0.61,1.22)	1.17 (0.98,1.40)
	4	1.00 (0.97,1.02)	1.06 (0.98,1.14)	1.01 (0.98,1.04)	1.04 (0.97,1.13)	0.80 (0.59,1.07)	1.05 (0.90,1.24)
	5	1.00 (0.98,1.03)	**1.08 (1.01,1.16)**	1.01 (0.98,1.04)	0.96 (0.89,1.03)	1.19 (0.86,1.64)	1.03 (0.88,1.20)
	6	1.00 (0.98,1.03)	**1.10 (1.03,1.18)**	1.00 (0.97,1.03)	0.96 (0.89,1.03)	1.19 (0.85,1.67)	0.89 (0.75,1.06)

[a]Models adjusted for temperature, humidity, and co-pollutants. Time-unvarying factors were controlled by study design. Estimates were obtained for each 5-unit increase in pollutants. Cold season: Nov. – Apr., warm season: May-Oct.
[b]Lag can be interpreted as the number of days after exposure. For example, lag 0 = risk on the day of exposure, lag 1 = risk one day after exposure, etc. Abbreviations: $PM_{2.5}$, particulate matter <2.5 microns; OR, odds ration; CI, confidence intervals. Boldface indicate statistical significance at $p<0.05$.

Findings on the association between air pollution and CCVD hospitalizations are presented in **Table 3.7**. We observed stronger and more consistent associations among Asian/Pacific Islanders.

Table 3.7. Associations between air pollution and cardio-cerebral vascular disease hospitalizations by race/ethnicity

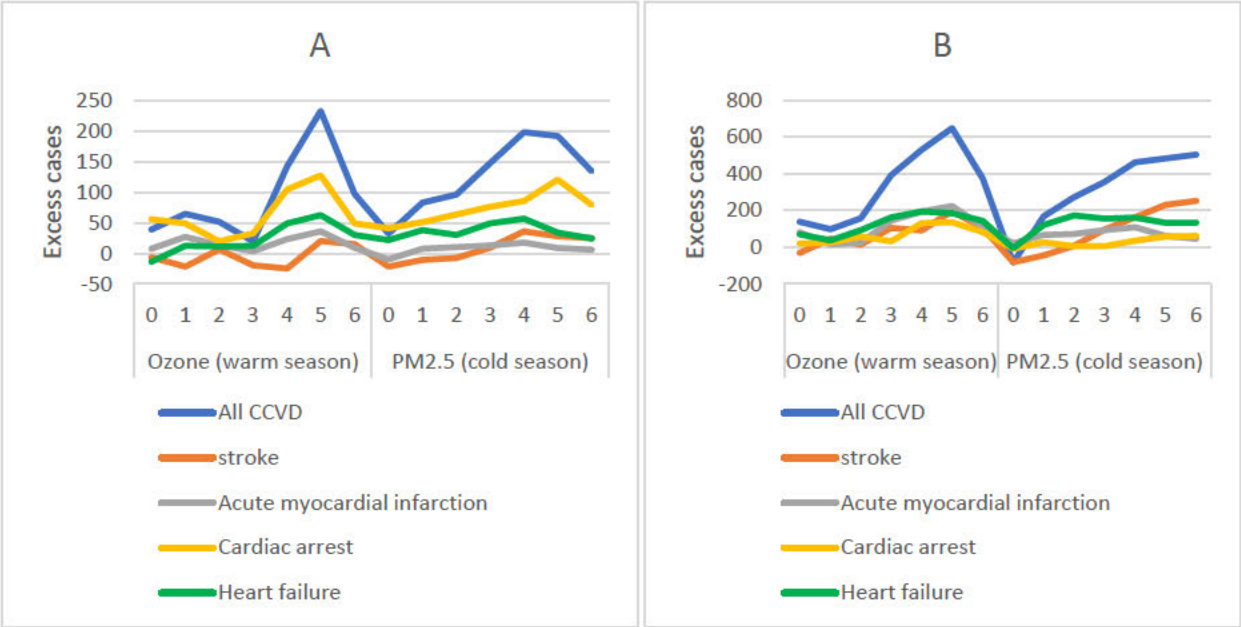
		OR (95% CI)[a]					
Pollutants	**Lag[b]**	**Non-Hispanic White**	**Non-Hispanic Black**	**Hispanic**	**Asian/PI**	**American Indian/Alaskan Native**	**Other**
Cold season $PM_{2.5}$	**0**	1.00 (0.99,1.01)	1.02 (0.98,1.05)	1.00 (0.98,1.01)	1.00 (0.97,1.03)	0.91 (0.78,1.08)	1.00 (0.94,1.07)
	1	1.01 (0.99,1.02)	1.01 (0.98,1.04)	1.00 (0.99,1.02)	1.01 (0.99,1.04)	1.03 (0.90,1.17)	0.98 (0.92,1.03)
	2	1.01 (0.99,1.02)	1.02 (0.98,1.05)	1.01 (0.99,1.03)	**1.03 (1.00,1.05)**	0.96 (0.84,1.10)	0.99 (0.94,1.05)
	3	1.01 (1.00,1.02)	1.00 (0.97,1.03)	**1.02 (1.00,1.04)**	**1.04 (1.01,1.06)**	0.95 (0.83,1.09)	1.03 (0.98,1.09)
	4	**1.02 (.001,1.03)**	1.00 (0.96,1.03)	1.02 (1.00,1.03)	**1.06 (1.04,1.09)**	0.96 (0.84,1.09)	1.04 (0.98,1.10)
	5	1.01 (1.00,1.03)	1.01 (0.98,1.05)	1.02 (1.00,1.03)	**1.05 (1.03,1.08)**	0.94 (0.83,1.07)	1.01 (0.95,1.06)
	6	**1.01 (1.00,1.02)**	0.98 (0.95,1.02)	**1.02 (1.00,1.04)**	**1.05 (1.03,1.08)**	1.01 (0.90,1.14)	0.99 (0.94,1.05)
Warm season ozone	**0**	1.01 (0.99,1.03)	1.04 (0.99,1.09)	0.99 (0.97,1.01)	0.99 (0.96,1.03)	0.91 (0.73,1.13)	0.97 (0.88,1.06)
	1	0.99 (0.98,1.01)	1.01 (0.97,1.05)	0.99 (0.97,1.01)	1.00 (0.97,1.04)	1.00 (0.81,1.22)	1.07 (0.99,1.15)
	2	0.99 (0.97,1.00)	1.00 (0.96,1.04)	1.00 (0.98,1.02)	0.97 (0.94,1.01)	0.98 (0.80,1.20)	1.04 (0.97,1.12)
	3	1.00 (0.99,1.02)	1.00 (0.96,1.04)	1.01 (0.99,1.03)	1.00 (0.97,1.04)	0.99 (0.81,1.21)	1.05 (0.98,1.14)
	4	1.00 (0.99,1.02)	0.98 (0.94,1.02)	1.01 (0.99,1.04)	1.03 (0.99,1.06)	1.08 (0.87,1.33)	1.08 (1.00,1.16)
	5	1.00 (0.99,1.02)	0.97 (0.93,1.01)	**1.05 (1.03,1.07)**	1.00 (0.97,1.04)	0.96 (0.79,1.16)	1.02 (0.94,1.10)
	6	1.01 (0.99,1.02)	1.00 (0.96,1.04)	1.02 (0.99,1.04)	0.99 (0.96,1.02)	0.84 (0.69,1.01)	1.00 (0.93,1.08)

[a]Models adjusted for temperature, humidity, and co-pollutants. Time-unvarying factors were controlled by study design. Estimates were obtained for each 5-unit increase in pollutants. Cold season: Nov. – Apr., warm season: May-Oct.
[b]Lag can be interpreted as the number of days after exposure. For example, lag 0 = risk on the day of exposure, lag 1 = risk one day after exposure, etc. Abbreviations: $PM_{2.5}$, particulate matter <2.5 microns; OR, odds ration; CI, confidence intervals. Boldface font indicates statistical significance at $p<0.05$.

3.3.3 EXCESS CARDIO-CEREBRAL VASCULAR EVENTS ASSOCIATED WITH AIR POLLUTION.

During the study period, each additional 5-unit increase in ozone resulted in up to 232 cases of ED visits and almost 600 hospitalizations due to CCVD (Figure 3.8, Table 3.8). Similarly, $PM_{2.5}$ exposures resulted in approximately 200 ED visits and more than 500 hospitalizations. Analyses by specific CCVD types showed a consistent pattern and are presented in Figure 3.8 and Table 3.8.

Figure 3.8. Excess number of ED visits (A) and hospitalizations (B) associated with air pollution in Fresno during the study period



Estimates are for each 5-unit decrease in air pollution. Numbers on x-axis represent lag, which can be interpreted as the number of days after exposure. For example, lag 0 = risk on the day of exposure, lag 1 = risk one day after exposure, etc.
Abbreviations: $PM_{2.5}$, particulate matter <2.5 microns; CCVD, cardio cerebral vascular disease.

Table 3.8. Excess CCVD cases associated with pollutants

Pollutants	Lag[a]	Excess cases per 10,000 people (95% CI) ED visits	Excess cases per 10,000 people (95% CI) Hospitalizations	Total excess cases during study period ED visits	Total excess cases during study period Hospitalizations
			Any CCVD		
Ozone	0	0.71 (-1.42, 2.96)	2.52 (-1.08, 6.48)	38.74 (-77.48, 161.42)	137.47 (-58.91, 353.48)
	1	1.18 (-0.95, 3.31)	1.80 (-1.80, 5.76)	64.57 (-51.66, 180.80)	98.19 (-98.19, 314.21)
	2	0.95 (-1.18, 3.08)	2.88 (-1.08, 6.48)	51.66 (-64.57, 167.88)	157.10 (-58.91, 353.48)
	3	0.36 (-1.78, 2.60)	7.20 (3.24, 11.16)	19.37 (-96.85, 142.05)	392.76 (176.74, 608.78)
	4	2.60 (0.47, 4.73)	9.72 (5.76, 13.68)	142.05 (25.83, 258.28)	530.23 (314.21, 746.24)
	5	4.26 (2.01, 6.51)	11.88 (7.92, 15.84)	232.45 (109.77, 355.14)	648.05 (432.04, 864.07)
	6	1.78 (-0.47, 3.91)	6.84 (2.88, 10.44)	96.85 (-25.83, 213.08)	373.12 (157.10, 569.50)
$PM_{2.5}$	0	0.59 (-1.05, 2.11)	-1.54 (-4.23, 1.15)	31.92 (-57.46, 114.93)	-83.88 (-230.66, 62.91)
	1	1.52 (-0.12, 3.04)	3.07 (0.38, 5.77)	83.00 (-6.38, 166.01)	167.75 (20.97, 314.53)
	2	1.76 (0.12, 3.28)	5.00 (2.31, 7.69)	95.77 (6.38, 178.78)	272.60 (125.81, 419.38)
	3	2.69 (1.05, 4.21)	6.53 (3.46, 9.22)	146.86 (57.46, 229.86)	356.47 (188.72, 503.26)
	4	3.63 (1.99, 5.15)	8.46 (5.77, 11.15)	197.93 (108.55, 280.94)	461.32 (314.53, 608.10)
	5	3.51 (1.87, 5.03)	8.84 (5.77, 11.53)	191.55 (102.16, 274.55)	482.29 (314.53, 629.07)
	6	2.46 (0.94, 3.98)	9.22 (6.53, 11.91)	134.09 (51.08, 217.09)	503.26 (356.47, 650.04)

Pollutants	Lag[a]	Excess cases per 10,000 people (95% CI) ED visits	Excess cases per 10,000 people (95% CI) Hospitalizations	Total excess cases during study period ED visits	Total excess cases during study period Hospitalizations
			Stroke		
Ozone	0	-0.12 (-1.18, 0.97)	-0.55 (-2.89, 1.79)	-6.61 (-64.47, 52.90)	-30.08 (-157.90, 97.75)
	1	-0.39 (-1.42, 0.67)	0.83 (-1.52, 3.31)	-21.49 (-77.69, 36.37)	45.11 (-82.71, 180.46)
	2	0.12 (-0.94, 1.24)	0.28 (-2.07, 2.62)	6.61 (-51.24, 67.77)	15.04 (-112.79, 142.86)
	3	-0.36 (-1.42, 0.73)	1.93 (-0.41, 4.27)	-19.84 (-77.69, 39.67)	105.27 (-22.56, 233.09)
	4	-0.45 (-1.51, 0.61)	1.65 (-0.69, 4.00)	-24.80 (-82.65, 33.06)	90.23 (-37.60, 218.05)
	5	0.36 (-0.70, 1.48)	3.58 (1.24, 6.06)	19.84 (-38.02, 81.00)	195.49 (67.67, 330.84)
	6	0.27 (-0.79, 1.39)	1.93 (-0.41, 4.27)	14.88 (-42.98, 76.04)	105.27 (-22.56, 233.09)
$PM_{2.5}$	0	-0.40 (-1.14, 0.37)	-1.49 (-3.13, 0.14)	-21.78 (-62.24, 20.23)	-81.55 (-170.52, 7.41)
	1	-0.20 (-0.94, 0.57)	-0.82 (-2.58, 0.82)	-10.89 (-51.35, 31.12)	-44.48 (-140.87, 44.48)
	2	-0.14 (-0.88, 0.66)	0.14 (-1.49, 1.90)	-7.78 (-48.24, 35.79)	7.41 (-81.55, 103.80)
	3	0.17 (-0.57, 0.97)	1.77 (0.14, 3.53)	9.34 (-31.12, 52.90)	96.38 (7.41, 192.76)
	4	0.66 (-0.11, 1.45)	2.99 (1.22, 4.62)	35.79 (-6.22, 79.36)	163.11 (66.73, 252.08)
	5	0.51 (-0.29, 1.31)	4.21 (2.45, 5.98)	28.01 (-15.56, 71.58)	229.83 (133.45, 326.22)
	6	0.46 (-0.29, 1.23)	4.62 (2.99, 6.39)	24.90 (-15.56, 66.91)	252.08 (163.11, 348.46)
			Acute myocardial infarction		
Ozone	0	0.14 (-0.33, 0.65)	1.46 (-0.46, 3.47)	7.70 (-17.76, 35.22)	79.78 (-24.93, 189.47)
	1	0.49 (-0.02, 1.05)	0.27 (-1.65, 2.19)	26.64 (-1.18, 57.13)	14.96 (-89.75, 119.66)
	2	0.24 (-0.24, 0.77)	0.46 (-1.46, 2.38)	13.02 (-13.32, 41.74)	24.93 (-79.78, 129.64)
	3	0.06 (-0.40, 0.56)	2.65 (0.73, 4.66)	3.26 (-21.90, 30.49)	144.59 (39.89, 254.29)
	4	0.42 (-0.08, 0.97)	3.56 (1.65, 5.57)	23.09 (-4.14, 52.98)	194.45 (89.75, 304.15)
	5	0.66 (0.13, 1.23)	4.11 (2.01, 6.12)	35.82 (7.10, 67.19)	224.37 (114.68, 334.06)
	6	0.16 (-0.30, 0.67)	2.01 (0.09, 4.02)	8.88 (-16.28, 36.41)	109.69 (4.99, 219.38)
$PM_{2.5}$	0	-0.18 (-0.52, 0.18)	0.38 (-1.04, 1.79)	-9.92 (-28.52, 9.61)	20.57 (-56.57, 97.72)
	1	0.14 (-0.21, 0.50)	1.23 (-0.19, 2.64)	7.44 (-11.47, 27.28)	66.86 (-10.29, 144.00)
	2	0.19 (-0.17, 0.56)	1.32 (-0.09, 2.83)	10.23 (-9.30, 30.69)	72.00 (-5.14, 154.29)
	3	0.23 (-0.13, 0.61)	1.70 (0.28, 3.21)	12.71 (-7.13, 33.48)	92.57 (15.43, 174.86)
	4	0.32 (-0.04, 0.70)	1.98 (0.57, 3.39)	17.36 (-2.17, 38.13)	108.00 (30.86, 185.15)
	5	0.15 (-0.20, 0.53)	1.13 (-0.28, 2.55)	8.37 (-10.85, 28.83)	61.72 (-15.43, 138.86)
	6	0.11 (-0.23, 0.48)	0.85 (-0.57, 2.26)	6.20 (-12.40, 26.04)	46.29 (-30.86, 123.43)
			Cardiac arrest		
Ozone	0	1.02 (-0.48, 2.63)	0.37 (-1.01, 1.84)	55.44 (-26.09, 143.48)	20.09 (-55.24, 100.44)
	1	0.90 (-0.60, 2.51)	0.46 (-0.92, 1.93)	48.91 (-32.61, 136.96)	25.11 (-50.22, 105.46)
	2	0.36 (-1.14, 1.91)	1.06 (-0.37, 2.53)	19.57 (-61.96, 104.35)	57.75 (-20.09, 138.11)
	3	0.60 (-0.90, 2.21)	0.60 (-0.83, 2.03)	32.61 (-48.92, 120.66)	32.64 (-45.20, 110.48)
	4	1.91 (0.36, 3.47)	2.39 (0.87, 3.91)	104.35 (19.57, 189.14)	130.57 (47.71, 213.44)
	5	2.33 (0.72, 3.94)	2.49 (1.01, 4.00)	127.18 (39.13, 215.23)	135.59 (55.24, 218.46)
	6	0.90 (-0.66, 2.51)	1.52 (0.09, 2.99)	48.91 (-35.87, 136.96)	82.86 (5.02, 163.22)
$PM_{2.5}$	0	0.75 (-0.35, 1.86)	-0.15 (-1.12, 0.83)	41.16 (-19.00, 101.31)	-7.99 (-61.23, 45.25)
	1	0.93 (-0.17, 2.03)	0.49 (-0.49, 1.51)	50.66 (-9.50, 110.81)	26.62 (-26.62, 82.52)
	2	1.16 (0.06, 2.26)	0.10 (-0.83, 1.12)	63.32 (3.17, 123.47)	5.32 (-45.25, 61.23)
	3	1.39 (0.29, 2.50)	0.10 (-0.88, 1.07)	75.98 (15.83, 136.14)	5.32 (-47.92, 58.56)
	4	1.57 (0.46, 2.67)	0.63 (-0.39, 1.61)	85.48 (25.33, 145.64)	34.61 (-21.30, 87.85)
	5	2.21 (1.10, 3.31)	1.07 (0.10, 2.05)	120.31 (60.15, 180.46)	58.56 (5.32, 111.80)
	6	1.45 (0.41, 2.55)	1.12 (0.15, 2.10)	79.15 (22.16, 139.30)	61.23 (7.99, 114.47)
			Heart failure		
Ozone	0	-0.25 (-1.17, 0.71)	1.27 (-0.68, 3.22)	-13.72 (-63.60, 38.66)	69.33 (-36.98, 175.64)
	1	0.23 (-0.71, 1.23)	0.68 (-1.19, 2.71)	12.47 (-38.66, 67.34)	36.98 (-64.71, 147.90)
	2	0.21 (-0.71, 1.17)	1.69 (-0.25, 3.64)	11.22 (-38.66, 63.60)	92.44 (-13.87, 198.75)
	3	0.23 (-0.73, 1.23)	2.97 (1.02, 5.00)	12.47 (-39.90, 67.34)	161.77 (55.46, 272.70)
	4	0.89 (-0.11, 1.92)	3.56 (1.52, 5.59)	48.63 (-6.23, 104.75)	194.12 (83.20, 305.05)
	5	1.14 (0.16, 2.19)	3.39 (1.36, 5.51)	62.35 (8.73, 119.71)	184.88 (73.95, 300.43)
	6	0.55 (-0.41, 1.58)	2.63 (0.59, 4.66)	29.93 (-22.45, 86.04)	143.28 (32.35, 254.21)
$PM_{2.5}$	0	0.40 (-0.32, 1.14)	-0.11 (-1.58, 1.26)	21.65 (-17.59, 62.24)	-5.75 (-86.25, 69.00)

Pollutants	Lag[a]	Excess cases per 10,000 people (95% CI) ED visits	Hospitalizations	Total excess cases during study period ED visits	Hospitalizations
	1	0.69 (-0.05, 1.46)	2.21 (0.74, 3.69)	37.88 (-2.71, 79.83)	120.75 (40.25, 201.25)
	2	0.55 (-0.20, 1.29)	3.16 (1.79, 4.64)	29.77 (-10.82, 70.36)	172.50 (97.75, 253.00)
	3	0.89 (0.15, 1.61)	2.85 (1.37, 4.32)	48.71 (8.12, 87.95)	155.25 (74.75, 235.75)
	4	1.04 (0.30, 1.79)	2.95 (1.58, 4.43)	56.83 (16.24, 97.42)	161.00 (86.25, 241.50)
	5	0.62 (-0.10, 1.34)	2.42 (1.05, 3.90)	33.82 (-5.41, 73.06)	132.25 (57.50, 212.75)
	6	0.45 (-0.25, 1.19)	2.42 (1.05, 3.90)	24.35 (-13.53, 64.94)	132.25 (57.50, 212.75)

[a]Lag can be interpreted as the number of days after exposure. For example, lag 0 = risk on the day of exposure, lag 1 = risk one
[a]Lag can be interpreted as the number of days after exposure. For example, lag 0 = risk on the day of exposure, lag 1 = risk one day after exposure, etc.
Estimates are for each 5-unit decrease in air pollution.
Abbreviations: $PM_{2.5}$, particulate matter <2.5 microns; CCVD, cardio cerebral vascular disease; ED, emergency department; OR, odds ratio; CI, confidence intervals.

3.4 SUMMARY

In our analyses of all ED visits and hospitalizations in Fresno between 2011 and 2020, we consistently found that both $PM_{2.5}$ and ozone were associated with increased risks of CCVD events within one week of exposure. Effects of ozone were observed primarily in the warm season and those of $PM_{2.5}$ were observed primarily in the cold season. Data further showed that pollution affects residents within and outside of the South Fresno AB 617 community boundaries differently. More specifically, the effects of $PM_{2.5}$ were more immediate and stronger for residents within the boundaries and effects of ozone were only present for those within the boundaries. Meanwhile, racial/ethnic disparities were also present, showing that communities of color are more impacted by air pollution, even at the same level of exposure. Consistent with findings in **Chapter 2**, given differences in impacts across geographic area and demographics characteristics such as race/ethnicity, we expect that the impacts of basin air pollution in the Fresno area may not be uniform for all residents, making efforts to reduce air pollution exposures among those who are more impacted even more critical.

Our findings are consistent with existing literature around the world. A recent systematic review and meta-analysis of almost 60 studies in different parts of the globe suggests that short-term exposures to $PM_{2.5}$ were consistently associated with increased risks of hypertension and triggering of myocardial infarction and stroke.[71] Another pertinent literature also suggests that air pollution, particularly fine particles, was associated with the risk of many CCVD conditions including myocardial infarction and heart failure.[76] A recent time series analysis also showed short-term exposures to ozone may also increase risks of being hospitalized for acute myocardial infarction, heart failure, and stroke.[70]

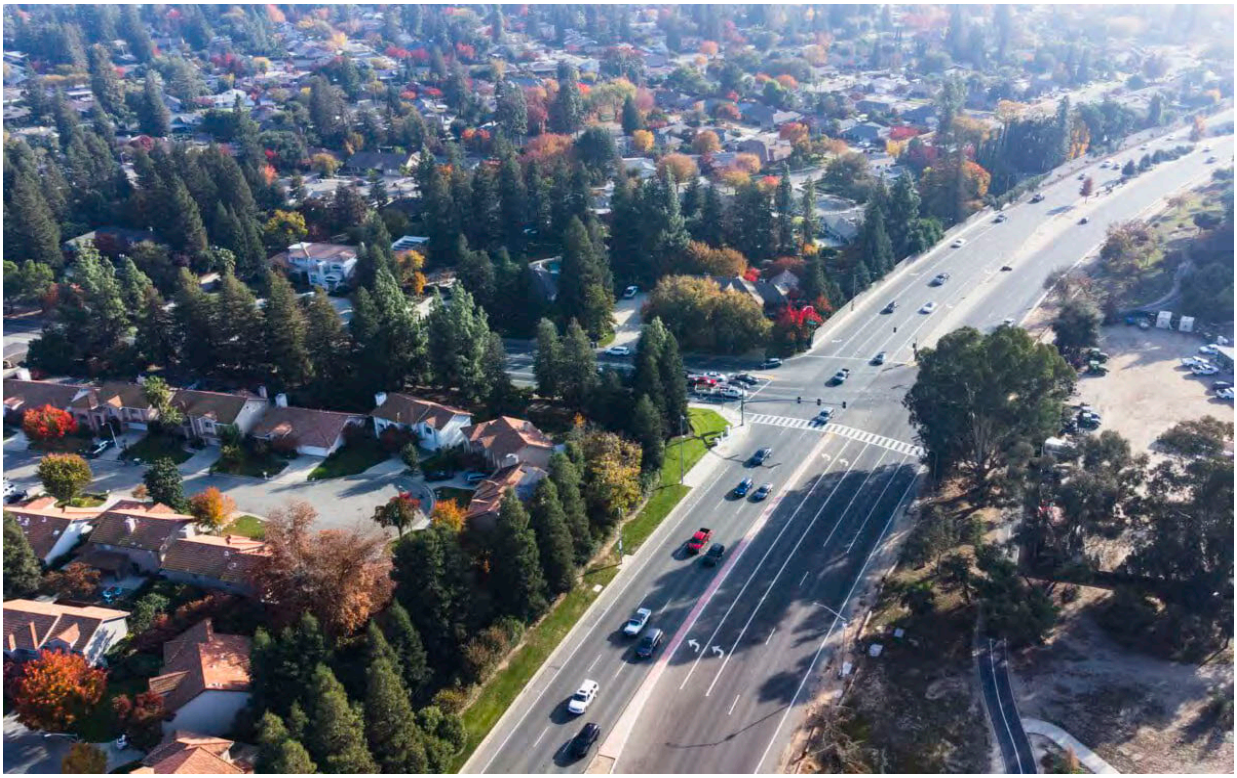
The disparities we observed have important implications for the health of Fresno residents, especially those who may be concurrently facing other stressors. Many recent epidemiologic studies consistently show higher adverse cardiovascular outcomes resulting from exposures to both short- and long-term air pollution among racial/ethnic minorities, those with lower socioeconomic positions, and those who are burdened by other stressors such as co-morbidities, stress, and other environmental burdens.[77,78] These additional health burdens can exacerbate the impacts of air pollution.

3.5 RECOMMENDATIONS

Based on the findings in this chapter, our recommendations are as follows:

1. Previously mentioned recommendations to reduce air pollution (through a 1,000 foot-buffer for truck traffic) should be adhered to and strengthened in Fresno.
2. Such efforts should also consider vulnerable populations, which include those living within the South Fresno AB 617 community boundaries and racial/ethnic minorities.
3. We also recommend the use of zero-emission commercial trucks when possible to minimize population exposure

CHAPTER 4. COMMUNITY-BASED HEALTH SURVEY IN SOUTH FRESNO AB 617 COMMUNITIES



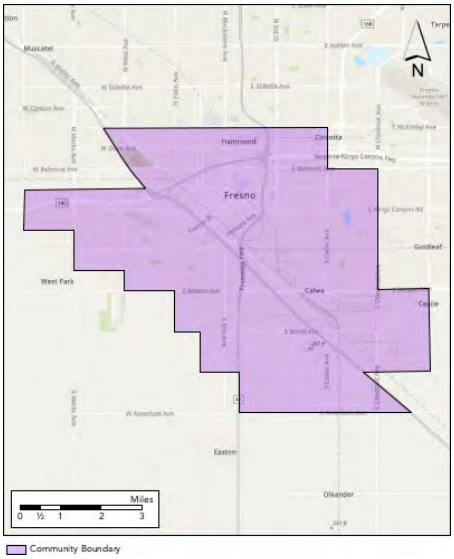
4.1 BACKGROUND

While population-based health data presented in Chapters 1 through Chapter 3 are critical and provide a comprehensive way to assess the health of populations, we also value the concerns and needs from residents of South Fresno. Such data are not available in population datasets, necessitating new data collection. Working closely with multiple community partners, the city, and the Air District, we sought to hear from residents in one of the most polluted areas in Fresno regarding their environmental health concerns, health needs, civic engagement, and policy preferences towards environmental issues.

4.2 METHODS

The study took place within the South Fresno area (**Figure 4.1**). We obtained all residential addresses (without identifiable information) from the region from the City of Fresno GIS Hub.[79] To ensure representativeness of the data, we randomly selected addresses within the study area. Centrally trained researchers went to the selected addresses to administer an approximately 15-minute survey, which asked about demographics, environmental health concerns, health needs, civic engagement, and policy preferences towards environmental issues. The survey took place from February to June, 2023, and was conducted in either English or Spanish.

Figure 4.1. Survey area



Source: California Air Resources Board

Our survey instrument was developed with several rounds of input from the SJV Air District, the Community Steering Committee, and community-based organization partners. We also obtained feedback during early surveys to improve our survey questionnaire.

To be eligible for the study, we selected the head of the household or significant other who was a) at least 18 years old, b) lived in the study area for at least one year, and c) speaks Spanish or English. A total of 1,766 residents participated in our survey. Although the survey is a random sample, we performed post-hoc weighting by age and race/ethnicity to optimize data generalizability. More specifically, we obtained five-year estimates (2017-2021) from the Census Bureau's American Community Survey (ACS) Public Use Microdata Sample (PUMS) data.[64] The PUMS contains records about a representative of individual people or housing units within specific regions of the U.S. From this data, we obtained information about individuals living within the study area and determined their demographic characteristics. These estimates represent known characteristics of the study area. We then used these estimates to create weights for our study sample to ensure it is representative of the rest of the population living in the study region.

Table 4.1 below shows that our study sample is very similar to the population characteristics of the study area, especially after weighting.

The study was approved by the UC Merced Institutional Review Board. All analyses were done in SAS 9.2 (Cary, NC) and Microsoft Excel.

Table 4.1. Comparison of study sample and target population

Demographics	Survey sample		Target population
	N (%)	N (weighted %)	N (%)[a]
Age (years)			
18-34	516 (30)	38.0	37.8
35-54	669 (38.8)	33.8	33.6
55-74	483 (28)	23.1	23.0
75+	57 (3.3)	5.1	5.6
Sex (n, %)			
Female	923 (52.3)	51.8	49.3
Male	834 (47.3)	47.6	50.7
Not disclosed	8 (0.5)		
Race/ethnicity (n, %)			
White	243 (15.3)	21.0	20.9
Black	272 (17.1)	5.5	5.5
Hispanic	817 (51.4)	60.3	60.0
Asian/Pacific Islanders	41 (2.6)	10.5	11.0
Native American/Alaskan	28 (1.8)	0.5	0.5
Multirace	151 (9.5)	1.8	1.8
Other	36 (2.3)	0.3	0.3
Education less than high school (n,%)	477 (27.5)	26.8	27.8
Did not work last week (n,%)	523 (34.8)	37.4	38.4

[a]Data were estimated from the Public Use Micro Sample data (2017-2021) from the US census.

We were able to geocode 1,140 participants (65%) who gave us permission to use their addresses. Addresses were linked to the nearest warehouse or distribution center, truck route, freeway, or major road, and distances were calculated. Given the small sample size and the rarity of some of the health outcomes, we were not able to run complex statistical models. Thus, we present descriptive statistics illustrating the risks of having any chronic condition or adverse pregnancy outcome, comparing people within and outside a 1,000 feet buffer from the various sources. Other buffers were also considered, but 1,000 feet appeared to be the distance that best distinguishes the risks inside and outside, consistent with our analyses in Chapter 1.

4.3 RESULTS

4.3.1 STUDY PARTICIPANTS

A total of 1,766 residents participated in our survey. **Table 4.2** describes participants' characteristics. The modal responses for survey participants were age 18-34 (37.9%), Hispanic/Latino (60.2%), high school graduates (38.6%), never married (50.7%), and had personal wage and salary income of 10-25K/year (among those employed at the time of the survey).

Table 4.2. Characteristics of survey participants (n=1,766)

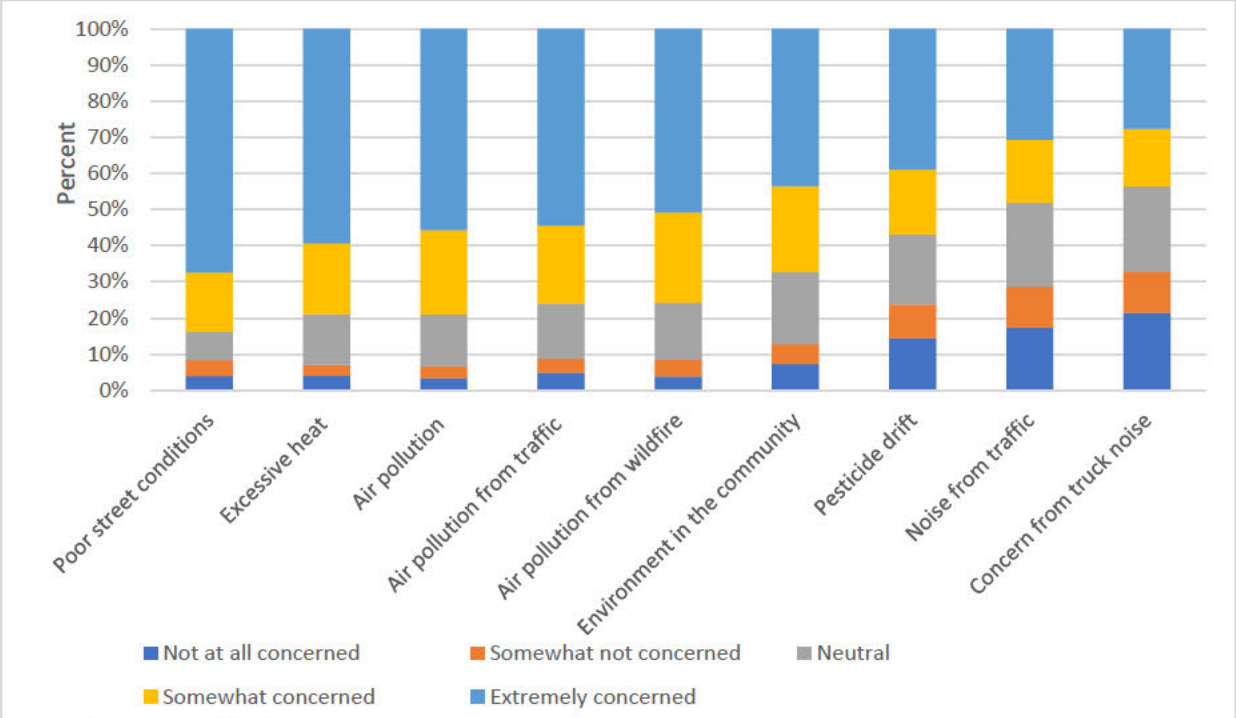
Characteristics	n	Weighted %
Age (years)		
18-34	516	38.0
35-54	669	33.8
55-74	483	23.1
75+	57	5.1
Sex		
Female	923	51.8
Male	834	47.6
Prefer to not disclose	8	0.5
Race/ethnicity		
White	243	21.0
Black	272	5.5
Asian/Native Hawaiian/ Pacific Islander	41	10.6
Native American/Alaskan	28	0.5
Hispanic/Latino	817	60.3
Two or more races	151	1.8
Other	10	0.3
Education		
Less than high school	477	26.8
High school	674	38.6
Some college	442	25.4
College graduate or more	144	9.2
Marital status		
Never married	913	50.7
Married	649	38.0
Divorced/Widowed	192	11.3
Income[a]		
$0-$9,999	568	24.2
$10,000-$24,999	235	33.2
$25,000-$49,999	176	24.7
$50,000-$74,999	57	10.1
>$75,000	39	7.9
Don't know/Refused	220	-
Missing	471	-

[a]Percent was only calculated among those employed at the time of the survey.

4.3.2 RESIDENTS' ENVIRONMENTAL HEALTH CONCERNS

When residents were asked to rate their concerns with respect to environmental issues in their community, the majority (~70%) responded that they were somewhat concerned or extremely concerned with the general environment in their community (**Figure 4.2**). When asked about specific issues, the majority reported that poor street conditions (84%), general air pollution (79%), excessive heat (79%), wildfire pollution (76%), and traffic pollution (76%) were top concerns. Meanwhile, almost half the participants reported concerns regarding traffic noise and truck noise. These estimates were weighted to maximize generalizability.

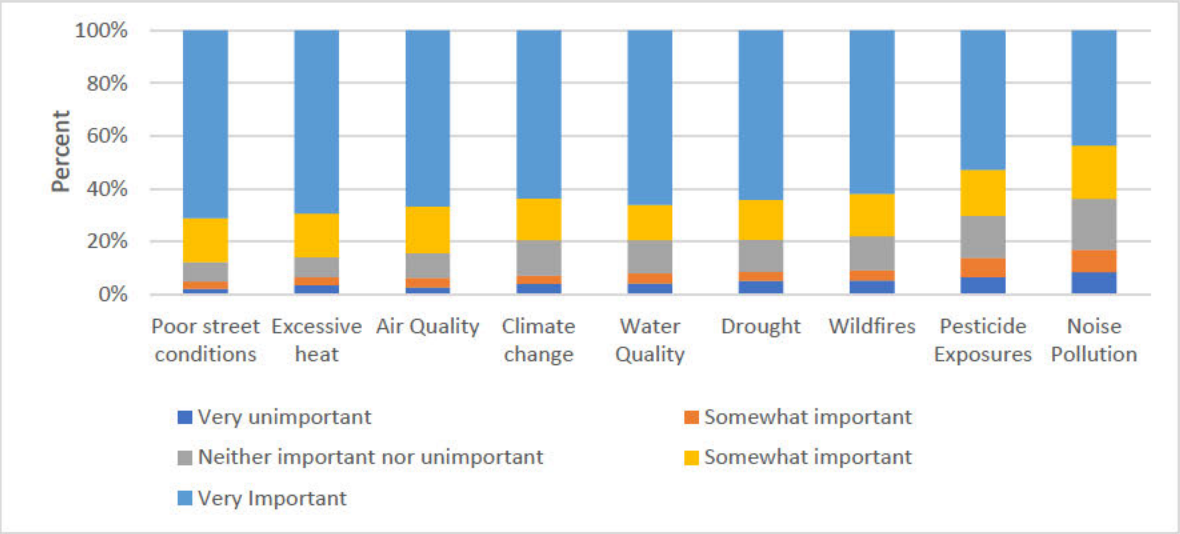
Figure 4.2. Residents' concerns about the environment in their community



Note: Estimates were weighted

Residents' responses to the question, "Considering your household and community needs, how important will it be for the government to address the following environmental issues within the next few years?" are presented in Figure 4.3. For all listed environmental issues, most respondents believed that addressing these issues is somewhat or very important. There was minimal variation between different issues, indicating a uniformly high level of concern across all environmental conditions. The top three environmental issues that residents would like the government to address in the next few years were poor street conditions (88%), excessive heat (86%), and air quality (84%). Very few respondents considered these environmental issues unimportant, underscoring the overall significance of environmental concerns among South Fresno residents.

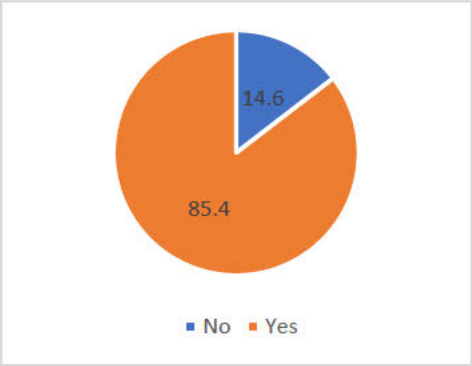
Figure 4.3. Importance of local government to address environmental issues within the next few years



Note: Estimates were weighted

Related to air quality, an overwhelming majority of residents (over 85%) stated that the government should invest public funds to build new roads that redirect truck traffic away from local streets (Figure 4.4).

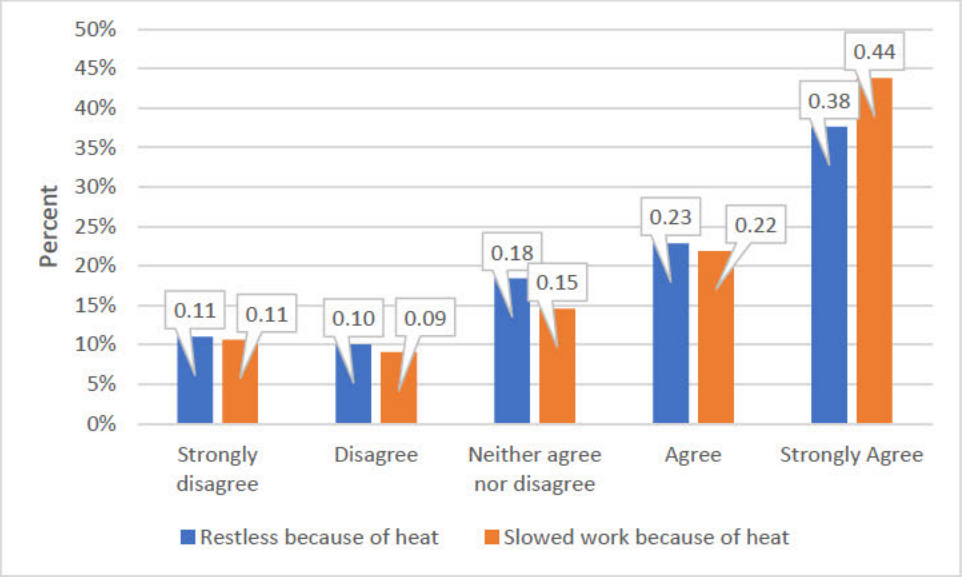
Figure 4.4. Residents' preference for new roads that direct truck traffic away from local streets



Note: Estimates were weighted

When asked about additional environmental health concerns, residents reported having problems resting or working because of either heat, air pollution, or traffic/truck noise. More specifically, with reference to the September 2022 heatwave, 66% agreed or strongly agreed that they had to slow work and 61% reported that they were unable to rest because of heat (Figure 4.5). Given the expected increase in the frequency, intensity, and duration of heat events, these findings warrant further investigation to ensure residents can rest properly and work comfortably during heat events.

Figure 4.5. Impacts of heat on rest and work

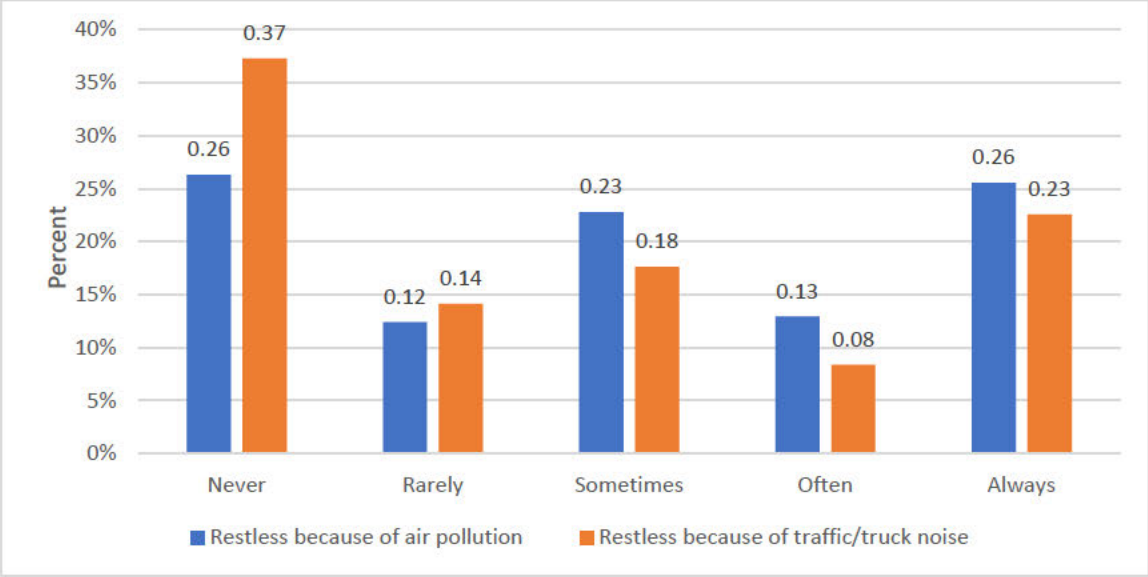


Note: Estimates were weighted

Furthermore, approximately 22.4% of participants reported that they use a community cooling center, and 28% said that they seek shelter somewhere else when the temperature is too high. This may mean that many residents may not have access to effective cooling, which may present health risks during heat events.

Almost half of the residents (49%) reported sometimes, often, or always being unable to rest because of traffic/truck noise. Meanwhile, 61% reported being unable to rest because of air pollution (**Figure 4.6**). These data suggest that air pollution and traffic noise are bothering residents significantly, and efforts to minimize exposure may be prudent.

Figure 4.6. Impacts of air pollution and traffic noise on home rest



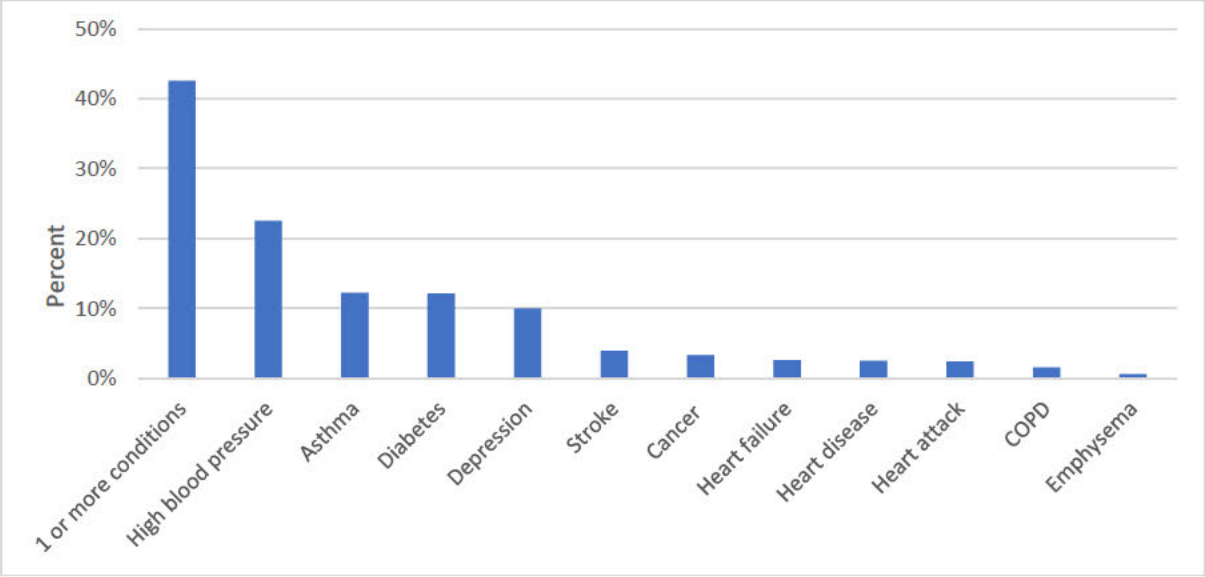
Note: Estimates were weighted

4.3.3 HEALTH CONDITIONS

CHRONIC HEALTH CONDITIONS

Approximately 43% of residents have been diagnosed with at least one chronic health ailment, including stroke, heart failure, heart attack, heart disease, high blood pressure, diabetes, cancer, asthma, emphysema, chronic obstructive pulmonary disease, or depression. The most commonly reported conditions among these are high blood pressure at 23%, followed by both diabetes and asthma at 12%, and depression at 10% (**Figure 4.7**). It is important to note that some of these health endpoints could be underreported because residents may not be aware they have them (e.g., high blood pressure, depression).

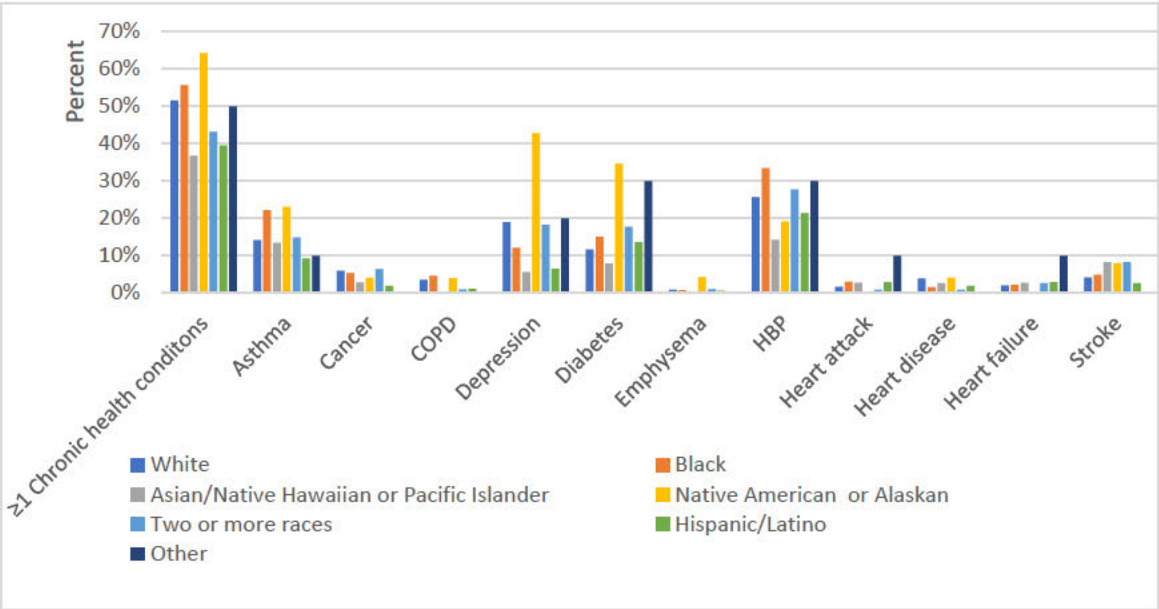
Figure 4.7. South Fresno Residents' chronic health conditions



Note: Estimates were weighted; abbreviations: COPD, chronic obstructive pulmonary disease.

When stratified by demographic characteristics, residents who are Native American/Alaskan were generally more likely to experience chronic health conditions compared to their counterparts (**Figure 4.8**). When analyzed by specific condition, this pattern is consistent for asthma, depression, and diabetes. Non-Hispanic Black residents had the highest prevalence of high blood pressure. Residents belonging to the "Other" category also reported higher prevalence of heart attack and heart failure.

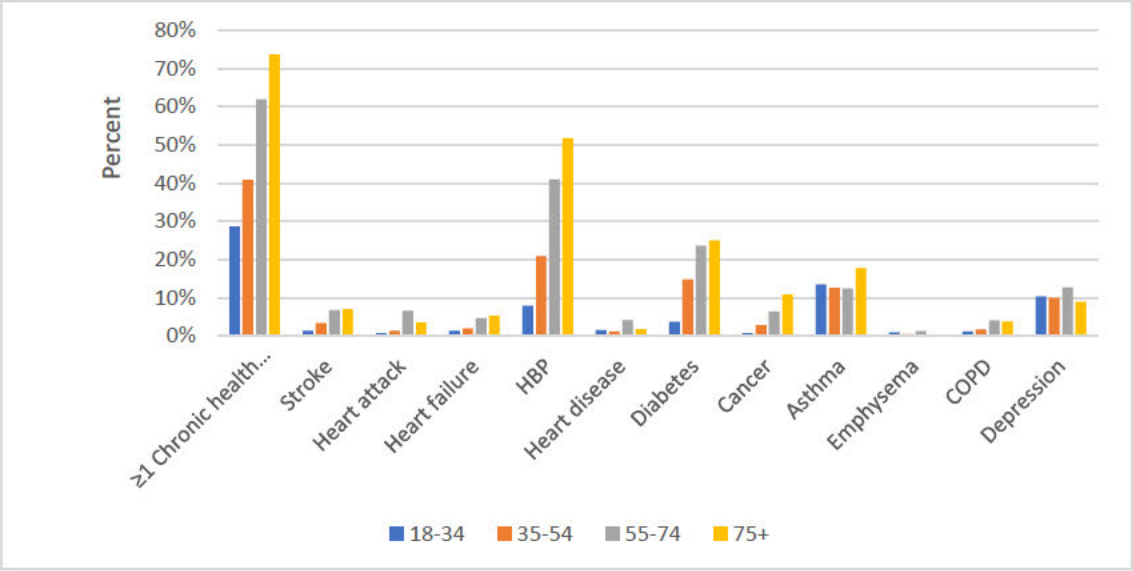
Figure 4.8. Self-reported health conditions by race/ethnicity



Abbreviations: COPD, chronic obstructive pulmonary disease; HBP, high blood pressure

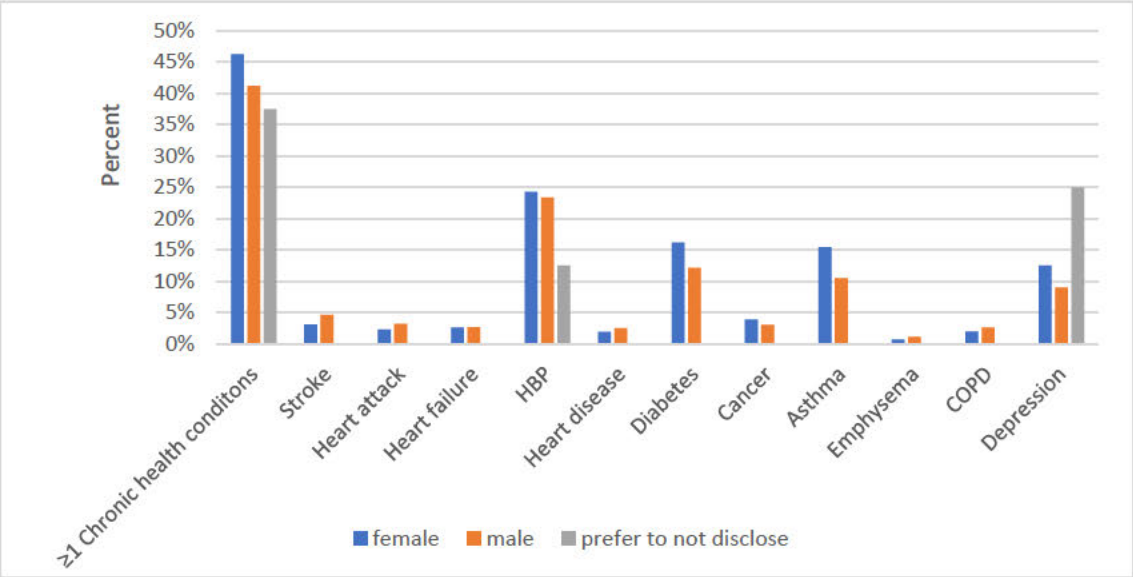
As expected, the prevalence of chronic health conditions increased with age (**Figure 4.9**). Female residents were more likely to report 1 or more chronic health conditions compared to male, but this pattern is reversed for some specific conditions (**Figure 4.10**). We did not observe meaningful differences in general prevalence across educational attainment, but these patterns varied by specific condition (**Figure 4.11**). Furthermore, residents with lower self-reported annual income generally had higher prevalence of having one or more chronic health conditions (**Figure 4.12**).

Figure 4.9. Self-reported chronic health conditions by age



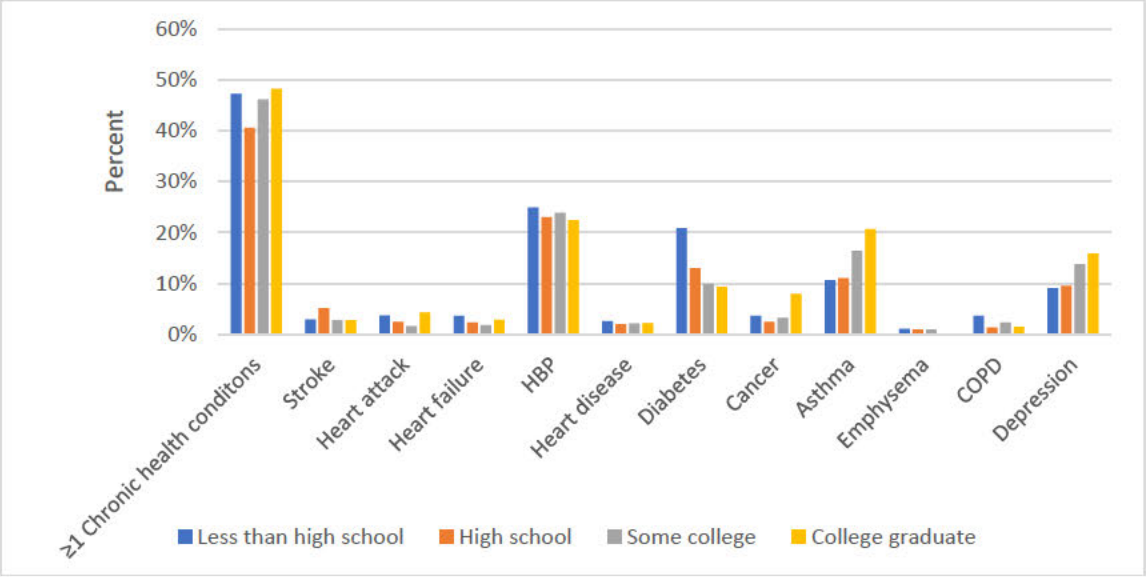
Abbreviations: COPD, chronic obstructive pulmonary disease; HBP, high blood pressure

Figure 4.10. Self-reported chronic health condition by sex



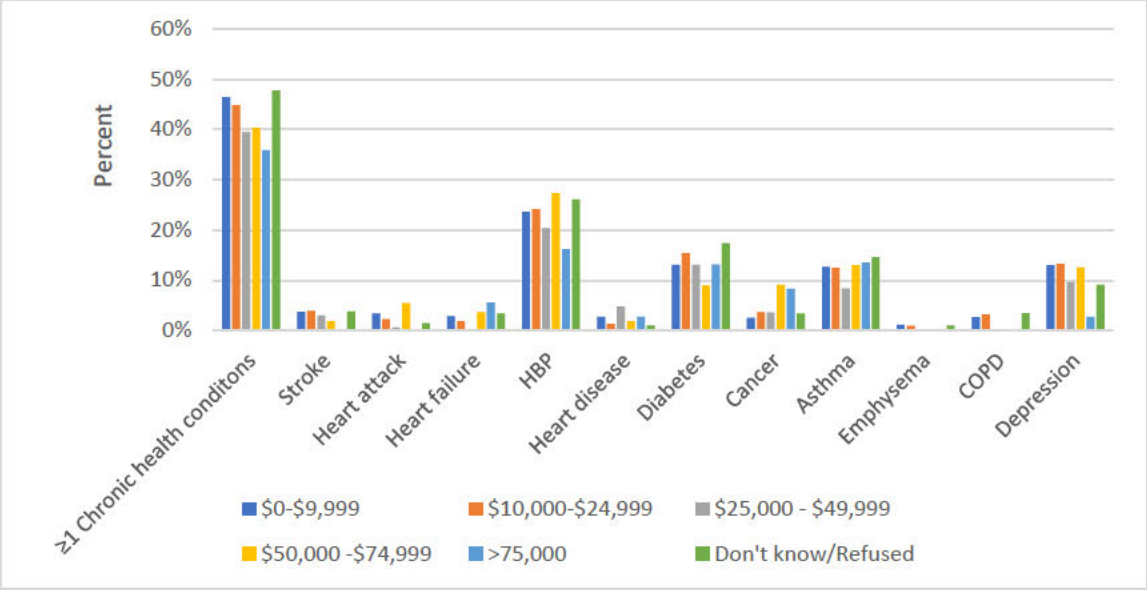
Abbreviations: COPD, chronic obstructive pulmonary disease; HBP, high blood pressure

Figure 4.11. Self-reported chronic health condition by educational attainment



Abbreviations: COPD, chronic obstructive pulmonary disease; HBP, high blood pressure

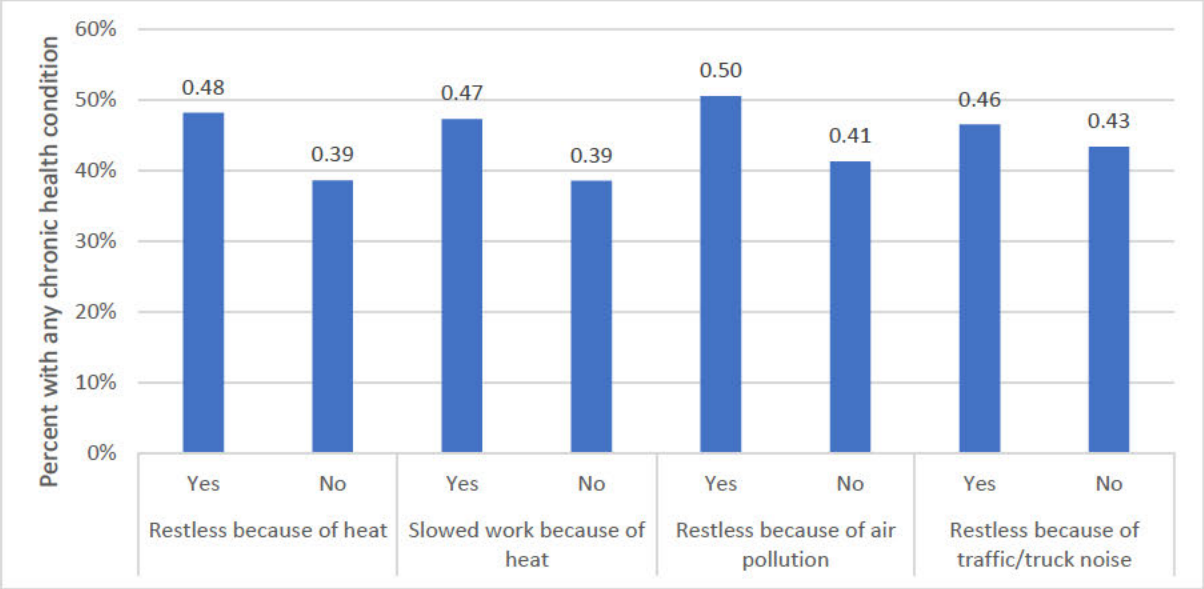
Figure 4.12. Self-reported chronic health condition by annual income



Abbreviations: COPD, chronic obstructive pulmonary disease; HBP, high blood pressure

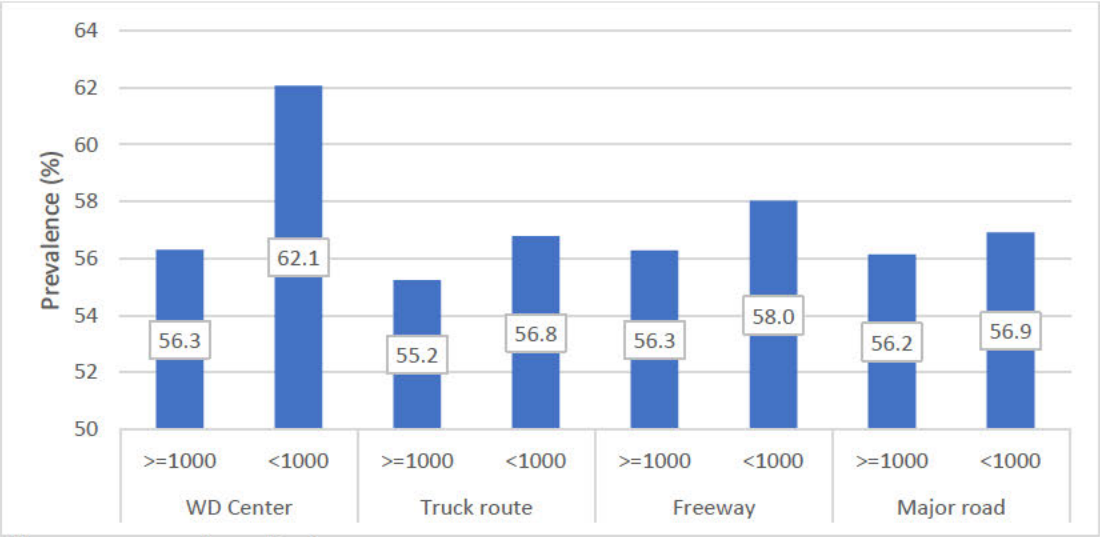
In general, the prevalence of having at least one chronic health condition was higher among residents who reported having to slow down work due to heat, air pollution, or truck/traffic noise (Figures 4.13).

Figure 4.13. Chronic health condition by environmental health concerns



Among participants with geocodable addresses, nearly 57% had one or more of the chronic health conditions listed above. In general, those who lived within 1,000 feet of a warehouse/distribution (WD) center, truck route, freeway, or major road appeared to have a higher prevalence of chronic health conditions (Figure 4.14). We note that these findings do not suggest that if we go outside of 1,000 feet, the risks will become insignificant. The buffer of 1,000 feet was chosen because it best distinguishes the risks outside and inside of the buffer.

Figure 4.14. Prevalence of having one or more chronic health conditions by proximity to pollution sources

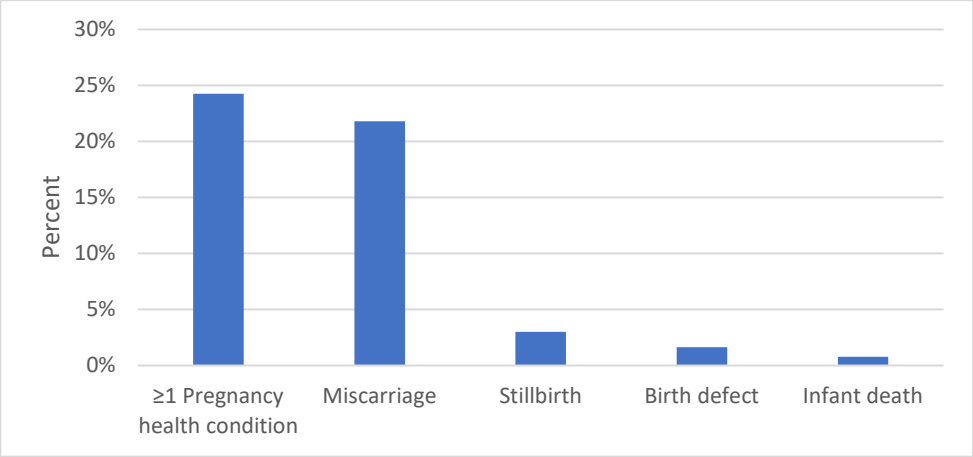


Abbreviation: WD, warehouse/distribution center

PREGNANCY OUTCOMES

Among reproductive-aged adult female respondents ages 18-46 years (n=541), about a quarter reported having at least one adverse pregnancy outcome including miscarriage, stillbirth, birth defects, or infant death. Twenty two percent (22%) reported having had a miscarriage and 3% reported stillbirth (**Figure 4.15**). Additionally, approximately 0.8% reported having a child who died within one year of life, and 1.6% reported having a child with a birth defect. We note that many of these estimates are high compared to the expected prevalence in the general population, but also recognize that these outcomes are rare and can contribute to unstable estimates in a relatively small survey.

Figure 4.15. Prevalence of selected pregnancy outcomes among reproductive-aged women



Reproductive age is defined as 18-46 years.

Adverse pregnancy outcomes varied by sociodemographic characteristics such as race/ethnicity, age, education, and income (**Figures 4.16 - 4.19)**. However, we also recognize that once restricted to only reproductive-age women, our sample became smaller and less stable, especially when some of the health outcomes were rare. In general, adverse pregnancy conditions were more common among Black women, especially stillbirths and infant death. These pregnancy outcomes were generally higher among women with higher maternal age, except for infant death, where younger women tended to have higher prevalence.

Figure 4.16. Adverse pregnancy outcomes by race/ethnicity

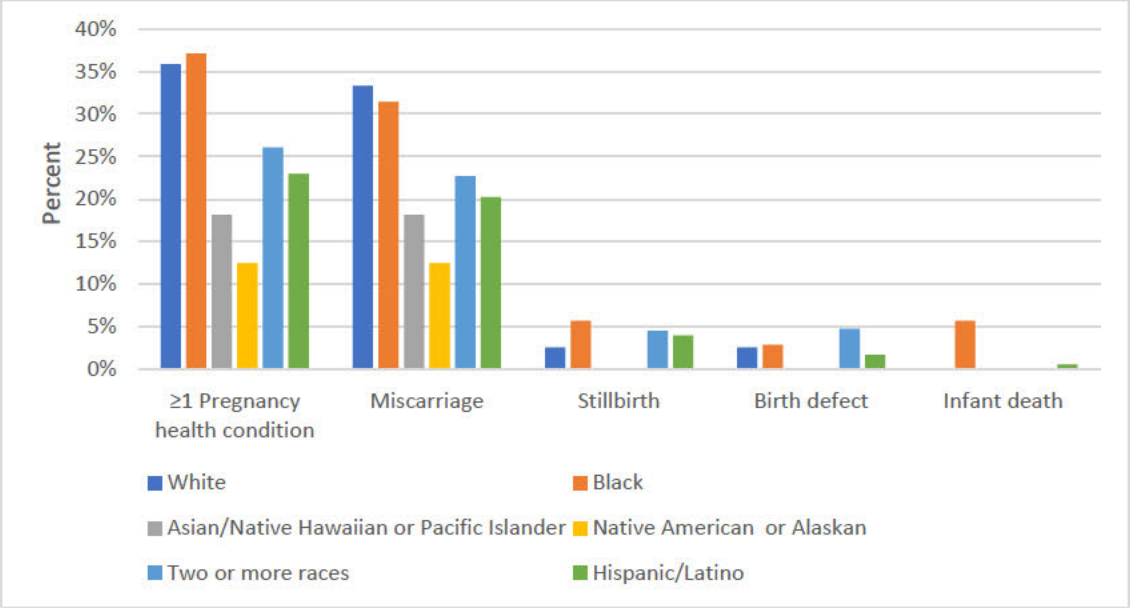


Figure 4.17. Adverse pregnancy outcome by maternal age

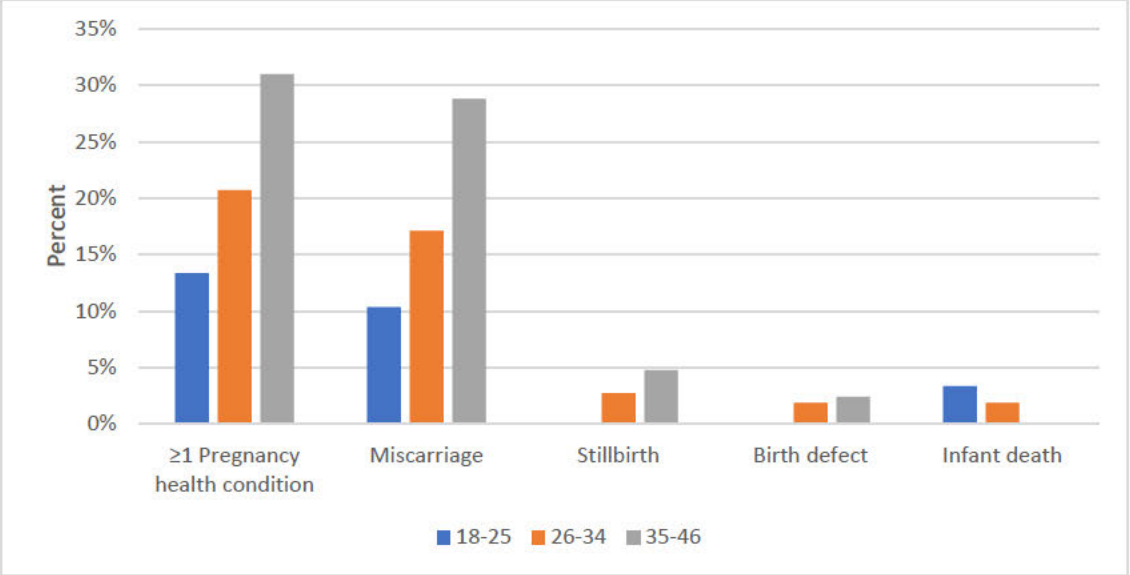


Figure 4.18. Adverse pregnancy outcomes by educational attainment

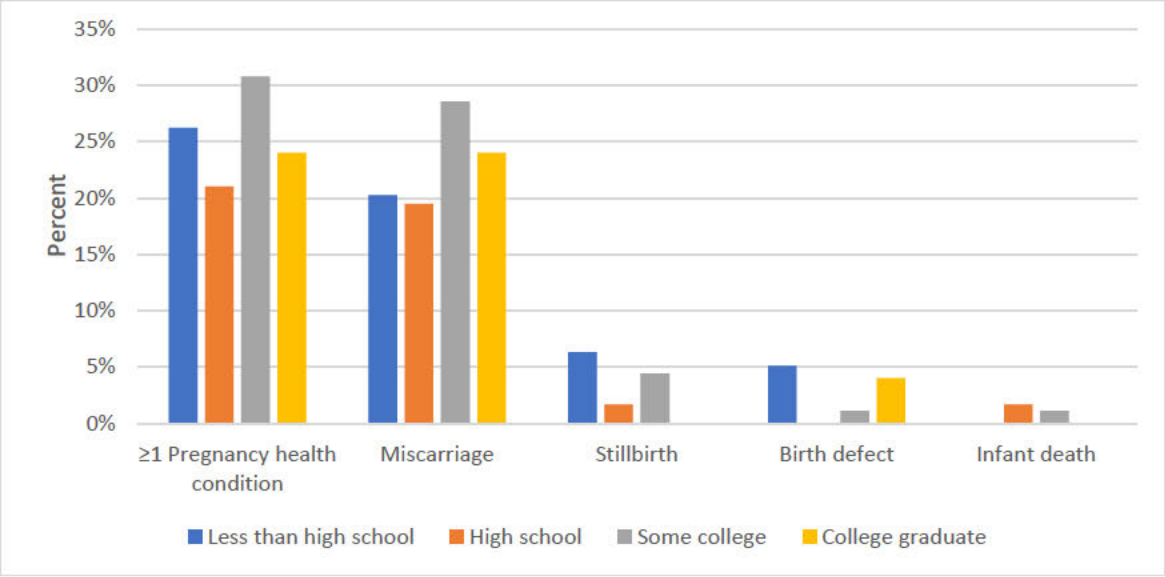
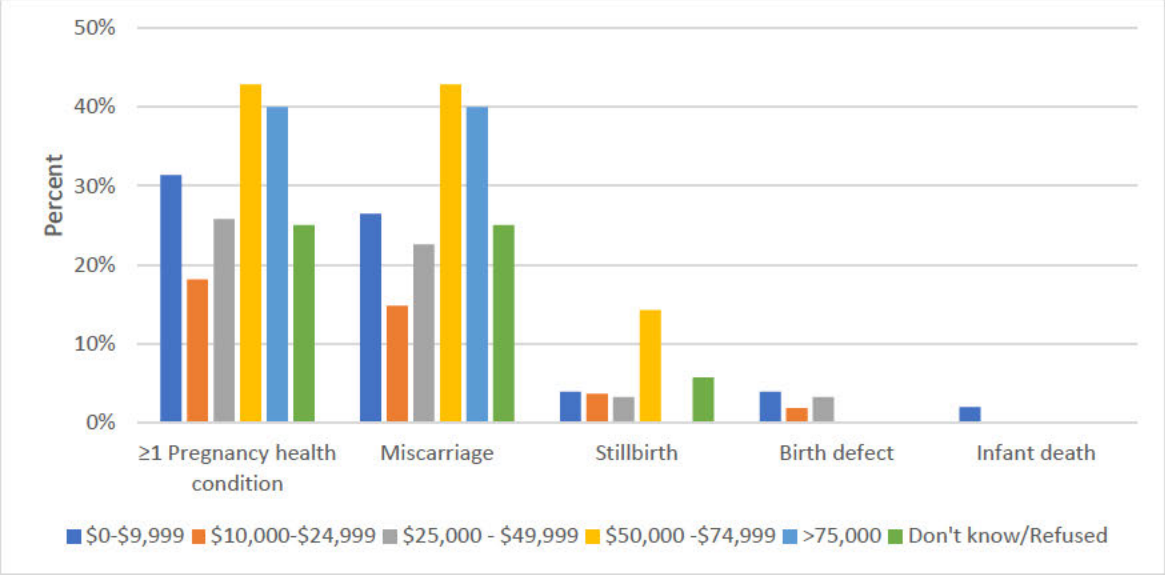


Figure 4.19. Adverse pregnancy outcomes by income

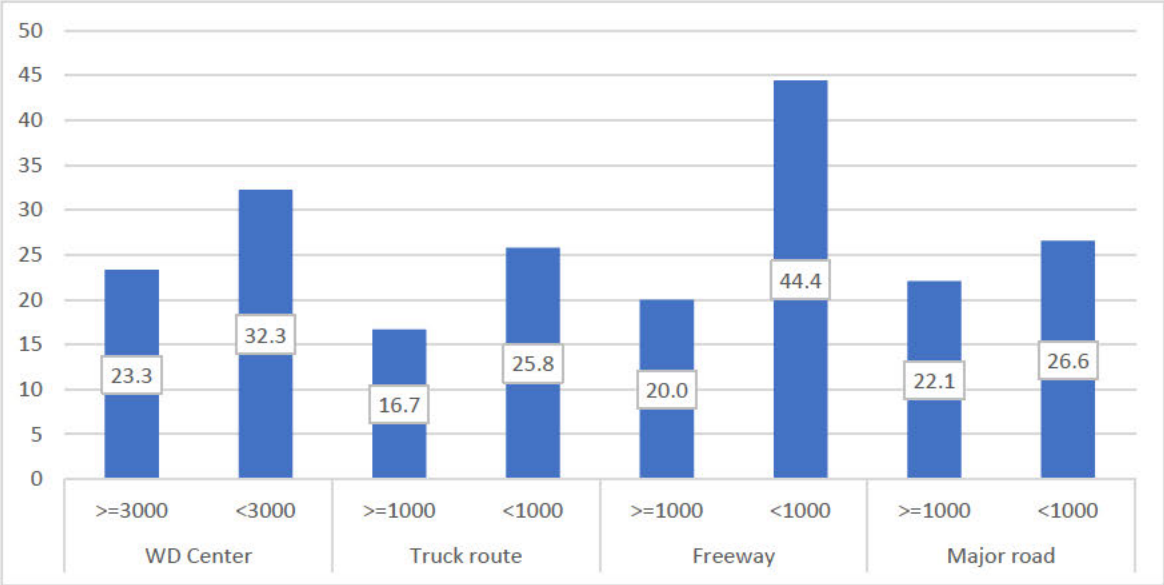


We did not observe a consistent pattern of correlation between adverse pregnancy outcomes and self-reported restlessness due to heat, pollution, or truck/traffic noise. However, we observed that people who reported restlessness due to air pollution or truck/traffic noise had a higher prevalence of stillbirth, birth defects, and infant death.

Among women of reproductive age who gave us permission to geocode their address (n=181), the prevalence of any adverse pregnancy outcomes (miscarriage, stillbirth, infant death, or birth defect) was 25%, similar to that of all reproductive age women in the survey. When stratified by proximity to various pollution sources, those who lived within 1,000 feet of a truck route, freeway, or major road had

elevated prevalence compared to those who lived further away (**Figure 4.20**). We note that these findings do not suggest that if we go outside of 1,000 feet, the risks of adverse pregnancy outcomes will become negligible. The buffer of 1,000 feet was chosen because it best distinguishes the risks outside and inside of the buffer. Although proximity to warehouse/distribution centers was not related to risk at 1,000 feet due to small data sample, we observed increased risks for those who lived within 3000 feet of a warehouse or distribution center.

Figure 4.20. Prevalence of having any adverse pregnancy outcome by proximity to pollution sources



WD: warehouse or distribution center

4.3.4 CIVIC ENGAGEMENT

A significant proportion of residents reported that they are willing to attend local meetings to discuss issues related to truck traffic/air pollution (31%), and adaptation strategies to climate change (32%). In addition, 32% expressed interest in receiving information and invitations on air pollution, truck traffic, or local planning.

4.4 SUMMARY

In this representative survey sample of 1,766 South Fresno residents, we uncovered significant environmental health concerns in the community. More specifically, residents expressed high concerns regarding environmental issues such as poor street conditions, air quality, and climate change. Almost half of the residents surveyed (43%) reported having at least one chronic health condition, and about a quarter of reproductive-aged women reported having experienced an adverse pregnancy outcome such as miscarriage, stillbirth, infant death, or birth defects. A significant proportion of the population also reported being unable to rest or work effectively because of heat, air pollution, or truck/traffic noise in their neighborhood. More importantly, these residents are more likely to report having some health problems. Consistent with findings in Chapter 1, our data further suggests that residents who lived

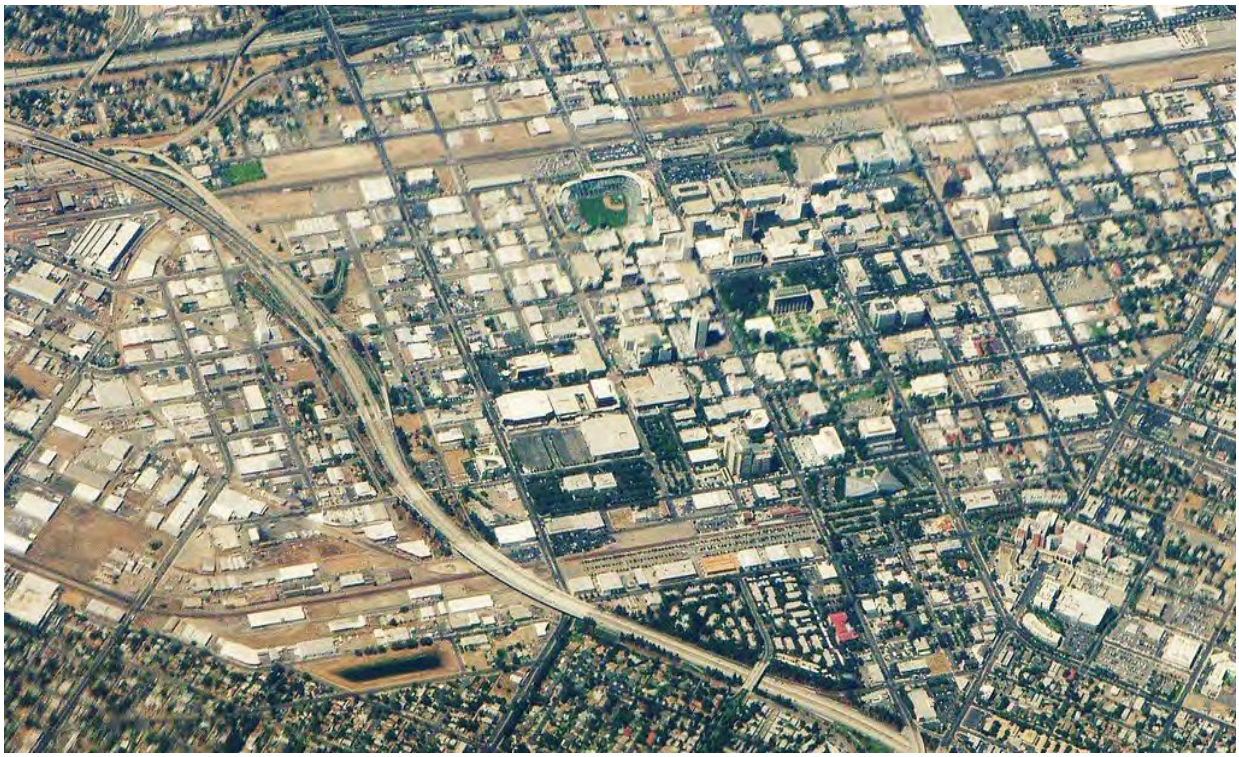
within 1,000 feet of a freeway, truck route, or major road had a higher prevalence of health problems compared to their counterparts. We also observed that living within 1,000 feet of a distribution center/warehouse was associated with a higher prevalence of health concerns.

4.5 RECOMMENDATIONS

Our two major recommendations from this chapter are as follows:

1. Although the 1,000 feet buffer best distinguishes the risks between residents inside and outside the buffer zone, our findings do not suggest that risks outside of 1,000 feet are insignificant. In fact, we recommend using a more conservative distance whenever possible, especially around more vulnerable receptors. Given significant health concerns in the region, it is critical to continue and strengthen efforts to reduce air pollution exposures in South Fresno.

2. Where appropriate, our goal is to engage South Fresno residents in the Fresno Truck Reroute Study's civic efforts. This is especially necessary given the significant proportion of South Fresno residents indicating concern with the environment, support for rerouting truck traffic, and interests in civic engagement.



GLOSSARY

AB 617: Assembly Bill 617 (AB 617) is a California state bill that was signed into law in 2017. The primary purpose of AB 617 is to address air quality issues in communities that are disproportionately affected by pollution. The law aims to enhance community air monitoring, improve air quality data, and involve local communities in the decision-making process to reduce air pollution. AB 617 establishes the Community Air Protection Program, which identifies communities with the highest cumulative exposure to air pollutants, referred to as AB 617 communities in this report.

Acute exposure: Short-term exposures to air pollution, typically within a couple of weeks. The idea is to see whether the exposures (like air pollution) have short-term health effects (i.e., within a few days of exposures).

Adverse pregnancy outcome: generally, any unfavorable health condition(s) that occurs during pregnancy. In this report, we chose to focus on preterm birth and infant mortality, two very serious outcomes.

American Community Survey (ACS): An ongoing survey conducted by the U.S. Census Bureau. It collects detailed demographic, social, economic, and housing information from a sample of households across the United States every year. This data source is commonly used in research that involves neighborhood or contextual factors.

Association: Correlation or relationship between two factors. Although associations do not always mean causation, in well-designed studies, associations estimate the causal relationship between two factors.

CalEnviroScreen: A tool developed by the California Environmental Protection Agency (CalEPA) to identify communities in California that are disproportionately burdened by multiple sources of pollution and are more vulnerable to environmental and public health hazards. CalEnviroScreen can be accessible at https://oehha.ca.gov/calenviroscreen.

California Air Resources Board (CARB): A state agency charged with protecting the public from the harmful effects of air pollution and developing programs and actions to fight climate change.

Department of Health Care Access and Information (HCAi): A state agency whose mission is to expand equitable access to quality affordable health care for all Californians through resilient facilities, actionable information, and the health workforce each community needs. Among the many things it does, HCAi collects data on all healthcare encounters in the state. This data source is unique and valuable for research efforts across the state.

California Department of Public Health's Office of Vital Statistics: An office within the California Department of Public Health which maintains birth, death, fetal death/still birth, marriage, and divorce records for California. The branch provides valuable data for population-based research due to the high state-level coverage.

Case-crossover analysis: A unique type of study design where people can serve as their own controls, which allows complete elimination of factors that can influence the quantifiable relationship. This is the reason we used this study for this study.

Confidence intervals (CI): The range of values that the true estimate can be if the sample/study was repeated infinite times. In this study, we used the 95% CI, which means that if the sample/study was conducted 100 times, the estimates will be in the range indicated 95% of the time.

Cardio-cerebral vascular diseases: Disease related to the blood vessels of the heart and brain.

Cumulative exposures: Exposures to a certain factor (like air pollution) over a period of time.

Emergency department (ED) visits: Medical encounters in emergency rooms across the state.

Excess cases: The number of cases of health outcomes as the result of a certain exposure (i.e., air pollution). Excess cases can also be interpreted as the number of cases that could be prevented if a certain amount of air pollution is reduced, which in this study is by 5 units.

Exposure: Refers to factors that may impact health. In this report, exposures refer to environmental exposures, including air pollution and proximity to pollution sources.

South Central Fresno Truck Reroute Study: A study aiming to identify, analyze, and evaluate potential strategies that freight-impacted communities might implement, in cooperation with the city of Fresno, to abate truck impacts. The study is led by the city of Fresno Public Works Department in partnership with the SJV Air District. More information can be found here: https://www.fresno.gov/publicworks/south-central-truck-re-route-study/

International Classification of Disease codes (ICD-10, ICD-9): A set of standardized codes used internationally to identify specific diseases. These codes are used mostly for billing reasons but are also an accurate way to identify specific health outcomes of interest from medical records.

Infant mortality (IM): Death of a live birth within the first year of life.

Lags: an indicator of delayed health effects. Lag 0 refers to health effects on the same day of exposure; lags 1-7 refer to health effects 1 through 7 days after exposure.

Odds ratio (OR): The ratio of the odds (estimates of the risks) in one group (usually those with the exposure) compared to another group (usually those without the exposure). OR is a common approach to quantify the relationship between exposures like air pollution and health outcomes.

Ozone: An odorless, colorless gaseous pollutant common in the SJV. This pollutant is formed from precursors including nitrogen oxides, volatile organic compounds, and heat/sunlight.

Outcome: Refers to health conditions or health risks (such as asthma, cardiovascular disease, stroke) that could be caused by or associated with an exposure; in this case, air pollution

Patient Discharge Data (PDD): These datasets contain all inpatient discharges from any licensed hospital in the state of California. The purpose of the data is to capture those people who ended up hospitalized for conditions evaluated in this study (asthma, cerebral cardiovascular disease).

$PM_{2.5}$: Fine particles with a diameter of <2.5 microns. These are small particles that are inhalable and have been known to cause many health problems worldwide.

Proximity: Refers to how close people lived from a source of pollutants, such as freeways, major roads, or truck routes). In this study, the proximity was evaluated by determining the distance from the closest source of pollutants.

Preterm birth: Birth occurring before 37 weeks of gestation. This is an adverse pregnancy outcome with potential serious short- and long-term consequences, because the baby is born too early and does not have enough time to develop inside the mother.

Prevalence: The proportion of the population with a specific health condition.

Risks: The probability or chance of having a health condition.

San Joaquin Valley Air Pollution Control District: A regional public health agency with the mission to improve the health and quality of life for residents through efficient and effective air quality management strategies. Website: https://ww2.valleyair.org/about/

Stratified analysis: An analysis that is separated by certain characteristics. For example, if an analysis is stratified by season, it means the researchers conducted the analysis separately by season to determine the effects of air pollution by season.

APPENDICES

Limitations of study

Chapter 1

We note that the study is limited by a few factors. First is the lack of residential relocation history in birth certificate data. It is possible that some pregnant people moved during the study period, causing potential misclassification of the exposure in the cumulative exposure analyses. However, we also know that although about 10-30% of pregnant people move during pregnancy, most relocated within a short distance.[80] Thus, residential relocation likely did not profoundly affect our results. Furthermore, in the acute exposure analyses, since we compared exposures within one month, it is unlikely that relocation had significant influence. The second limitation is the lack of personally monitored air pollution exposure. Since pregnant people have different daily patterns of activity, their actual exposures may not be the same as that at their residential address. A more accurate way to estimate exposure would be to personally monitor air pollution concentrations where people were during the day. Such an approach would not have been feasible for a large population. The use of modelled air pollution estimation is indirect but offers a more cost-effective strategy to learn how air pollution impacts pregnant people in Fresno. We also note that this study likely underestimated the true effects of air pollution on PTB and IM given the control period (or comparison group) is within the same person who are already highly exposed to air pollution because they live in the valley. The ideal comparison would be people who are exposed to significantly lower pollution, but given the fact that the SJV has more pollution compared to other regions within the state, the control group had inflated exposures. Lastly, given the lack of data on source-specific pollution (such as wildfire), our estimates were for general $PM_{2.5}$ and ozone exposures, regardless of the source. However, given the fact that sources like wildfires contribute a smaller proportion of long-term air pollution, we feel reassured that we have captured the impacts of major sources like traffic and transportation in the area, especially when our findings for pollutant-specific effects are consistent with distance from freeway and truck routes. Both are major sources of pollution. Furthermore, given wildfires are generally short-term and occur in the warm season, they do not explain the effects we consistently observed in the cold season for $PM_{2.5}$.

Chapters 2 and 3

The study has a few notable limitations. First, as with most air pollution studies, we did not have data on personal exposure. We relied on an air pollution model to estimate personal exposures. Since people move around during the day and may work in a different zip code than their residential zip code, there is a certain degree of misclassification. We expect this misclassification to underestimate the effects of air pollution, making our estimate rather conservative. We did not have identifiable information to track people over time and thus lacked the ability to assess event reoccurrence within the same person. Similar to Chapter 1, we note that our air pollution exposures captured all sources. However, given our findings for pollutant-specific effects are consistent with distance from freeway and truck routes, we feel confident that the estimates can be attributed to these sources.

In addition, the HCAi data only captured cases with medical encounters, which by nature are more serious. As a result, we were not able to capture minor instances that may not have been serious enough for people to end up in the ED or hospital. Lastly, all health conditions may be underreported

with the hospital/emergency room data based on sociodemographic characteristics (uninsured, immigration status, etc.) as obstacles to reporting or seeking medical treatment.

Chapter 4

It is reassuring that the findings in this Chapter are aligned with previous analyses in this report. However, we note a few potential limitations in the data. First, the cross-sectional nature of the survey does not allow us to make conclusions about temporality between certain risk factors (i.e., reporting restlessness due to pollution) and health outcomes. In other words, restlessness could lead to health outcomes, but health outcomes could lead to restlessness. Nevertheless, the fact that exposed residents had more health concerns warrants attention. Second, given the rarity of many health outcomes, we were unable to implement more sophisticated models to further explore factors and mechanisms that can explain risks.

REFERENCES

1. Grande G, Ljungman PLS, Eneroth K, Bellander T, Rizzuto D. Association Between Cardiovascular Disease and Long-term Exposure to Air Pollution With the Risk of Dementia. *JAMA Neurol.* 2020;77(7):801-809.
2. Hayes RB, Lim C, Zhang Y, et al. PM2.5 air pollution and cause-specific cardiovascular disease mortality. *Int J Epidemiol.* 2020;49(1):25-35.
3. Schraufnagel DE, Balmes JR, Cowl CT, et al. Air Pollution and Noncommunicable Diseases: A Review by the Forum of International Respiratory Societies' Environmental Committee, Part 2: Air Pollution and Organ Systems. *Chest.* 2019;155(2):417-426.
4. Orru H, Ebi KL, Forsberg B. The Interplay of Climate Change and Air Pollution on Health. *Curr Environ Health Rep.* 2017;4(4):504-513.
5. Lee JT. Review of epidemiological studies on air pollution and health effects in children. *Clin Exp Pediatr.* 2021;64(1):3-11.
6. Guo LQ, Chen Y, Mi BB, et al. Ambient air pollution and adverse birth outcomes: a systematic review and meta-analysis. *J Zhejiang Univ Sci B.* 2019;20(3):238-252.
7. Fiordelisi A, Piscitelli P, Trimarco B, Coscioni E, Iaccarino G, Sorriento D. The mechanisms of air pollution and particulate matter in cardiovascular diseases. *Heart Fail Rev.* 2017;22(3):337-347.
8. Yang D, Yang X, Deng F, Guo X. Ambient Air Pollution and Biomarkers of Health Effect. *Adv Exp Med Biol.* 2017;1017:59-102.
9. Lighthall D, Capitman J. *The Long Road to Clean Air in the San Joaquin Valley: Facing the Challenge of Public Engagement.* Fresno, CA: California State University, Fresno.;2007.
10. Bengiamin M, Capitman JA, Chang X. *Healthy people 2010: A 2007 profile of health status in the San Joaquin Valley.* Fresno, CA: California State University, Fresno;2008.
11. Association; AL. *State of the Air 2022.* Chicago, IL: American Lung Association;2023.
12. District SA. Air quality in the San Joaquin Valley. [Powerpoint Presentation]. https://ww2.valleyair.org/media/4x5ng03o/short-presentation-for-web-2021.pdf. Accessed Jan 23, 2024.
13. WHO. *Health risk assessment of air pollution – general principles.* Copenhagen: WHO Regional Office for Europe: World Health Organization;2016.
14. Ha S. The Changing Climate and Pregnancy Health. *Curr Environ Health Rep.* 2022;9(2):263-275.
15. Wesselink AK, Wellenius GA. Impacts of climate change on reproductive, perinatal and paediatric health. *Paediatr Perinat Epidemiol.* 2022;36(1):1-3.
16. Olson DM, Metz GAS. Climate change is a major stressor causing poor pregnancy outcomes and child development. *F1000Res.* 2020;9.
17. Bilhartz TD, Bilhartz PA, Bilhartz TN, Bilhartz RD. Making use of a natural stress test: pregnancy and cardiovascular risk. *J Womens Health (Larchmt).* 2011;20(5):695-701.
18. Williams D. Pregnancy: a stress test for life. *Curr Opin Obstet Gynecol.* 2003;15(6):465-471.
19. Soma-Pillay P, Nelson-Piercy C, Tolppanen H, Mebazaa A. Physiological changes in pregnancy. *Cardiovasc J Afr.* 2016;27(2):89-94.
20. Bongaerts E, Lecante LL, Bove H, et al. Maternal exposure to ambient black carbon particles and their presence in maternal and fetal circulation and organs: an analysis of two independent population-based observational studies. *Lancet Planet Health.* 2022;6(10):e804-e811.
21. Bove H, Bongaerts E, Slenders E, et al. Ambient black carbon particles reach the fetal side of human placenta. *Nat Commun.* 2019;10(1):3866.
22. Dimes; Mo. Preterm Birth. 2022; https://www.marchofdimes.org/peristats/data?top=3. Accessed Oct 13, 2023.

23. Preterm Birth. https://www.cdph.ca.gov/Programs/CFH/DMCAH/surveillance/Pages/Preterm-Birth.aspx. Accessed October 13, 2023.
24. Premature Birth. Accessed October 13, 2023.
25. Okoli ML, Ogbu CE, Enyi CO, Okoli IC, Wilson RE, Kirby RS. Sociodemographic and socioeconomic correlates of learning disability in preterm children in the United States. *BMC Public Health.* 2022;22(1):212.
26. Fitzallen GC, Sagar YK, Taylor HG, Bora S. Anxiety and Depressive Disorders in Children Born Preterm: A Meta-Analysis. *J Dev Behav Pediatr.* 2021;42(2):154-162.
27. Ou-Yang MC, Sun Y, Liebowitz M, et al. Accelerated weight gain, prematurity, and the risk of childhood obesity: A meta-analysis and systematic review. *PLoS One.* 2020;15(5):e0232238.
28. Paquette K, Coltin H, Boivin A, Amre D, Nuyt AM, Luu TM. Cancer risk in children and young adults born preterm: A systematic review and meta-analysis. *PLoS One.* 2019;14(1):e0210366.
29. Duncan AF, Matthews MA. Neurodevelopmental Outcomes in Early Childhood. *Clin Perinatol.* 2018;45(3):377-392.
30. Huang QT, Gao YF, Zhong M, Yu YH. Preterm Birth and Subsequent Risk of Acute Childhood Leukemia: a Meta-Analysis of Observational Studies. *Cell Physiol Biochem.* 2016;39(3):1229-1238.
31. Singh GK, Kenney MK, Ghandour RM, Kogan MD, Lu MC. Mental Health Outcomes in US Children and Adolescents Born Prematurely or with Low Birthweight. *Depress Res Treat.* 2013;2013:570743.
32. Montgomery S, Bahmanyar S, Brus O, Hussein O, Kosma P, Palme-Kilander C. Respiratory infections in preterm infants and subsequent asthma: a cohort study. *BMJ Open.* 2013;3(10):e004034.
33. Robbins CL, Hutchings Y, Dietz PM, Kuklina EV, Callaghan WM. History of preterm birth and subsequent cardiovascular disease: a systematic review. *Am J Obstet Gynecol.* 2014;210(4):285-297.
34. Mortality and Morbidity. https://www.marchofdimes.org/peristats/data?reg=99&top=6&stop=92&lev=1&slev=4&obj=1&sreg=06. Accessed October 19, 2023.
35. Bekkar B, Pacheco S, Basu R, DeNicola N. Association of Air Pollution and Heat Exposure With Preterm Birth, Low Birth Weight, and Stillbirth in the US: A Systematic Review. *JAMA Netw Open.* 2020;3(6):e208243.
36. Klepac P, Locatelli I, Korosec S, Kunzli N, Kukec A. Ambient air pollution and pregnancy outcomes: A comprehensive review and identification of environmental public health challenges. *Environ Res.* 2018;167:144-159.
37. Grippo A, Zhang J, Chu L, et al. Air pollution exposure during pregnancy and spontaneous abortion and stillbirth. *Rev Environ Health.* 2018;33(3):247-264.
38. Sram RJ, Binkova B, Dejmek J, Bobak M. Ambient air pollution and pregnancy outcomes: a review of the literature. *Environ Health Perspect.* 2005;113(4):375-382.
39. Maisonet M, Correa A, Misra D, Jaakkola JJ. A review of the literature on the effects of ambient air pollution on fetal growth. *Environ Res.* 2004;95(1):106-115.
40. Luben TJ, Wilkie AA, Krajewski AK, et al. Short-term exposure to air pollution and infant mortality: A systematic review and meta-analysis. *Sci Total Environ.* 2023;898:165522.
41. Proietti E, Roosli M, Frey U, Latzin P. Air pollution during pregnancy and neonatal outcome: a review. *J Aerosol Med Pulm Drug Deliv.* 2013;26(1):9-23.
42. Hannam K, McNamee R, Baker P, Sibley C, Agius R. Maternal residential proximity to major roads in north west England and adverse pregnancy outcomes. *J Occup Environ Med.* 2013;55(11):1329-1336.

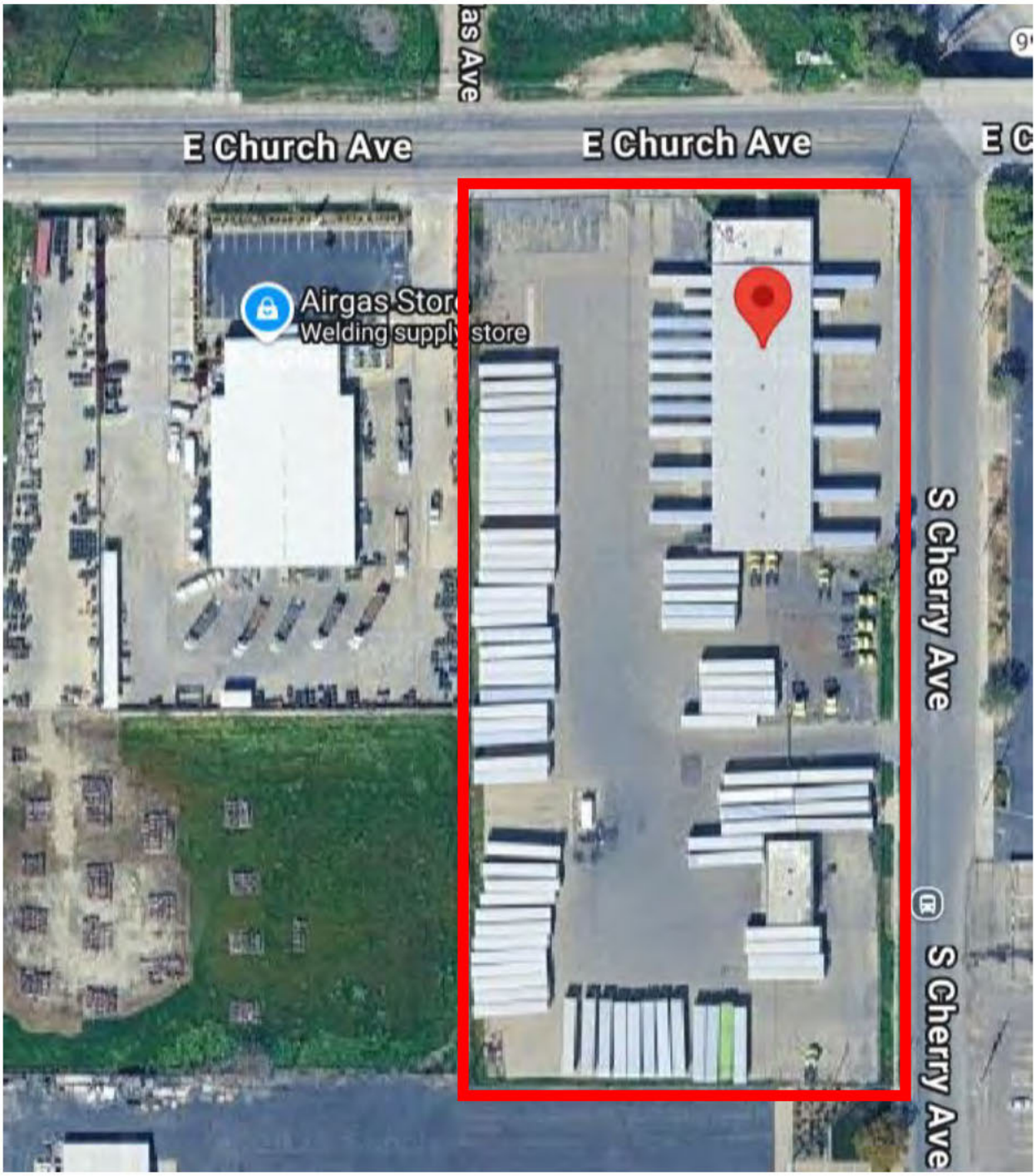
43. Barnett AG, Plonka K, Seow WK, Wilson LA, Hansen C. Increased traffic exposure and negative birth outcomes: a prospective cohort in Australia. *Environ Health.* 2011;10:26.
44. Green RS, Malig B, Windham GC, Fenster L, Ostro B, Swan S. Residential exposure to traffic and spontaneous abortion. *Environ Health Perspect.* 2009;117(12):1939-1944.
45. van den Hooven EH, Jaddoe VW, de Kluizenaar Y, et al. Residential traffic exposure and pregnancy-related outcomes: a prospective birth cohort study. *Environ Health.* 2009;8:59.
46. Genereux M, Auger N, Goneau M, Daniel M. Neighbourhood socioeconomic status, maternal education and adverse birth outcomes among mothers living near highways. *J Epidemiol Community Health.* 2008;62(8):695-700.
47. EPA. CMAQ: The Community Multiscale Air Quality Modeling System. 2023; https://www.epa.gov/cmaq. Accessed November 17, 2023.
48. Nunes D. A Method for Quantifying Historical Air Quality in Unmonitored Regions Using Statistical Relationships Developed from Regional Air Quality Model Output. CMAS; October 5-7, 2015, 2015; Chapel Hill, NC.
49. CalEnviroScreen 4.0. https://oehha.ca.gov/media/downloads/calenviroscreen/report/calenviroscreen40reportf2021.pdf. Accessed October 19, 2023.
50. Maclure M. The case-crossover design: a method for studying transient effects on the risk of acute events. *Am J Epidemiol.* 1991;133(2):144-153.
51. Carracedo-Martínez E, Taracido M, Tobias A, Saez M, Figueiras A. Case-crossover analysis of air pollution health effects: a systematic review of methodology and application. *Environ Health Perspect.* 2010;118(8):1173-1182.
52. Janes H, Sheppard L, Lumley T. Case-crossover analyses of air pollution exposure data: referent selection strategies and their implications for bias. *Epidemiology.* 2005;16(6):717-726.
53. Costello JM, Steurer MA, Baer RJ, Witte JS, Jelliffe-Pawlowski LL. Residential particulate matter, proximity to major roads, traffic density and traffic volume as risk factors for preterm birth in California. *Paediatr Perinat Epidemiol.* 2022;36(1):70-79.
54. Volk HE, Hertz-Picciotto I, Delwiche L, Lurmann F, McConnell R. Residential proximity to freeways and autism in the CHARGE study. *Environ Health Perspect.* 2011;119(6):873-877.
55. Brugge D, Durant JL, Rioux C. Near-highway pollutants in motor vehicle exhaust: a review of epidemiologic evidence of cardiac and pulmonary health risks. *Environ Health.* 2007;6:23.
56. Boehmer TK, Stephanie, S. L., Henry J. R., Woghiren-Akinnifesi, E. L., Yip, F. Y. Residential Proximity to Major Highways — United States, 2010. https://www.cdc.gov/mmwr/preview/mmwrhtml/su6203a8.htm. Accessed November 2, 2023.
57. Ha S, Martinez V, Chan-Golston AM. Air pollution and preterm birth: A time-stratified case-crossover study in the San Joaquin Valley of California. *Paediatr Perinat Epidemiol.* 2022;36(1):80-89.
58. District SJVAPC. Web-based Archived Air Quality (WAAQ) System. https://apps.valleyair.org/WAAQS/. Accessed November 3, 2023.
59. Most Recent Asthma State or Territory Data. Accessed October 20, 2023.
60. California Asthma Dashboard. https://www.cdph.ca.gov/Programs/CCDPHP/DEODC/EHIB/CPE/Pages/CaliforniaBreathingCountyAsthmaProfiles.aspx.
61. Bronte-Moreno O, González-Barcala FJ, Muñoz-Gall X, Pueyo-Bastida A, Ramos-González J, Urrutia-Landa I. Impact of Air Pollution on Asthma: A Scoping Review. *Open Respir Arch.* 2023;5(2):100229.
62. Tiotiu AI, Novakova P, Nedeva D, et al. Impact of Air Pollution on Asthma Outcomes. *Int J Environ Res Public Health.* 2020;17(17).

63. California Department of Health Care Access and Information. Accessed October 20, 2023.
64. Bureau USC. QuickFacts Fresno city, California. Accessed October 26, 2023.
65. Liu S, Long Y, Yu S, et al. Borneol in cardio-cerebrovascular diseases: Pharmacological actions, mechanisms, and therapeutics. *Pharmacol Res.* 2021;169:105627.
66. Li D, Long Y, Yu S, et al. Research Advances in Cardio-Cerebrovascular Diseases of Ligusticum chuanxiong Hort. *Front Pharmacol.* 2021;12:832673.
67. CDPH. Heart Disease Prevention. https://www.cdph.ca.gov/Programs/CCDPHP/DCDIC/CDCB/Pages/HeartDiseasePrevention.aspx#:~:text=Nearly%20one%20in%20three%20adults,mirrors%20that%20of%20the%20nation. Accessed November 9, 2023.
68. CDPH. Cardiovascular Disease Prevention Program (CDPP). Accessed November 9, 2023.
69. Fresno County Departmnent of Public Health E, Surveilance, and Data Management Division. 2021 Leading Causes of Death. chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.fresnocountyca.gov/files/assets/county/v/1/public-health/epidemiology-surveillance-and-data-management/vital-statistics/2021-lcod-report_%C2%ADfinal.pdf.
70. Jiang Y, Huang J, Li G, et al. Ozone pollution and hospital admissions for cardiovascular events. *Eur Heart J.* 2023;44(18):1622-1632.
71. de Bont J, Jaganathan S, Dahlquist M, Persson A, Stafoggia M, Ljungman P. Ambient air pollution and cardiovascular diseases: An umbrella review of systematic reviews and meta-analyses. *J Intern Med.* 2022;291(6):779-800.
72. Klompmaker JO, Hart JE, James P, et al. Air pollution and cardiovascular disease hospitalization - Are associations modified by greenness, temperature and humidity? *Environ Int.* 2021;156:106715.
73. Aryal A, Harmon AC, Dugas TR. Particulate matter air pollutants and cardiovascular disease: Strategies for intervention. *Pharmacol Ther.* 2021;223:107890.
74. Rajagopalan S, Al-Kindi SG, Brook RD. Air Pollution and Cardiovascular Disease: JACC State-of-the-Art Review. *J Am Coll Cardiol.* 2018;72(17):2054-2070.
75. Franklin BA, Brook R, Arden Pope C, 3rd. Air pollution and cardiovascular disease. *Curr Probl Cardiol.* 2015;40(5):207-238.
76. Lederer AM, Fredriksen PM, Nkeh-Chungag BN, et al. Cardiovascular effects of air pollution: current evidence from animal and human studies. *Am J Physiol Heart Circ Physiol.* 2021;320(4):H1417-H1439.
77. Tibuakuu M, Michos ED, Navas-Acien A, Jones MR. Air Pollution and Cardiovascular Disease: A Focus on Vulnerable Populations Worldwide. *Curr Epidemiol Rep.* 2018;5(4):370-378.
78. Initiative SoGA. *State of the Global Air Report 2020.* HEI and IHME;2020.
79. City of Fresno GIS Data Hub. https://gis-cityoffresno.hub.arcgis.com/. Accessed October 22, 2023.
80. Bell ML, Belanger K. Review of research on residential mobility during pregnancy: consequences for assessment of prenatal environmental exposures. *J Expo Sci Environ Epidemiol.* 2012;22(5):429-438.

Attachment E

Aerial view of current Central Transport Facility at 2440 E Church Ave.

This site is approximately 4.4 acres with 26 truck docks. The proposed facility on S. Cherry will be on 15.95 acres with 106 truck docks.



Street-view of truck docks at current Central Transport Facility at 2440 E Church Ave.

Dock numbers are noted at each door. The building is double-loaded and there are dock doors on each side. There are a total of 26 truck docks.

Attachment F

Material Handling • Leasing • Property Design • Real Estate • Tactics

Aug 25 • Written By Chuck Berger

How Many Dock Positions Do I Need?

One of the most important facility requirements for any logistics operation is the amount of dock high positions an industrial building provides. Often overlooked, dock high positions can have a significant

of the internal and external factors which affect the amount of dock high positions required. The internal factors can include the amount of trucks serviced by the docks over a period of time (average and peak), the time to load and unload each trailer per dock, staging and cross-docking requirements, work hours over a period of time, employee breaks, drop trailer requirements, trash / bailing requirements, shifts, and shipping preferences.

External factors can include time of truck arrivals and departures, the reliability of carriers, whether carriers will back haul drop trailers, types of trailers used by carriers, and truck driver capabilities. A comprehensive understanding of these and any other internal and external factors will result in more precise understandings of an operation's dock high requirements.

In general, the minimum number of dock high positions are calculated based upon a formula involving their use, the amount of time they can be used, and a safety factor. Below are three examples of manual calculations using some of the internal and external factors above.

- Number of Truck Positions Needed = ((Number of Trucks per Year x Hours it takes to Load / Unload a Truck) / Work Hours per Year) x Safety Factor [1]
    - Inputs
        - 7,000 trucks per year
        - 2.5 hours for loading / unloading
        - 2080 work hours per year
        - Safety factor of 25%
    - Calculation
        - (7,000 trucks per year x 2.5 hours for loading / unloading) / 2080 work hours per year) = 8.4 x 1.25 safety factor = 10.5 docks or 11 dock high positions needed at a minimum
- Number of Truck Positions Needed = Number of Trucks per Hour x Turnaround Time per Hour [2]

        - 150 minute turnaround time
    - Calculation
        - (20 trucks per day / 8 hour work day) = 2.5 trucks per hour x (150 minute turnaround time / 60 minutes per hour = 2.5 turnaround time) = 6.25 dock positions needed or 7 positions needed
        - If all trucks arrive in AM, then work day would be shortened to 4 hours and the dock requirements would be 12.5 or 13 positions needed
- ((Peak trucks per day) x (Average dock time per truck) x (Safety factor of 1.5 to 2)) / Number of hours in work day [3]
    - Inputs
        - 20 trucks per day
        - 2.5 hours per truck
        - 8 hour work day
    - Calculation
        - ((20 trucks per day) x (2.5 hours per truck) x (1.5 safety factor)) / 8 hour work day = 9.375 docks required or 10 docks needed

These three calculations show that depending on the formula used, roughly the same inputs will yield slightly to drastically different minimum dock requirements. Where formulas 1 and 3 resulted in 11 and 10 positions required, formula 2 resulted in only 7. Not surprisingly, formula 2 did not employ a safety factor. Safety factors are used to account for unforeseen variability such as disruptions in deliveries or labor.

Companies may also employ manual simulations of dock requirements. These simulations include the detailed logging of docks used by the various types of vehicles that deliver or ship to a facility. These simulations can show how to improve dock assignments or delivery schedules for better dock utilization and determining of minimum docks required.[4]

factors involved with determining the minimum number of dock positions for a given operation.

Just Hit Go to discuss how we can match your company's requirements with a brand new property today!

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[1] Mulcahy, David E. Warehouse Distribution and Operations Handbook. New York: McGraw-Hill, 1994. 4.18-.20. Print.
[2] 4Front Engineered Solutions, Inc. "Dock Planning Standards." (n.d.): 10. Web. 31 July 2016.
[3] Gross & Associates. "Calculating Dock Door Requirements." (n.d.): n. pag. Web. 31 July 2016.
[4] Mulcahy, David E. Warehouse Distribution and Operations Handbook. New York: McGraw-Hill, 1994. 4.18-.20. Print.

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LTL Terminals: Key Locations for Efficient Freight Handling

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Did you know LTL freight shipping is only 10% to 15% of the industry? Yet, it's vital for many businesses. LTL terminals are the backbone of this system, moving goods across the country.

LTL terminals handle millions of shipments every year. They are key hubs where smaller loads are combined and sorted. This makes it affordable for small businesses to ship across the country.

As e-commerce grows, LTL (https://parcelpath.com/LTL/) terminals will become even more important. U.S. e-commerce sales are expected to jump from $657 billion to $1.9 trillion by 2029. These facilities will manage the rise in parcels and pallets.

Exploring LTL terminals reveals their role in shaping freight handling's future. They are more than just stops on the way. They are the heart of modern logistics (https://www.facebook.com/ParcelPath/).

Key Takeaways

- LTL shipping accounts for 10-15% of transportation industry volume
- LTL terminals are crucial for consolidating and distributing smaller freight loads
- E-commerce growth is increasing the importance of LTL terminals
- These facilities enable cost-effective shipping for businesses of all sizes
- LTL terminals are key to efficient supply chain management

Understanding LTL Freight Terminal Networks

LTL terminals are key in freight networks. They handle shipments from 150 to 15,000 pounds. These networks use a hub-and-spoke model to move goods efficiently.

Hub-and-Spoke Distribution Model

The hub-and-spoke system sends shipments through central hubs for sorting. This method helps carriers save money and work better. A typical LTL truck (https://parcelpath.com/ltl-freight/) stops 5-15 times a day for pickups.

Terminal Network Infrastructure

LTL terminals are important in freight networks. They can handle different shipments, from small pallets to big loads. The system supports 18 freight classes, from 50 to 500, as set by the National Motor Freight Traffic Association.

Cross-Docking Operations

Cross-docking is a big part of LTL shipping. It moves shipments quickly between vehicles. This makes shipping faster, cheaper, and more efficient. Cross-docking keeps goods moving smoothly through networks.

LTL Shipping Metric	Value
Typical Shipment Weight Range	150 – 15,000 pounds
Number of Freight Classes	18
Average Daily Truck Stops	5 – 15
Maximum Linear Feet of Trailer Space	12 feet

The Role of LTL Terminals in Supply Chain Management

LTL terminals are key in supply chain management. They are important hubs for handling freight. These places help businesses manage their logistics better and meet customer needs.

In today's e-commerce world, LTL (https://parcelpath.com/freight-shipping/) shipping is very important. It works for all kinds of products and orders. LTL terminals handle shipments from 100 to 10,000 pounds, with 1 to 6 pallets.

LTL terminals make supply chains more efficient. They help combine multiple LTL shipments into one big truckload. This saves money and boosts logistics performance. It's especially helpful for suppliers working with big retailers like Walmart.

LTL Shipping Aspect	Impact on Supply Chain
Shipment Size Flexibility	Handles 100-10,000 lbs, 1-6 pallets
Cost Reduction	Shared loads, maximized trailer space
Warehouse Efficiency	Reduced storage costs
Real-time Tracking	Enhanced shipment visibility

LTL terminals help make supply chains stronger. They offer real-time tracking and help with flexible shipping plans. As the logistics world changes, these terminals keep things running smoothly and cost-effective.

Key Components of Modern LTL Terminals

LTL terminals are the heart of efficient freight handling. They have modern parts that work together for smooth operations and on-time deliveries. Let's explore the main parts that make LTL shipping strong in the transport world.

Loading Dock Facilities

The loading dock is where it all starts. It's the entrance and exit for freight. Modern LTL terminals have many bays with adjustable dock levelers for different truck sizes.

This setup helps trucks move in and out fast. It also makes handling different shipments easy.

Sorting and Processing Areas

After freight gets in, it goes to the sorting area. Here, conveyor systems and barcode scanners help sort packages. They make sure each item goes to the right truck.

This high-tech sorting makes shipping cheaper and more efficient.

Storage and Staging Zones

Not all freight moves right away. Storage and staging zones hold it until it's ready. These areas are set up for easy access and quick loading.

Terminal Component	Function	Impact on Efficiency
Loading Docks	Freight entry/exit point	Reduces turnaround time
Sorting Areas	Package direction	Optimizes load consolidation
Storage Zones	Temporary freight holding	Enhances scheduling flexibility

These modern parts work together well. They help the global LTL market (https://parcelpath.com/ltl-market/) grow. By improving these areas, LTL terminals can cut shipping costs, speed up deliveries, and keep shipments on time.

Terminal Operations and Workflow Processes

LTL terminals are busy places where freight moves around a lot. They have special steps to make sure goods get from one place to another quickly.

Inbound Freight Processing

When freight comes to an LTL terminal, it gets checked and documented. Each shipment gets a special number for tracking. This first step helps everything run smoothly.

Sorting and Consolidation

Then, freight is sorted and combined with other shipments going the same way. This is key in LTL shipping. It helps save space and money on transport.

Outbound Distribution

The last step is getting freight ready to move again. Terminal operations change as needed. For example, if roads change, new routes are found to keep things moving.

Aspect	Details
Freight Movement	Multi-terminal operations (e.g., BCTERM to QCTERM via MBTERM)
Operational Strategy	Freight bill merges, adaptive routing (e.g., ABTERM as alternative)
Planning	Real-time updates, historical record keeping
Contingency	Emergency reroutes (e.g., ONTERM as intermediate terminal)
Delivery Focus	Continuous plan updates for timely delivery

Knowing how LTL terminals work is important. Each step is vital for fast and reliable freight transport.

Technology Integration in LTL Terminals

LTL terminals are using new tech to make things run smoother. They handle many shipments from different places. This means they need to manage lots of data accurately.

Even a tiny mistake can cause big problems. It can lead to late deliveries and wrong bills.

To fix these issues, LTL terminals are using tech. Optical Character Recognition (OCR) helps read data quickly and correctly. GPS tracking lets them watch shipments in real time. This helps them find the best routes and saves time.

Machine learning also helps a lot. It makes tasks like billing faster by doing less manual work.

The effects of using technology in LTL terminals are huge:

- 25% better safety for terminals and drivers
- 40% more accurate delivery times
- 10% less empty miles thanks to AI
- 3% less total miles driven

Cloud-based systems keep important data safe. This tech makes things run better and helps the planet too. For example, using Electronic Delivery Receipts (EDR) cuts down on paper waste.

Company	LTL Terminals	Equipment	Employees
Pitt Ohio	25	1,600+ tractors, 4,100+ trailers	5,400+
Sutton Transport	13	850+ pieces	700+

As LTL terminals keep using new tech, things will get even better. They'll be more efficient, accurate, and make customers happier. The future of LTL shipping looks bright with these tech advancements.

Location Strategies for LTL Terminals

Choosing the right spot for LTL terminals is like playing chess. Every move counts. Smart placement can make or break a shipping network. Let’s explore the key factors that shape these decisions.

Geographic Considerations

LTL terminals thrive near major highways and population hubs. They aim to be close to customers and key transport routes. Coastal areas with ports often host terminals to link sea and land freight.

Market Access Factors

Terminals position themselves to serve bustling industries and regions. They look at local business landscapes and growth trends. This smart placement helps cut costs and boost efficiency for shippers.

Transportation Infrastructure

Good roads and railways are vital for LTL terminals. They need smooth connections to move freight fast. Areas with strong transport networks often see more terminal development.

Factor	Impact on LTL Terminal Location
Proximity to Highways	Reduces transit times, improves accessibility
Population Density	Increases potential customer base
Industrial Zones	Provides steady freight flow, reduces empty miles
Rail Access	Enables intermodal shipping options

LTL terminals play a crucial role in efficient freight handling. Their location strategies focus on geographic reach, market access, and solid infrastructure. This careful planning ensures smooth operations and happy customers in the competitive world of shipping.

Terminal Safety and Security Measures

LTL terminals focus on safety and security. They protect workers and cargo with strong measures. These steps make sure the place is safe for handling and moving freight.

Keeping workers safe is key. They wear hard hats (https://parcelpath.com/how-to-ship-hats/) and safety glasses to avoid injuries. The terminals have strict rules for handling dangerous materials. This keeps the work area safe for everyone.

Security is also a big deal. The terminals use advanced cameras to watch what's happening. Only people who are allowed in can get in. They also track cargo closely to prevent theft or loss.

- Cargo theft went up by 49% in the first half of the year. There were 787 cases in the U.S.
- In Los Angeles, thieves took over $5 million in Nike shoes from containers.
- A worker in Memphis was caught stealing about $1 million in cargo.

To fight these problems, LTL terminals use different tactics:

Security Measure	Description
Advanced Tracking	GPS and RFID track cargo in real-time
Access Control	Biometric systems and ID checks limit entry
Video Surveillance	24/7 camera monitoring of terminal activities
Security Personnel	Trained guards patrol the premises

With these safety steps and security plans, LTL terminals make a safe space. They protect goods and keep workers safe during their journey.

Optimizing LTL Terminal Efficiency

LTL terminals are key in the shipping world. Their work affects costs and how fast things get delivered. With LTL rates up 60% since 2018, making things run smoothly is more important than ever.

Workforce Management

Getting the right people in place is crucial. It helps terminals deal with changing shipment numbers well. This way, they save on labor costs without sacrificing quality.

Equipment Utilization

Using equipment well is essential. LTL terminals use tech to keep track of their assets. For example, they offer a full domestic rating and booking system, making things run better.

Schedule Optimization

Good scheduling is vital in LTL shipping. Shipments might go through up to seven terminals over 2,000 miles. This means efficient planning can cut down on delays and damage.

By working on these areas, LTL terminals can do better. Customers who use LTL pool distribution save 15-30% on costs. This shows the real benefits of making things more efficient.

Environmental Considerations in LTL Terminals

LTL terminals are now using eco-friendly ways to lessen their harm to the environment. They are finding new ways to be more sustainable while still moving goods efficiently.

They are installing energy-saving lights and HVAC systems. These changes cut down on energy use and lower costs. They also have recycling programs to reduce waste and use resources wisely.

Electric vehicles are becoming more common for short trips in ltl terminals. This move cuts down on pollution and noise in cities. They also focus on better routes to use less fuel and lower emissions.

LTL shipping helps the environment too. By combining shipments, fewer trucks are on the road. This means less pollution. It also helps businesses save money and reduce their carbon footprint.

Environmental Initiative	Impact
Energy-efficient lighting	Reduced energy consumption
Electric vehicles	Lower emissions and noise pollution
Route optimization	Decreased fuel consumption
Shipment consolidation	Fewer trucks on the road

These steps show the ltl industry's (https://parcelpath.com/ltl-industry/) dedication to green logistics. As technology improves and awareness grows, we'll see more creative ways to make freight handling better for the planet.

ParcelPath's Role in LTL Shipping Solutions

ParcelPath is changing the game in LTL shipping. It offers services for all businesses, from small startups to big corporations. With advanced tech and partnerships, ParcelPath makes shipping cheaper and easier.

Discount Shipping Options

ParcelPath's big feature is its discounts. You can save 60% to 89% on shipping. This makes LTL shipping cheaper for all businesses. You can see prices before you sign up, so you always get a good deal.

PalletPath Integration

For big items, ParcelPath has PalletPath. It gives big discounts on pallet shipping. This makes shipping big goods cheaper and easier. Using both ParcelPath and PalletPath helps businesses ship all kinds of goods well.

Small Business Solutions

ParcelPath helps small businesses a lot. It gives them access to good rates and services. This lets small businesses compete better and save money.

ParcelPath is changing how businesses handle shipping. It saves a lot of money and offers solutions for all shipping needs. It's a key tool for businesses to stay ahead in today's market.

Conclusion

LTL terminals are key to efficient freight handling in the shipping world. They handle shipments from 150 to 15,000 pounds. This usually means 1-10 pallets.

LTL shipping lets businesses share truck space. This can save a lot of money compared to full truckload options.

How long it takes to ship depends on the distance. Shipments within the same state take 1-2 days. Cross-country trips take 4-6 business days.

Even though it's a bit longer than FTL shipping, LTL is cheaper. Companies like Mothership and ShipBob are making it better. They offer nationwide service and smart inventory placement to cut costs and times.

As online shopping grows, LTL terminals will become even more important. Knowing how LTL shipping works helps businesses improve their logistics. The future of LTL terminals looks bright, promising more efficiency and green practices in freight handling.

Related Posts

- LTL Trailer: Enhance Your Freight Shipping Efficiency (https://parcelpath.com/ltl-trailer/)
- LTL Experience: Navigating the World of Less-Than-Truckload Shipping (https://parcelpath.com/ltl-experience/)
- Local LTL Carriers: Partner with Trusted Freight Providers (https://parcelpath.com/local-ltl-carriers/)
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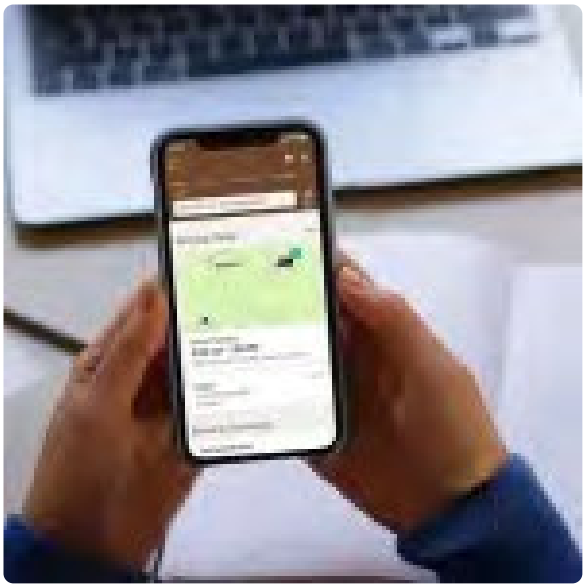

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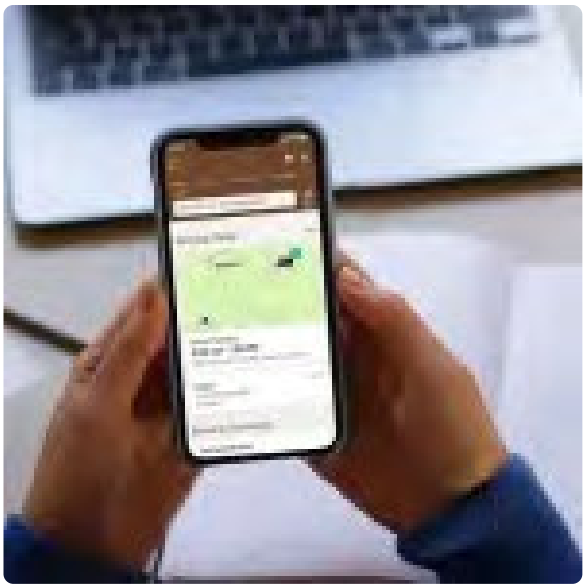

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Founded in 2019, ParcelPath helps small businesses thrive by making door-to-door package delivery simple, reliable, and affordable.

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Attachment G

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ROB BONTA
Attorney General

State of California
DEPARTMENT OF JUSTICE

Warehouse Projects: Best Practices and Mitigation Measures to Comply with the California Environmental Quality Act

Table of Contents

I. Background 1
II. Proactive Planning: General Plans, Local Ordinances, and Good Neighbor Policies 3
III. Community Engagement 4
IV. Warehouse Siting and Design Considerations 5
V. Air Quality and Greenhouse Gas Emissions Analysis and Mitigation 7
VI. Noise Impacts Analysis and Mitigation 10
VII. Traffic Impacts Analysis and Mitigation 11
VIII. Other Significant Environmental Impacts Analysis and Mitigation 12
IX. Conclusion 13

In carrying out its duty to enforce laws across California, the California Attorney General's Bureau of Environmental Justice (Bureau)[1] regularly reviews proposed warehouse projects for compliance with the California Environmental Quality Act (CEQA) and other laws. When necessary, the Bureau submits comment letters to lead agencies regarding warehouse projects, and in rare cases the Bureau has filed litigation to enforce CEQA.[2] This document builds upon the Bureau's work on warehouse projects, collecting information gained from the Bureau's review of hundreds of warehouse projects across the state.[3] It is meant to help lead agencies pursue CEQA compliance and promote environmentally-just development as they confront warehouse project proposals.[4] While CEQA analysis is necessarily project-specific, this document provides information on feasible best practices and mitigation measures, nearly all of which have been adapted from actual warehouse projects in California.

I. Background

In recent years, the proliferation of e-commerce and rising consumer expectations of rapid shipping have contributed to a boom in warehouse development.[5] California, with its ports, population centers, and transportation network, has found itself at the center of this trend. In 2020, the Ports of Los Angeles, Long Beach, and Oakland collectively accounted for over 34% of all United States international container trade.[6] The Ports of Los Angeles and Long Beach alone generate about 35,000 container truck trips every day.[7] Accordingly, the South Coast Air Basin now contains approximately 3,000 warehouses of over 100,000 square feet each, with a total warehouse capacity of approximately 700 million square feet, an increase of 20 percent over the last five years.[8] This trend has only accelerated, with e-commerce growing to

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[1] https://oag.ca.gov/environment/justice.

[2] https://oag.ca.gov/environment/ceqa; *People of the State of California v. City of Fontana* (Super. Ct. San Bernardino County, No. CIVSB2121829); *South Central Neighbors United et al. v. City of Fresno et al.* (Super. Ct. Fresno County, No. 18CECG00690).

[3] This September 2022 version revises and replaces the prior March 2021 version of this document.

[4] Anyone reviewing this document to determine CEQA compliance responsibilities should consult their own attorney for legal advice.

[5] As used in this document, "warehouse" or "logistics facility" is defined as a facility consisting of one or more buildings that stores cargo, goods, or products on a short- or long-term basis for later distribution to businesses and/or retail customers.

[6] Data from the Bureau of Transportation Statistics, Container TEUs (Twenty-foot Equivalent Units) (2020), https://data.bts.gov/stories/s/Container-TEU/x3fb-aeda/ (Ports of Los Angeles, Long Beach, and Oakland combined for 14.157 million TEUs, 34% of 41.24 million TEUs total nationwide) (last accessed September 18, 2022).

[7] U.S. Dept. of Transportation, Federal Highway Administration, *FHWA Operations Support – Port Peak Pricing Program Evaluation* (2020), available at https://ops.fhwa.dot.gov/publications/fhwahop09014/sect2.htm (last accessed September 18, 2022).

[8] South Coast Air Qual. Mgmt. Dist., *Final Socioeconomic Assessment for Proposed Rule 2305 – Warehouse Indirect Source Rule – Warehouse Actions and Investments to Reduce Emissions (WAIRE) Program and Proposed Rule 316 – Fees for Rule 2305*, at 7-8, 41 (May 2021).

13% of all retail sales and 2021 being a second consecutive record year for new warehouse space leased.[9] The latest data and forecasts predict that the next wave of warehouse development will be in the Central Valley.[10]

When done properly, these activities can contribute to the economy and consumer welfare. However, imprudent warehouse development can harm local communities and the environment. Among other pollutants, diesel trucks visiting warehouses emit nitrogen oxide (NO_x)—a primary precursor to smog formation and a significant factor in the development of respiratory problems like asthma, bronchitis, and lung irritation—and diesel particulate matter (a subset of fine particular matter that is smaller than 2.5 micrometers)—a contributor to cancer, heart disease, respiratory illnesses, and premature death.[11] Trucks and on-site loading activities can also be loud, bringing disruptive noise levels during 24/7 operation that can cause hearing damage after prolonged exposure.[12] The hundreds, and sometimes thousands, of daily truck and passenger car trips that warehouses generate contribute to traffic jams, deterioration of road surfaces, and traffic accidents.

These environmental impacts also tend to be concentrated in neighborhoods already suffering from disproportionate health impacts and systemic vulnerability. For example, a comprehensive study by the South Coast Air Quality Management District found that communities located near large warehouses scored far higher on California's environmental justice screening tool, which measures overall pollution and demographic vulnerability.[13] That

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[9] U.S. Census Bureau News, Quarterly Retail E-Commerce Sales 4th Quarter 2021 (February 22, 2022), https://www.census.gov/retail/mrts/www/data/pdf/ec_current.pdf (last accessed September 18, 2022); CBRE Research, *2022 North America Industrial Big Box Report: Review and Outlook*, at 2-3 (March 2022), *available at* https://www.cbre.com/insights/reports/2022-north-america-industrial-big-box#download-report (last accessed September 18, 2022).
[10] CBRE Research, *supra note* 9, at 4, 36; New York Times, *Warehouses Are Headed to the Central Valley, Too* (Jul. 22, 2020), *available* at https://www.nytimes.com/2020/07/22/us/coronavirus-ca-warehouse-workers.html.
[11] California Air Resources Board, Nitrogen Dioxide & Health, https://ww2.arb.ca.gov/resources/nitrogen-dioxide-and-health (last accessed September 18, 2022) (NOx); California Air Resources Board, Summary: Diesel Particular Matter Health Impacts, https://ww2.arb.ca.gov/resources/summary-diesel-particulate-matter-health-impacts (last accessed September 18, 2022); Office of Environmental Health Hazard Assessment and American Lung Association of California, Health Effects of Diesel Exhaust, https://oehha.ca.gov/media/downloads/calenviroscreen/indicators/diesel4-02.pdf (last accessed September 18, 2022) (DPM).
[12] Noise Sources and Their Effects, https://www.chem.purdue.edu/chemsafety/Training/PPETrain/dblevels.htm (last accessed September 18, 2022) (a diesel truck moving 40 miles per hour, 50 feet away, produces 84 decibels of sound).
[13] South Coast Air Quality Management District, "Final Socioeconomic Assessment for Proposed Rule 2305 – Warehouse Indirect Source Rule – Warehouse Actions and Investments to Reduce Emissions (WAIRE) Program and Proposed Rule 316 – Fees for Rule 2305" (May 2021), at 4-5.

study concluded that, compared to the South Coast Air Basin averages, communities in the South Coast Air Basin near large warehouses had a substantially higher proportion of people of color; were exposed to more diesel particulate matter; had higher rates of asthma, cardiovascular disease, and low birth weights; and had higher poverty and unemployment rates.[14] Each area has its own unique history, but many of these impacts and vulnerabilities reflect historic redlining practices in these communities, which devalued land and concentrated poverty, racial outgroups, and pollution into designated areas.[15]

II. Proactive Planning: General Plans, Local Ordinances, and Good Neighbor Policies

To systematically guide warehouse development, we encourage local governing bodies to proactively plan for logistics projects in their jurisdictions. Proactive planning allows jurisdictions to prevent land use conflicts before they materialize and direct sustainable development. Benefits also include providing a predictable business environment, protecting residents from environmental harm, and setting consistent expectations jurisdiction-wide.

Proactive planning can take many forms. Land use designation and zoning decisions should channel development into appropriate areas. For example, establishing industrial districts near major highway and rail corridors but away from sensitive receptors[16] can help attract investment while avoiding conflicts between warehouse facilities and residential communities. Transition zones with lighter industrial and commercial land uses may also help minimize conflicts between residential and industrial uses.

In addition, general plan policies, local ordinances, and good neighbor policies should set minimum standards for logistics projects. General plan policies can be incorporated into existing economic development, land use, circulation, or other related general plan elements. Many jurisdictions alternatively choose to consolidate policies in a separate environmental justice element. Adopting general plan policies to guide warehouse development may also help

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[14] *Id*. at 5-7.

[15] Beginning in the 1930s, federal housing policy directed investment away from Black, immigrant, and working-class communities by color-coding neighborhoods according to the purported "riskiness" of loaning to their residents. In California cities where such "redlining" maps were drawn, nearly all of the communities where warehouses are now concentrated were formerly coded "red," signifying the least desirable areas where investment was to be avoided. *See* University of Richmond Digital Scholarship Lab, Mapping Inequality, https://dsl.richmond.edu/panorama/redlining/#loc=12/33.748/-118.272&city=los-angeles-ca (Los Angeles), https://dsl.richmond.edu/panorama/redlining/#loc=13/32.685/-117.132&city=san-diego-ca (San Diego), https://dsl.richmond.edu/panorama/redlining/#loc=11/37.81/-122.38&city=oakland-ca (Oakland), https://dsl.richmond.edu/panorama/redlining/#loc=13/37.956/-121.326&city=stockton-ca (Stockton), https://dsl.richmond.edu/panorama/redlining/#loc=12/36.751/-119.86&city=fresno-ca (Fresno) (all last accessed September 18, 2022).

[16] In this document, "sensitive receptors" refers to residences, schools, public recreation facilities, health care facilities, places of worship, daycare facilities, community centers, or incarceration facilities.

jurisdictions comply with their obligations under SB 1000, which requires local government general plans to identify objectives and policies to reduce health risks in disadvantaged communities, promote civil engagement in the public decision making process, and prioritize improvements and programs that address the needs of disadvantaged communities.[17]

Local ordinances and good neighbor policies that set development standards for all warehouses in the jurisdiction are a critical and increasingly common tool that serve several goals. When well-designed, these ordinances direct investment to local improvements, provide predictability for developers, conserve government resources by streamlining project review processes, and reduce the environmental impacts of industrial development. While many jurisdictions have adopted warehouse-specific development standards, an ordinance in the City of Fontana provides an example to review and build upon.[18] Good neighbor policies in Riverside County and by the Western Riverside Council of Government include additional measures worth consideration.[19]

The Bureau encourages jurisdictions to adopt their own local ordinances that combine the strongest policies from those models with measures discussed in the remainder of this document.

III. Community Engagement

Early and consistent community engagement is central to establishing good relationships between communities, lead agencies, and warehouse developers and tenants. Robust community engagement can give lead agencies access to community residents' on-the-ground knowledge and information about their concerns, build community support for projects, and develop creative solutions to ensure new logistics facilities are mutually beneficial. Examples of best practices for community engagement include:

- Holding a series of community meetings at times and locations convenient to members of the affected community and incorporating suggestions into the project design.
- Posting information in hard copy in public gathering spaces and on a website about the project. The information should include a complete, accurate project description, maps and drawings of the project design, and information about how the public can provide input and be involved in the project approval process. The

[17] For more information about SB 1000, *see* https://oag.ca.gov/environment/sb1000.
[18] https://oag.ca.gov/system/files/attachments/press-docs/Final%20Signed%20Fontana%20Ordinance.pdf (last accessed September 18, 2022).
[19] For example, the Riverside County policy requires community benefits agreements and supplemental funding contributions toward additional pollution offsets, and the Western Riverside Council of Governments policy sets a minimum buffer zone of 300 meters between warehouses and sensitive receptors. https://www.rivcocob.org/wp-content/uploads/2020/01/Good-Neighbor-Policy-F-3-Final-Adopted.pdf (last accessed September 18, 2022) (Riverside County); http://www.wrcog.cog.ca.us/DocumentCenter/View/318/Good-Neighbor-Guidelines-for-Siting-Warehouse-Distribution-Facilities-PDF?bidId= (last accessed September 18, 2022) (Western Riverside Council of Governments).

information should be in a format that is easy to navigate and understand for members of the affected community.

- Providing notice by mail to residents and schools within a certain radius of the project and along transportation corridors to be used by vehicles visiting the project, and by posting a prominent sign on the project site. The notice should include a brief project description and directions for accessing complete information about the project and for providing input on the project.
- Providing translation or interpretation in residents' native language, where appropriate.
- For public meetings broadcast online or otherwise held remotely, providing for access and public comment by telephone and supplying instructions for access and public comment with ample lead time prior to the meeting.
- Partnering with local community-based organizations to solicit feedback, leverage local networks, co-host meetings, and build support.
- Considering adoption of a community benefits agreement, negotiated with input from affected residents and businesses, by which the developer provides benefits to the affected community.
- Creating a community advisory board made up of local residents to review and provide feedback on project proposals in early planning stages.
- Identifying a person to act as a community liaison concerning on-site construction activity and operations, and providing contact information for the community liaison to the surrounding community.
- Requiring signage in public view at warehouse facilities with contact information for a local designated representative for the facility operator who can receive community complaints, and requiring any complaints to be answered by the facility operator within 48 hours of receipt.

IV. Warehouse Siting and Design Considerations

The most important consideration when planning a logistics facility is its location. Warehouses located in residential neighborhoods or near sensitive receptors expose community residents and those using or visiting sensitive receptor sites to the air pollution, noise, traffic, and other environmental impacts they generate. Therefore, placing facilities away from sensitive receptors significantly reduces their environmental and quality of life harms on local communities. The suggested best practices for siting and design of warehouse facilities does not relieve lead agencies' responsibility under CEQA to conduct a project-specific analysis of the project's impacts and evaluation of feasible mitigation measures and alternatives; lead agencies' incorporation of the best practices must be part of the impact, mitigation and alternatives analyses to meet the requirements of CEQA. Examples of best practices when siting and designing warehouse facilities include:

- Per California Air Resources Board (CARB) guidance, siting warehouse facilities so that their property lines are at least 1,000 feet from the property lines of the nearest sensitive receptors.[20]
- Providing adequate amounts of on-site parking to prevent trucks and other vehicles from parking or idling on public streets and to reduce demand for off-site truck yards.
- Establishing setbacks from the property line of the nearest sensitive receptor to warehouse dock doors, loading areas, and truck drive aisles, and locating warehouse dock doors, loading areas, and truck drive aisles on the opposite side of the building from the nearest sensitive receptors—e.g., placing dock doors on the north side of the facility if sensitive receptors are near the south side of the facility.
- Placing facility entry and exit points from the public street away from sensitive receptors—e.g., placing these points on the north side of the facility if sensitive receptors are adjacent to the south side of the facility.
- Ensuring heavy duty trucks abide by the on-site circulation plans by constructing physical barriers to block those trucks from using areas of the project site restricted to light duty vehicles or emergency vehicles only.
- Preventing truck queuing spillover onto surrounding streets by positioning entry gates after a minimum of 140 feet of space for queuing, and increasing the distance by 70 feet for every 20 loading docks beyond 50 docks.
- Locating facility entry and exit points on streets of higher commercial classification that are designed to accommodate heavy duty truck usage.
- Screening the warehouse site perimeter and onsite areas with significant truck traffic (e.g., dock doors and drive aisles) by creating physical, structural, and/or vegetative buffers that prevent or substantially reduce pollutant and noise dispersion from the facility to sensitive receptors.
- Planting exclusively 36-inch box evergreen trees to ensure faster maturity and four-season foliage.
- Requiring all property owners and successors in interest to maintain onsite trees and vegetation for the duration of ownership, including replacing any dead or unhealthy trees and vegetation.
- Posting signs clearly showing the designated entry and exit points from the public street for trucks and service vehicles.
- Including signs and drive aisle pavement markings that clearly identify onsite circulation patterns to minimize unnecessary onsite vehicle travel.
- Posting signs indicating that all parking and maintenance of trucks must be conducted within designated on-site areas and not within the surrounding community or public streets.

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[20] CARB, Air Quality and Land Use Handbook: A Community Health Perspective (April 2005), at ES-1. CARB staff has released draft updates to this siting and design guidance which suggests a greater distance may be warranted in some scenarios. CARB, Concept Paper for the Freight Handbook (December 2019), *available at* https://ww2.arb.ca.gov/sites/default/files/2020-03/2019.12.12%20-%20Concept%20Paper%20for%20the%20Freight%20Handbook_1.pdf (last accessed September 18, 2022).

V. Air Quality and Greenhouse Gas Emissions Analysis and Mitigation

Emissions of air pollutants and greenhouse gases are often among the most substantial environmental impacts from new warehouse facilities. CEQA compliance demands a proper accounting of the full air quality and greenhouse gas impacts of logistics facilities and adoption of all feasible mitigation of significant impacts. Although efforts by CARB and other authorities to regulate the heavy-duty truck and off-road diesel fleets have made excellent progress in reducing the air quality impacts of logistics facilities, the opportunity remains for local jurisdictions to further mitigate these impacts at the project level. Lead agencies and developers should also consider designing projects with their long-term viability in mind. Constructing the necessary infrastructure to prepare for the zero-emission future of goods movement not only reduces a facility's emissions and local impact now, but it can also save money as demand for zero-emission infrastructure grows. In planning new logistics facilities, the Bureau strongly encourages developers to consider the local, statewide, and global impacts of their projects' emissions.

Examples of best practices when studying air quality and greenhouse gas impacts include:

- Fully analyzing all reasonably foreseeable project impacts, including cumulative impacts. In general, new warehouse developments are not ministerial under CEQA because they involve public officials' personal judgment as to the wisdom or manner of carrying out the project, even when warehouses are permitted by a site's applicable zoning and/or general plan land use designation.[21]
- When analyzing cumulative impacts, thoroughly considering the project's incremental impact in combination with past, present, and reasonably foreseeable future projects, even if the project's individual impacts alone do not exceed the applicable significance thresholds.
- Preparing a quantitative air quality study in accordance with local air district guidelines.
- Preparing a quantitative health risk assessment in accordance with California Office of Environmental Health Hazard Assessment and local air district guidelines.
- Refraining from labeling compliance with CARB or air district regulations as a mitigation measure—compliance with applicable regulations is required regardless of CEQA.
- Disclosing air pollution from the entire expected length of truck trips. CEQA requires full public disclosure of a project's anticipated truck trips, which entails calculating truck trip length based on likely truck trip destinations, rather than the distance from the facility to the edge of the air basin, local jurisdiction, or other truncated endpoint. All air pollution associated with the project must be considered, regardless of where those impacts occur.

[21] CEQA Guidelines § 15369.

- Accounting for all reasonably foreseeable greenhouse gas emissions from the project, without discounting projected emissions based on participation in California's Cap-and-Trade Program.

Examples of measures to mitigate air quality and greenhouse gas impacts from construction are below. To ensure mitigation measures are enforceable and effective, they should be imposed as permit conditions on the project where applicable.

- Requiring off-road construction equipment to be hybrid electric-diesel or zero-emission, where available, and all diesel-fueled off-road construction equipment to be equipped with CARB Tier IV-compliant engines or better, and including this requirement in applicable bid documents, purchase orders, and contracts, with successful contractors demonstrating the ability to supply the compliant construction equipment for use prior to any ground-disturbing and construction activities.
- Prohibiting off-road diesel-powered equipment from being in the "on" position for more than 10 hours per day.
- Using electric-powered hand tools, forklifts, and pressure washers, and providing electrical hook ups to the power grid rather than use of diesel-fueled generators to supply their power.
- Designating an area in the construction site where electric-powered construction vehicles and equipment can charge.
- Limiting the amount of daily grading disturbance area.
- Prohibiting grading on days with an Air Quality Index forecast of greater than 100 for particulates or ozone for the project area.
- Forbidding idling of heavy equipment for more than three minutes.
- Keeping onsite and furnishing to the lead agency or other regulators upon request, all equipment maintenance records and data sheets, including design specifications and emission control tier classifications.
- Conducting an on-site inspection to verify compliance with construction mitigation and to identify other opportunities to further reduce construction impacts.
- Using paints, architectural coatings, and industrial maintenance coatings that have volatile organic compound levels of less than 10 g/L.
- Providing information on transit and ridesharing programs and services to construction employees.
- Providing meal options onsite or shuttles between the facility and nearby meal destinations for construction employees.

Examples of measures to mitigate air quality and greenhouse gas impacts from operation include:

- Requiring all heavy-duty vehicles engaged in drayage[22] to or from the project site to be zero-emission beginning in 2030.

[22] "Drayage" refers generally to transport of cargo to or from a seaport or intermodal railyard.

- Requiring all on-site motorized operational equipment, such as forklifts and yard trucks, to be zero-emission with the necessary charging or fueling stations provided.
- Requiring tenants to use zero-emission light- and medium-duty vehicles as part of business operations.
- Forbidding trucks from idling for more than three minutes and requiring operators to turn off engines when not in use.
- Posting both interior- and exterior-facing signs, including signs directed at all dock and delivery areas, identifying idling restrictions and contact information to report violations to CARB, the local air district, and the building manager.
- Installing solar photovoltaic systems on the project site of a specified electrical generation capacity that is equal to or greater than the building's projected energy needs, including all electrical chargers.
- Designing all project building roofs to accommodate the maximum future coverage of solar panels and installing the maximum solar power generation capacity feasible.
- Constructing zero-emission truck charging/fueling stations proportional to the number of dock doors at the project.
- Running conduit to designated locations for future electric truck charging stations.
- Unless the owner of the facility records a covenant on the title of the underlying property ensuring that the property cannot be used to provide refrigerated warehouse space, constructing electric plugs for electric transport refrigeration units at every dock door and requiring truck operators with transport refrigeration units to use the electric plugs when at loading docks.
- Oversizing electrical rooms by 25 percent or providing a secondary electrical room to accommodate future expansion of electric vehicle charging capability.
- Constructing and maintaining electric light-duty vehicle charging stations proportional to the number of employee parking spaces (for example, requiring at least 10% of all employee parking spaces to be equipped with electric vehicle charging stations of at least Level 2 charging performance)
- Running conduit to an additional proportion of employee parking spaces for a future increase in the number of electric light-duty charging stations.
- Installing and maintaining, at the manufacturer's recommended maintenance intervals, air filtration systems at sensitive receptors within a certain radius of facility for the life of the project.
- Installing and maintaining, at the manufacturer's recommended maintenance intervals, an air monitoring station proximate to sensitive receptors and the facility for the life of the project, and making the resulting data publicly available in real time. While air monitoring does not mitigate the air quality or greenhouse gas impacts of a facility, it nonetheless benefits the affected community by providing information that can be used to improve air quality or avoid exposure to unhealthy air.
- Requiring all stand-by emergency generators to be powered by a non-diesel fuel.
- Requiring facility operators to train managers and employees on efficient scheduling and load management to eliminate unnecessary queuing and idling of

trucks.

- Requiring operators to establish and promote a rideshare program that discourages single-occupancy vehicle trips and provides financial incentives for alternate modes of transportation, including carpooling, public transit, and biking.
- Meeting CalGreen Tier 2 green building standards, including all provisions related to designated parking for clean air vehicles, electric vehicle charging, and bicycle parking.
- Designing to LEED green building certification standards.
- Providing meal options onsite or shuttles between the facility and nearby meal destinations.
- Posting signs at every truck exit driveway providing directional information to the truck route.
- Improving and maintaining vegetation and tree canopy for residents in and around the project area.
- Requiring that every tenant train its staff in charge of keeping vehicle records in diesel technologies and compliance with CARB regulations, by attending CARB-approved courses. Also require facility operators to maintain records on-site demonstrating compliance and make records available for inspection by the local jurisdiction, air district, and state upon request.
- Requiring tenants to enroll in the United States Environmental Protection Agency's SmartWay program, and requiring tenants who own, operate, or hire trucking carriers with more than 100 trucks to use carriers that are SmartWay carriers.
- Providing tenants with information on incentive programs, such as the Carl Moyer Program and Voucher Incentive Program, to upgrade their fleets.

VI. Noise Impacts Analysis and Mitigation

The noise associated with logistics facilities can be among their most intrusive impacts to nearby sensitive receptors. Various sources, such as unloading activity, diesel truck movement, and rooftop air conditioning units, can contribute substantial noise pollution. These impacts are exacerbated by logistics facilities' typical 24-hour, seven-days-per-week operation. Construction noise is often even greater than operational noise, so if a project site is near sensitive receptors, developers and lead agencies should adopt measures to reduce the noise generated by both construction and operation activities.

Examples of best practices when studying noise impacts include:

- Preparing a noise impact analysis that considers all reasonably foreseeable project noise impacts, including to nearby sensitive receptors. All reasonably foreseeable project noise impacts encompasses noise from both construction and operations, including stationary, on-site, and off-site noise sources.
- Adopting a lower significance threshold for incremental noise increases when baseline noise already exceeds total noise significance thresholds, to account for the cumulative impact of additional noise and the fact that, as noise moves up the decibel scale, each decibel increase is a progressively greater increase in sound

pressure than the last. For example, 70 dBA is ten times more sound pressure than 60 dBA.

- Disclosing and considering the significance of short-term noise levels associated with all aspects of project operation (i.e. both on-site noise generation and off-site truck noise). Considering only average noise levels may mask noise impacts sensitive receptors would consider significant—for example, the repeated but short-lived passing of individual trucks or loading activities at night.

Examples of measures to mitigate noise impacts include:

- Constructing physical, structural, or vegetative noise barriers on and/or off the project site.
- Planning and enforcing truck routes that avoid passing sensitive receptors.
- Locating or parking all stationary construction equipment as far from sensitive receptors as possible, and directing emitted noise away from sensitive receptors.
- Verifying that construction equipment has properly operating and maintained mufflers.
- Requiring all combustion-powered construction equipment to be surrounded by a noise protection barrier
- Limiting operation hours to daytime hours on weekdays.
- Paving roads where truck traffic is anticipated with low noise asphalt.
- Orienting any public address systems onsite away from sensitive receptors and setting system volume at a level not readily audible past the property line.

VII. Traffic Impacts Analysis and Mitigation

Warehouse facilities inevitably bring truck and passenger car traffic. Truck traffic can present substantial safety issues. Collisions with heavy-duty trucks are especially dangerous for passenger cars, motorcycles, bicycles, and pedestrians. These concerns can be even greater if truck traffic passes through residential areas, school zones, or other places where pedestrians are common and extra caution is warranted.

Examples of measures to mitigate traffic impacts include:

- Designing, clearly marking, and enforcing truck routes that keep trucks out of residential neighborhoods and away from other sensitive receptors.
- Installing signs in residential areas noting that truck and employee parking is prohibited.
- Requiring preparation and approval of a truck routing plan describing the facility's hours of operation, types of items to be stored, and truck routing to and from the facility to designated truck routes that avoids passing sensitive receptors. The plan should include measures for preventing truck queuing, circling, stopping, and parking on public streets, such as signage, pavement markings, and queuing analysis and enforcement. The plan should hold facility operators responsible for violations of the truck routing plan, and a revised plan should be required from any new tenant that occupies the property before a business license

is issued. The approving agency should retain discretion to determine if changes to the plan are necessary, including any additional measures to alleviate truck routing and parking issues that may arise during the life of the facility.

- Constructing new or improved transit stops, sidewalks, bicycle lanes, and crosswalks, with special attention to ensuring safe routes to schools.
- Consulting with the local public transit agency and securing increased public transit service to the project area.
- Designating areas for employee pickup and drop-off.
- Implementing traffic control and safety measures, such as speed bumps, speed limits, or new traffic signs or signals.
- Placing facility entry and exit points on major streets that do not have adjacent sensitive receptors.
- Restricting the turns trucks can make entering and exiting the facility to route trucks away from sensitive receptors.
- Constructing roadway improvements to improve traffic flow.
- Preparing a construction traffic control plan prior to grading, detailing the locations of equipment staging areas, material stockpiles, proposed road closures, and hours of construction operations, and designing the plan to minimize impacts to roads frequented by passenger cars, pedestrians, bicyclists, and other non-truck traffic.

VIII. Other Significant Environmental Impacts Analysis and Mitigation

Warehouse projects may result in significant environmental impacts to other resources, such as to aesthetics, cultural resources, energy, geology, or hazardous materials. All significant adverse environmental impacts must be evaluated, disclosed and mitigated to the extent feasible under CEQA. Examples of best practices and mitigation measures to reduce environmental impacts that do not fall under any of the above categories include:

- Appointing a compliance officer who is responsible for implementing all mitigation measures, and providing contact information for the compliance officer to the lead agency, to be updated annually.
- Creating a fund to mitigate impacts on affected residents, schools, places of worship, and other community institutions by retrofitting their property. For example, retaining a contractor to retrofit/install HVAC and/or air filtration systems, doors, dual-paned windows, and sound- and vibration-deadening insulation and curtains.
- Sweeping surrounding streets on a daily basis during construction to remove any construction-related debris and dirt.
- Directing all lighting at the facility into the interior of the site.
- Using full cut-off light shields and/or anti-glare lighting.
- Requiring submission of a property maintenance program for agency review and approval providing for the regular maintenance of all building structures, landscaping, and paved surfaces.
- Using cool pavement to reduce heat island effects.

- Planting trees in parking areas to provide at least 35% shade cover of parking areas within fifteen years to reduce heat island impacts.
- Using light colored roofing materials with a solar reflective index of 78 or greater.
- Including on-site amenities, such as a truck operator lounge with restrooms, vending machines, and air conditioning, to reduce the need for truck operators to idle or travel offsite.
- Designing skylights to provide natural light to interior worker areas.
- Installing climate control and air filtration in the warehouse facility to promote worker well-being.

IX. Conclusion

California's world-class economy, ports, and transportation network position it at the center of the e-commerce and logistics industry boom. At the same time, California is a global leader in environmental protection and environmentally just development. The guidance in this document furthers these dual strengths, ensuring that all can access the benefits of economic development. The Bureau will continue to monitor proposed projects for compliance with CEQA and other laws. Lead agencies, developers, community advocates, and other interested parties should feel free to reach out to us as they consider how to guide warehouse development in their area.

Please do not hesitate to contact the Environmental Justice Bureau at ej@doj.ca.gov if you have any questions.

Attachment H

LEADERSHIP COUNSEL FOR JUSTICE & ACCOUNTABILITY

GOLDEN GATE UNIVERSITY SCHOOL OF LAW ENVIRONMENTAL LAW AND JUSTICE CLINIC

DECLARATION OF TERRY M. HIRSCHFIELD IN SUPPORT OF SOUTH FRESNO COMMUNITY ALLIANCE'S COMMENTS ON THE CITY OF FRESNO'S GENERAL PLAN FINAL PROGRAMMATIC ENVIRONMENTAL IMPACT REPORT (SCH #2109050005)

I, Terry M. Hirschfield, declare:

1. I am the superintendent of the Orange Center School District, which is a single-school district comprised of the Orange Center Elementary School (the "School"). I am also the principal of the School. I have been the School's superintendent and principal since July 2015.

2. The School is located in unincorporated Fresno County at 3530 S. Cherry Avenue between E. Central Avenue and E. North Avenue. The District serves approximately 300 students, ranging from TK-8th grade. The School also provides preschool opportunities through a state-funded preschool.

3. Orange Center's student population is composed of 76% students who identify as being of Hispanic descent and 18% who identify as students of Hmong descent. One hundred percent of Orange Center students are eligible to receive meals through the federal free and reduced lunch program. Approximately 40 percent of all students who attend Orange Center have been identified as being English Language Learners. Over 25% of the families that are served by Orange Center speak a primary language other than English in the home.

4. In 2017, the Ulta Beauty distribution center was constructed near the School on E. Central Avenue between S. Cherry Avenue and S. East Avenue. Shortly before the Ulta facility was built, the Amazon Fulfillment Center was constructed near the School on E. Central Avenue and S. Orange Avenue. I was not notified by the City or County of Fresno that these large warehouses would be located near the School. I was not consulted about how these two major facilities would impact my staff and students before the projects were constructed.

5. The construction of the Ulta facility created significant amounts of noise from the construction equipment and activities. The construction caused other disruptions as well. For example, when the developer was installing an A/C unit at the facility, a helicopter flew at a low altitude over the schoolyard. The helicopter forced me and my staff to send the students inside because we did not know whether it was safe for them to be outside. No one notified us that the developer was planning to fly a helicopter over the School in such a disruptive manner.

6. After the Ulta construction started, there was an increase in the amount of gophers, ground squirrels, rabbits, and other wildlife entering the schoolyard and digging holes on the students play area. The holes in our playing fields made the field unusable for sports games and caused an increase in the number of holes in the field making it a potential safety hazard. To

protect the students, the School has been forced to pay a wildlife management company to come to the School monthly to reduce the wildlife on the school grounds.

7. Since the Ulta and Amazon facilities began operating, there has been a significant increase in truck traffic on E. Central Avenue, S. Cherry Avenue, and other streets in the vicinity of the School. In addition to the increased truck traffic, there has been a significant increase in traffic from employees traveling to and from the 99 and 41 highways to the Ulta and Amazon facilities. The employee traffic causes additional congestion, noise, and hazards on the streets near the School.

8. Due to the high amount of traffic and the condition of the roads and lack of sidewalks, the school encourages all students to ride the bus or to be dropped off or picked up.

9. I am also concerned for the safety of people driving in the neighborhood and surrounding area due to the increased car and truck traffic. Recent automobile accidents in our outlying community have made me more concerned. I am concerned that these accidents are a symptom of the problem that the County roads are not designed for the high volume of truck traffic caused by the industrial developments. I do not believe that it is safe or appropriate to have so many trucks on the two-lane country roads in this neighborhood. I am frustrated that the City is allowing new or modified applications for industrial developments without doing an environmental impact report which properly studies the increased traffic and other significant impacts on this community.

10. I am not aware of the City ever contacting the School about the City's development of its current General Plan ("2014 General Plan"), the 2014 General Plan Master Environmental Impact Report, the Programmatic Environmental Impact Report for the 2014 General Plan, the Roosevelt Community Plan, or other action to zone or pre-zone land near the School for industrial land uses.

11. After the Ulta and Amazon facilities were already operating, the former Mayor asked for the School's input on industrial development in the area. I relayed our concerns about the lack of notice and significant impacts from the developments. I attended numerous meetings with the former Mayor where I provided input. I was also part of the South Central Specific Plan advisory committee. The committee submitted a list of the impacts from developments about which residents were most concerned as well as recommended mitigation measures. The City was supposed to take these recommendations to the Mayor and his staff, so that the City could use this information to drive the decision-making for the future of the South Central Specific Plan area. Since then, I am not aware of the City taking any action on our recommendations, and the City has not communicated with me further about this matter.

12. I am concerned that the City's Programmatic Environmental Impact Report for the 2014 General Plan ("GP PEIR") is ignoring significant impacts caused by recent industrial developments near the School. The GP PEIR proposes to use a 2019 baseline to analyze impacts.

But the City knows very well that there has been extensive industrial development in this area, including the Amazon and Ulta warehouse projects, since 2015. I believe that the City's GP PEIR must account for the baseline of the community before these facilities were constructed to understand the extent of the impacts the projects have had on residents. I believe this will help ensure that the City and the public are adequately informed when deciding whether to approve even more industrial development in this community.

13. I am concerned that the County representatives have not provided any input on the City of Fresno's approval of projects in this area. The City of Fresno does not represent the County, where the School is located. I have been to many City Council meetings, planning commission meetings, and other public meetings. Although County representatives attended the initial meetings that were done when the City wanted to rezone the area surrounding the School, I have not seen or heard from County representatives when dealing with the more recent projects. I am concerned that the City Council is making decisions that significantly impact people in Fresno County who did not elect them.

14. The City has not given the School adequate notice about its plans to approve major industrial developments or amendments to project requests near the School, even though I have repeatedly requested notice. I believe that the City has not done a proper environmental impact report for the General Plan. Nevertheless, I am informed and believe that the City continues to allow new or amended projects in this community.

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct, and that this declaration is executed on September 14, 2021, in the County of Fresno, California.

Terry M. Hirschfield

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Attachment I

LEADERSHIP COUNSEL FOR JUSTICE & ACCOUNTABILITY

GOLDEN GATE UNIVERSITY SCHOOL OF LAW ENVIRONMENTAL LAW AND JUSTICE CLINIC

DECLARATION OF KATIE TAYLOR IN SUPPORT OF SOUTH FRESNO COMMUNITY ALLIANCE'S COMMENTS ON THE CITY OF FRESNO'S GENERAL PLAN FINAL PROGRAMMATIC ENVIRONMENTAL IMPACT REPORT (SCH #2109050005)

I, Ms. Katie Taylor, declare:

1. I am a resident of Fresno, California. For over fifty years, I have lived on Central Avenue near its intersection with Orange Avenue in unincorporated Fresno County, just South of Fresno City limits.

2. The Amazon Fulfillment Center was constructed across the street from my house in 2017. The Ulta Beauty distribution center was built less than half a mile from my house in 2017 as well. There are other large facilities near my house, including the FedEx terminal, that attract traffic. Several other truck terminals and truck stops have been built around my neighborhood in the last few years as well. It seems like there are always new facilities being built nearby.

3. I was never notified that large warehouses were going to be built so close to me. When I saw the orchard trees being plowed down across the street, I did not know why. I thought the property owners were just going to plant more fruit trees. My neighbors thought the same thing. The next thing we knew there were big buildings being constructed. We were not given an opportunity to provide input on whether these projects went forward, the types of impacts they might have on the community, and what types of mitigation to avoid and reduce the projects' impacts might be appropriate. We were not given the opportunity for our voices to be heard.

4. I am not aware of the City ever contacting me or my family to inform us of the City's development of its current General Plan ("2014 General Plan"), the 2014 General Plan Master Environmental Impact Report, the Programmatic Environmental Impact Report for the 2014 General Plan, the Roosevelt Community Plan, or other action to zone or pre-zone land in my neighborhood for industrial land uses.

5. Three of my family members have passed away from cancer. My husband, daughter, and son all died of cancer. Some of my neighbors have died of cancer too. I have a heart condition and thyroid problems. I have allergies as well. My allergies have gotten worse since the warehouses were built. Some of my neighbors' children have asthma, which they say has gotten worse.

6. The construction of the Amazon facility had major impacts on me and my neighborhood. While construction was ongoing for months, the Amazon construction covered my house with dust. The construction occurred at night as well. The nighttime construction was loud and they used very bright lights. The truck traffic during the construction was also extremely loud,

and I could hear the noise from within my home with the windows shut. The construction caused vibrations that were so strong that my house shook on some occasions.

7. Since the Amazon and Ulta facilities began operating, the car and truck traffic in my neighborhood has increased significantly. People who come visit my house are shocked by how much traffic there is now. There is traffic traveling to the facilities 24 hours a day, seven days week. A loud rumbling from the trucks passing can be heard all hours of the day and night. The vibration from the trucks shakes my house. The trucks are so loud sometimes that it sounds like someone is knocking at my door, and it can sometimes be hard to hear visitors talking in my house when trucks pass by.

8. The trucks going to and from the facilities create a lot of dust and fumes, which covers my house and car constantly. I have to clean the dust off the windows of my house and car almost every day. The dust also seeps into my house through cracks in my doors and windows. My neighbors complain about the dust getting inside their houses too.

9. Traffic lights were put up at the intersection of Central and Orange when the Amazon warehouse was constructed. The lights are very bright and blink continuously. They shine into my windows, which disrupts my sleep. My daughter has Down syndrome and autism. The constant flashing of the traffic lights is very disturbing for her because of her condition.

10. I have noticed that my neighborhood has become hotter since the warehouses were constructed, including during the night. I am forced to use my air conditioning more, which increases my energy bill. My neighbors have also noticed that it is hotter, that the neighborhood does not seem to cool down as much in the evening as it used to, and that they have to use their air conditioners more.

11. I have noticed that the traffic from the warehouses affects pedestrians. People I know that walk around the neighborhood have to be very careful because of the traffic. Some of the Amazon employees drive recklessly. I have noticed more accidents because of the traffic from the warehouses. There is frequently congestion from employee vehicles backed onto Orange Avenue near my house.

12. The water pressure at my house has dropped in the last four or five years. I have to pay for a water tank that comes every two weeks. My water is contaminated. One of my family members tested the water and found that it was not safe to drink. A person from UC Davis came and tested my water too and told me not to drink it because of the contamination.

13. I am worried that the value of my house has gone down because of the warehouses and other facilities. I believe that the value of my neighbors' houses has gone down too. This really hurts us because we do not have very much money, my home is my main source of wealth, and we are trying to pass our homes down to our kids to help support them economically.

14. Since about 2017, my neighbors and I have made many efforts to seek that the City stop approving new warehouses and industrial facilities in my neighborhood, that they notify us before studying and approving any new projects and allow us an opportunity to provide input, and that industrial developers and land owners respect these requests. When I and my neighbors have talked to the City and the developers, we tell them about the noise, dust, traffic, health problems, lowered property values, and other impacts from the warehouses and other projects. But they ignore us and keep building projects here without even notifying us first. It feels like we are not being heard. It feels like they are bullying us—like we are being targeted because of our race and because we do not have a lot of money.

15. The traffic, noise, dust, health, and other impacts from the facilities have caused me to suffer from a significant amount of stress and anxiety. For example, the abrupt loud noises and flashing lights are very unnerving and stressful. The heavy traffic from cars and trucks makes me constantly worry about my family's safety. My daughter has also said that she worries about the traffic, noise, and other impacts from the facilities.

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct, and that this declaration is executed on September 13, 2021, in Fresno, California.

Ms. Katie Taylor

Ms. Katie Taylor

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Attachment J

TECHNICAL ADVISORY

ON EVALUATING TRANSPORTATION IMPACTS IN CEQA

December 2018

Contents

A. Introduction 1
B. Background 2
C. Technical Considerations in Assessing Vehicle Miles Traveled 4
1. Recommendations Regarding Methodology 4
D. General Principles to Guide Consideration of VMT 7
E. Recommendations Regarding Significance Thresholds 8
1. Screening Thresholds for Land Use Projects 12
2. Recommended Numeric Thresholds for Residential, Office, and Retail Projects 15
3. Recommendations Regarding Land Use Plans 18
4. Other Considerations 19
F. Considering the Effects of Transportation Projects on Vehicle Travel 19
1. Recommended Significance Threshold for Transportation Projects 22
2. Estimating VMT Impacts from Transportation Projects 23
G. Analyzing Other Impacts Related to Transportation 25
H. VMT Mitigation and Alternatives 26

Appendix 1. Considerations About Which VMT to Count 29
Appendix 2. Induced Travel: Mechanisms, Research, and Additional Assessment Approaches 32

A. Introduction

This technical advisory is one in a series of advisories provided by the Governor's Office of Planning and Research (OPR) as a service to professional planners, land use officials, and CEQA practitioners. OPR issues technical assistance on issues that broadly affect the practice of land use planning and the California Environmental Quality Act (CEQA) (Pub. Resources Code, § 21000 et seq.). (Gov. Code, § 65040, subds. (g), (l), (m).) The purpose of this document is to provide advice and recommendations, which agencies and other entities may use at their discretion. This document does not alter lead agency discretion in preparing environmental documents subject to CEQA. This document should not be construed as legal advice.

Senate Bill 743 (Steinberg, 2013), which was codified in Public Resources Code section 21099, required changes to the guidelines implementing CEQA (CEQA Guidelines) (Cal. Code Regs., Title 14, Div. 6, Ch. 3, § 15000 et seq.) regarding the analysis of transportation impacts. As one appellate court recently explained: "During the last 10 years, the Legislature has charted a course of long-term sustainability based on denser infill development, reduced reliance on individual vehicles and improved mass transit, all with the goal of reducing greenhouse gas emissions. Section 21099 is part of that strategy . . . ." (*Covina Residents for Responsible Development v. City of Covina* (2018) 21 Cal.App.5th 712, 729.) Pursuant to Section 21099, the criteria for determining the significance of transportation impacts must "promote the reduction of greenhouse gas emissions, the development of multimodal transportation networks, and a diversity of land uses." (*Id.*, subd. (b)(1); see generally, adopted CEQA Guidelines, § 15064.3, subd. (b) [Criteria for Analyzing Transportation Impacts].) To that end, in developing the criteria, OPR has proposed, and the California Natural Resources Agency (Agency) has certified and adopted, changes to the CEQA Guidelines that identify vehicle miles traveled (VMT) as the most appropriate metric to evaluate a project's transportation impacts. With the California Natural Resources Agency's certification and adoption of the changes to the CEQA Guidelines, automobile delay, as measured by "level of service" and other similar metrics, generally no longer constitutes a significant environmental effect under CEQA. (Pub. Resources Code, § 21099, subd. (b)(3).)

This advisory contains technical recommendations regarding assessment of VMT, thresholds of significance, and mitigation measures. Again, OPR provides this Technical Advisory as a resource for the public to use at their discretion. OPR is not enforcing or attempting to enforce any part of the recommendations contained herein. (Gov. Code, § 65035 ["It is not the intent of the Legislature to vest in the Office of Planning and Research any direct operating or regulatory powers over land use, public works, or other state, regional, or local projects or programs."].)

This December 2018 technical advisory is an update to the advisory it published in April 2018. OPR will continue to monitor implementation of these new provisions and may update or supplement this advisory in response to new information and advancements in modeling and methods.

B. Background

VMT and Greenhouse Gas Emissions Reduction. Senate Bill 32 (Pavley, 2016) requires California to reduce greenhouse gas (GHG) emissions 40 percent below 1990 levels by 2030, and Executive Order B-16-12 provides a target of 80 percent below 1990 emissions levels for the transportation sector by 2050. The transportation sector has three major means of reducing GHG emissions: increasing vehicle efficiency, reducing fuel carbon content, and reducing the amount of vehicle travel. The California Air Resources Board (CARB) has provided a path forward for achieving these emissions reductions from the transportation sector in its 2016 Mobile Source Strategy. CARB determined that it will not be possible to achieve the State's 2030 and post-2030 emissions goals without reducing VMT growth. Further, in its 2018 Progress Report on California's Sustainable Communities and Climate Protection Act, CARB found that despite the State meeting its 2020 climate goals, "emissions from statewide passenger vehicle travel per capita [have been] increasing and going in the wrong direction," and "California cannot meet its [long-term] climate goals without curbing growth in single-occupancy vehicle activity."[1] CARB also found that "[w]ith emissions from the transportation sector continuing to rise despite increases in fuel efficiency and decreases in the carbon content of fuel, California will not achieve the necessary greenhouse gas emissions reductions to meet mandates for 2030 and beyond without significant changes to how communities and transportation systems are planned, funded, and built."[2]

Thus, to achieve the State's long-term climate goals, California needs to reduce per capita VMT. This can occur under CEQA through VMT mitigation. Half of California's GHG emissions come from the transportation sector[3], therefore, reducing VMT is an effective climate strategy, which can also result in co-benefits.[4] Furthermore, without early VMT mitigation, the state may follow a path that meets GHG targets in the early years, but finds itself poorly positioned to meet more stringent targets later. For example, in absence of VMT analysis and mitigation in CEQA, lead agencies might rely upon verifiable offsets for GHG mitigation, ignoring the longer-term climate change impacts resulting from land use development and infrastructure investment decisions. As stated in CARB's 2017 Scoping Plan:

> "California's future climate strategy will require increased focus on integrated land use planning to support livable, transit-connected communities, and conservation of agricultural and other lands. Accommodating population and economic growth through travel- and energy-efficient land use provides GHG-efficient growth, reducing GHGs from both transportation and building energy use. GHGs can be further reduced at the project level through implementing energy-efficient construction and travel demand management approaches."[5] (*Id.* at p. 102.)

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[1] California Air Resources Board (Nov. 2018) *2018 Progress Report on California's Sustainable Communities and Climate Protection Act*, pp. 4, 5, available at https://ww2.arb.ca.gov/sites/default/files/2018-11/Final2018Report_SB150_112618_02_Report.pdf.
[2] *Id.*, p. 28.
[3] See https://ca50million.ca.gov/transportation/
[4] Fang et al. (2017) *Cutting Greenhouse Gas Emissions Is Only the Beginning: A Literature Review of the Co-Benefits of Reducing Vehicle Miles Traveled*.
[5] California Air Resources Board (Nov. 2017) *California's 2017 Climate Change Scoping Plan*, p. 102, available at https://www.arb.ca.gov/cc/scopingplan/scoping_plan_2017.pdf.

In light of this, the 2017 Scoping Plan describes and quantifies VMT reductions needed to achieve our long-term GHG emissions reduction goals, and specifically points to the need for statewide deployment of the VMT metric in CEQA:

> "Employing VMT as the metric of transportation impact statewide will help to ensure GHG reductions planned under SB 375 will be achieved through on-the-ground development, and will also play an important role in creating the additional GHG reductions needed beyond SB 375 across the State. Implementation of this change will rely, in part, on local land use decisions to reduce GHG emissions associated with the transportation sector, both at the project level, and in long-term plans (including general plans, climate action plans, specific plans, and transportation plans) and supporting sustainable community strategies developed under SB 375."[6]

VMT and Other Impacts to Health and Environment. VMT mitigation also creates substantial benefits (sometimes characterized as "co-benefits" to GHG reduction) in both in the near-term and the long-term. Beyond GHG emissions, increases in VMT also impact human health and the natural environment. Human health is impacted as increases in vehicle travel lead to more vehicle crashes, poorer air quality, increases in chronic diseases associated with reduced physical activity, and worse mental health. Increases in vehicle travel also negatively affect other road users, including pedestrians, cyclists, other motorists, and many transit users. The natural environment is impacted as higher VMT leads to more collisions with wildlife and fragments habitat. Additionally, development that leads to more vehicle travel also tends to consume more energy, water, and open space (including farmland and sensitive habitat). This increase in impermeable surfaces raises the flood risk and pollutant transport into waterways.[7]

VMT and Economic Growth. While it was previously believed that VMT growth was a necessary component of economic growth, data from the past two decades shows that economic growth is possible without a concomitant increase in VMT. (Figure 1.) Recent research shows that requiring development projects to mitigate LOS may actually reduce accessibility to destinations and impede economic growth.[8,9]

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[6] *Id.* at p. 76.

[7] Fang et al. (2017) *Cutting Greenhouse Gas Emissions Is Only the Beginning: A Literature Review of the Co-Benefits of Reducing Vehicle Miles Traveled*, available at https://ncst.ucdavis.edu/wp-content/uploads/2017/03/NCST-VMT-Co-Benefits-White-Paper_Fang_March-2017.pdf.

[8] Haynes et al. (Sept. 2015) *Congested Development: A Study of Traffic Delays, Access, and Economic Activity in Metropolitan Los Angeles*, available at http://www.its.ucla.edu/wp-content/uploads/sites/6/2015/11/Haynes_Congested-Development_1-Oct-2015_final.pdf.

[9] Osman et al. (Mar. 2016) *Not So Fast: A Study of Traffic Delays, Access, and Economic Activity in the San Francisco Bay Area*, available at http://www.its.ucla.edu/wp-content/uploads/sites/6/2016/08/Taylor-Not-so-Fast-04-01-2016_final.pdf.

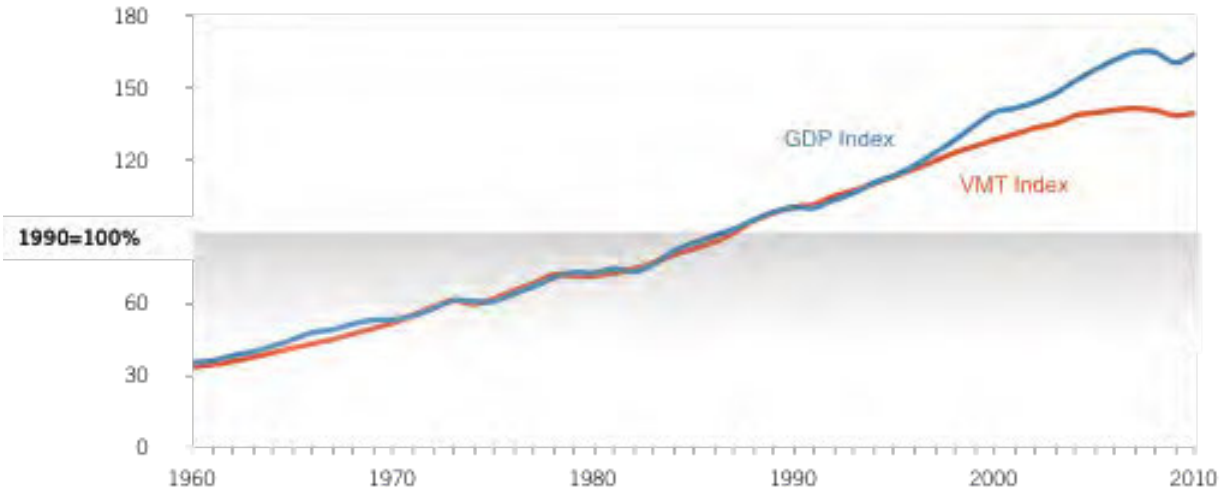

Figure 1. Kooshian and Winkelman (2011) *VMT and Gross Domestic Product (GDP), 1960-2010*.

C. Technical Considerations in Assessing Vehicle Miles Traveled

Many practitioners are familiar with accounting for VMT in connection with long-range planning, or as part of the CEQA analysis of a project's greenhouse gas emissions or energy impacts. This document provides technical information on how to assess VMT as part of a transportation impacts analysis under CEQA. Appendix 1 provides a description of which VMT to count and options on how to count it. Appendix 2 provides information on induced travel resulting from roadway capacity projects, including the mechanisms giving rise to induced travel, the research quantifying it, and information on additional approaches for assessing it.

1. Recommendations Regarding Methodology

Proposed Section 15064.3 explains that a "lead agency may use models to estimate a project's vehicle miles traveled . . . ." CEQA generally defers to lead agencies on the choice of methodology to analyze impacts. (*Santa Monica Baykeeper v. City of Malibu* (2011) 193 Cal.App.4th 1538, 1546; see *Laurel Heights Improvement Assn. v. Regents of University of California* (1988) 47 Cal.3d 376, 409 ["the issue is not whether the studies are irrefutable or whether they could have been better" … rather, the "relevant issue is only whether the studies are sufficiently credible to be considered" as part of the lead agency's overall evaluation].) This section provides suggestions to lead agencies regarding methodologies to analyze VMT associated with a project.

Vehicle Types. Proposed Section 15064.3, subdivision (a), states, "For the purposes of this section, 'vehicle miles traveled' refers to the amount and distance of automobile travel attributable to a project." Here, the term "automobile" refers to on-road passenger vehicles, specifically cars and light trucks. Heavy-duty truck VMT could be included for modeling convenience and ease of calculation (for example, where models or data provide combined auto and heavy truck VMT). For an apples-to-apples

comparison, vehicle types considered should be consistent across project assessment, significance thresholds, and mitigation.

Residential and Office Projects. Tour- and trip-based approaches[10] offer the best methods for assessing VMT from residential/office projects and for comparing those assessments to VMT thresholds. These approaches also offer the most straightforward methods for assessing VMT reductions from mitigation measures for residential/office projects. When available, tour-based assessment is ideal because it captures travel behavior more comprehensively. But where tour-based tools or data are not available for all components of an analysis, a trip-based assessment of VMT serves as a reasonable proxy.

Models and methodologies used to calculate thresholds, estimate project VMT, and estimate VMT reduction due to mitigation should be comparable. For example:

- A tour-based assessment of project VMT should be compared to a tour-based threshold, or a trip-based assessment to a trip-based VMT threshold.
- Where a travel demand model is used to determine thresholds, the same model should also be used to provide trip lengths as part of assessing project VMT.
- Where only trip-based estimates of VMT reduction from mitigation are available, a trip-based threshold should be used, and project VMT should be assessed in a trip-based manner.

When a trip-based method is used to analyze a residential project, the focus can be on home-based trips. Similarly, when a trip-based method is used to analyze an office project, the focus can be on home-based work trips.

When tour-based models are used to analyze an office project, either employee work tour VMT or VMT from all employee tours may be attributed to the project. This is because workplace location influences overall travel. For consistency, the significance threshold should be based on the same metric: either employee work tour VMT or VMT from all employee tours.

For office projects that feature a customer component, such as a government office that serves the public, a lead agency can analyze the customer VMT component of the project using the methodology for retail development (see below).

Retail Projects. Generally, lead agencies should analyze the effects of a retail project by assessing the change in total VMT[11] because retail projects typically re-route travel from other retail destinations. A retail project might lead to increases or decreases in VMT, depending on previously existing retail travel patterns.

[10] See Appendix 1, *Considerations About Which VMT to Count,* for a description of these approaches.
[11] See Appendix 1, *Considerations About Which VMT to Count, "*Assessing Change in Total VMT" section, for a description of this approach.

Considerations for All Projects. Lead agencies should not truncate any VMT analysis because of jurisdictional or other boundaries, for example, by failing to count the portion of a trip that falls outside the jurisdiction or by discounting the VMT from a trip that crosses a jurisdictional boundary. CEQA requires environmental analyses to reflect a "good faith effort at full disclosure." (CEQA Guidelines, § 15151.) Thus, where methodologies exist that can estimate the full extent of vehicle travel from a project, the lead agency should apply them to do so. Where those VMT effects will grow over time, analyses should consider both a project's short-term and long-term effects on VMT.

Combining land uses for VMT analysis is not recommended. Different land uses generate different amounts of VMT, so the outcome of such an analysis could depend more on the mix of uses than on their travel efficiency. As a result, it could be difficult or impossible for a lead agency to connect a significance threshold with an environmental policy objective (such as a target set by law), inhibiting the CEQA imperative of identifying a project's significant impacts and providing mitigation where feasible. Combining land uses for a VMT analysis could streamline certain mixes of uses in a manner disconnected from policy objectives or environmental outcomes. Instead, OPR recommends analyzing each use separately, or simply focusing analysis on the dominant use, and comparing each result to the appropriate threshold. Recommendations for methods of analysis and thresholds are provided below. In the analysis of each use, a mixed-use project should take credit for internal capture.

Any project that includes in its geographic bounds a portion of an existing or planned Transit Priority Area (i.e., the project is within a ½ mile of an existing or planned major transit stop or an existing stop along a high quality transit corridor) may employ VMT as its primary metric of transportation impact for the entire project. (See Pub. Resources Code, § 21099, subds. (a)(7), (b)(1).)

Cumulative Impacts. A project's cumulative impacts are based on an assessment of whether the "incremental effects of an individual project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects." (Pub. Resources Code, § 21083, subd. (b)(2); see CEQA Guidelines, § 15064, subd. (h)(1).) When using an absolute VMT metric, i.e., total VMT (as recommended below for retail and transportation projects), analyzing the combined impacts for a cumulative impacts analysis may be appropriate. However, metrics such as VMT per capita or VMT per employee, i.e., metrics framed in terms of efficiency (as recommended below for use on residential and office projects), cannot be summed because they employ a denominator. A project that falls below an efficiency-based threshold that is aligned with long-term environmental goals and relevant plans would have no cumulative impact distinct from the project impact. Accordingly, a finding of a less-than-significant project impact would imply a less than significant cumulative impact, and vice versa. This is similar to the analysis typically conducted for greenhouse gas emissions, air quality impacts, and impacts that utilize plan compliance as a threshold of significance. (See *Center for Biological Diversity v. Department of Fish & Wildlife* (2015) 62 Cal.4th 204, 219, 223; CEQA Guidelines, § 15064, subd. (h)(3).)

D. General Principles to Guide Consideration of VMT

SB 743 directs OPR to establish specific "criteria for determining the significance of transportation impacts of projects[.]" (Pub. Resources Code, § 21099, subd. (b)(1).) In establishing this criterion, OPR was guided by the general principles contained within CEQA, the CEQA Guidelines, and applicable case law.

To assist in the determination of significance, many lead agencies rely on "thresholds of significance." The CEQA Guidelines define a "threshold of significance" to mean "an identifiable **quantitative, qualitative**[12] **or performance level** of a particular environmental effect, non-compliance with which means the effect will ***normally*** be determined to be significant by the agency and compliance with which means the effect ***normally*** will be determined to be less than significant." (CEQA Guidelines, § 15064.7, subd. (a) (emphasis added).) Lead agencies have discretion to develop and adopt their own, or rely on thresholds recommended by other agencies, "provided the decision of the lead agency to adopt such thresholds is supported by substantial evidence." (*Id*. at subd. (c); *Save Cuyama Valley v. County of Santa Barbara* (2013) 213 Cal.App.4th 1059, 1068.) Substantial evidence means "enough relevant information and reasonable inferences from this information that a fair argument can be made to support a conclusion, even though other conclusions might also be reached." (*Id*. at § 15384 (emphasis added); *Protect the Historic Amador Waterways v. Amador Water Agency* (2004) 116 Cal.App.4th 1099, 1108-1109.)

Additionally, the analysis leading to the determination of significance need not be perfect. The CEQA Guidelines describe the standard for adequacy of environmental analyses:

> An EIR should be prepared with a sufficient degree of analysis to provide decision makers with information which enables them to **make a decision which intelligently takes account of environmental consequences**. An evaluation of the environmental effects of a proposed project need not be exhaustive, but the sufficiency of an EIR is to be reviewed in the light of what is **reasonably feasible**. Disagreement among experts does not make an EIR inadequate, but the EIR should summarize the main points of disagreement among the experts. The **courts have looked not for perfection** but for **adequacy**, **completeness**, and a **good faith effort** at full disclosure.

(CEQA Guidelines, § 15151 (emphasis added).)

These general principles guide OPR's recommendations regarding thresholds of significance for VMT set forth below.

[12] Generally, qualitative analyses should only be conducted when methods do not exist for undertaking a quantitative analysis.

E. Recommendations Regarding Significance Thresholds

As noted above, lead agencies have the discretion to set or apply their own thresholds of significance. (*Center for Biological Diversity v. California Dept. of Fish & Wildlife* (2015) 62 Cal.4th 204, 218-223 [lead agency had discretion to use compliance with AB 32's emissions goals as a significance threshold]; *Save Cuyama Valley v. County of Santa Barbara* (2013) 213 Cal.App.4th at p. 1068.) However, Section 21099 of the Public Resources Code states that the criteria for determining the significance of transportation impacts must promote: (1) reduction of greenhouse gas emissions; (2) development of multimodal transportation networks; and (3) a diversity of land uses. It further directed OPR to prepare and develop criteria for determining significance. (Pub. Resources Code, § 21099, subd. (b)(1).) This section provides OPR's suggested thresholds, as well as considerations for lead agencies that choose to adopt their own

The VMT metric can support the three statutory goals: "the reduction of greenhouse gas emissions, the development of multimodal transportation networks, *and* a diversity of land uses." (Pub. Resources Code, § 21099, subd. (b)(1), emphasis added.) However, in order for it to promote and support all three, lead agencies should select a significance threshold that aligns with state law on all three. State law concerning the development of multimodal transportation networks and diversity of land uses requires planning for and prioritizing increases in complete streets and infill development, but does not mandate a particular depth of implementation that could translate into a particular threshold of significance. Meanwhile, the State has clear quantitative targets for GHG emissions reduction set forth in law and based on scientific consensus, and the depth of VMT reduction needed to achieve those targets has been quantified. Tying VMT thresholds to GHG reduction also supports the two other statutory goals. Therefore, to ensure adequate analysis of transportation impacts, OPR recommends using quantitative VMT thresholds linked to GHG reduction targets when methods exist to do so.

Various legislative mandates and state policies establish quantitative greenhouse gas emissions reduction targets. For example:

- Assembly Bill 32 (2006) requires statewide GHG emissions reductions to 1990 levels by 2020 and continued reductions beyond 2020.

- Senate Bill 32 (2016) requires at least a 40 percent reduction in GHG emissions from 1990 levels by 2030.

- Pursuant to Senate Bill 375 (2008), the California Air Resources Board GHG emissions reduction targets for metropolitan planning organizations (MPOs) to achieve based on land use patterns and transportation systems specified in Regional Transportation Plans and Sustainable Community Strategies (RTP/SCS). Current targets for the State's largest MPOs call for a 19 percent reduction in GHG emissions from cars and light trucks from 2005 emissions levels by 2035.

- Executive Order B-30-15 (2015) sets a GHG emissions reduction target of 40 percent below 1990 levels by 2030.

- Executive Order S-3-05 (2005) sets a GHG emissions reduction target of 80 percent below 1990 levels by 2050.

- Executive Order B-16-12 (2012) specifies a GHG emissions reduction target of 80 percent below 1990 levels by 2050 specifically for transportation.

- Executive Order B-55-18 (2018) established an additional statewide goal of achieving carbon neutrality as soon as possible, but no later than 2045, and maintaining net negative emissions thereafter. It states, "The California Air Resources Board shall work with relevant state agencies to develop a framework for implementation and accounting that tracks progress toward this goal."

- Senate Bill 391 requires the California Transportation Plan to support 80 percent reduction in GHGs below 1990 levels by 2050.

- The *California Air Resources Board Mobile Source Strategy* (2016) describes California's strategy for containing air pollutant emissions from vehicles, and quantifies VMT growth compatible with achieving state targets.

- The California Air Resources Board's *2017 Climate Change Scoping Plan Update: The Strategy for Achieving California's 2030 Greenhouse Gas Target* describes California's strategy for containing GHG emissions from vehicles, and quantifies VMT growth compatible with achieving state targets.

Considering these various targets, the California Supreme Court observed:

> Meeting our statewide reduction goals does not preclude all new development. Rather, the Scoping Plan … assumes continued growth and depends on increased efficiency and conservation in land use and transportation from all Californians.

(*Center for Biological Diversity v. California Dept. of Fish & Wildlife*, *supra*, 62 Cal.4th at p. 220.) Indeed, the Court noted that when a lead agency uses consistency with climate goals as a way to determine significance, particularly for long-term projects, the lead agency must consider the project's effect on meeting long-term reduction goals. (*Ibid*.) And more recently, the Supreme Court stated that "CEQA requires public agencies . . . to ensure that such analysis stay in step with evolving scientific knowledge and state regulatory schemes." (*Cleveland National Forest Foundation v. San Diego Assn. of Governments* (2017) 3 Cal.5th 497, 504.)

Meeting the targets described above will require substantial reductions in existing VMT per capita to curb GHG emissions and other pollutants. But targets for overall GHG emissions reduction do not translate directly into VMT thresholds for individual projects for many reasons, including:

- Some, but not all, of the emissions reductions needed to achieve those targets could be accomplished by other measures, including increased vehicle efficiency and decreased fuel carbon content. The CARB's *First Update to the Climate Change Scoping Plan* explains:

"Achieving California's long-term criteria pollutant and GHG emissions goals will require four strategies to be employed: (1) improve vehicle efficiency and develop zero emission technologies, (2) reduce the carbon content of fuels and provide market support to get these lower-carbon fuels into the marketplace, (3) **plan and build communities to reduce vehicular GHG emissions and provide more transportation options, and (4) improve the efficiency and throughput of existing transportation systems.**"[13] CARB's *2018 Progress Report on California's Sustainable Communities and Climate Protection Act* states on page 28 that "California cannot meet its climate goals without curbing growth in single-occupancy vehicle activity." In other words, vehicle efficiency and better fuels are necessary, but insufficient, to address the GHG emissions from the transportation system. Land use patterns and transportation options also will need to change to support reductions in vehicle travel/VMT.

- New land use projects alone will not sufficiently reduce per-capita VMT to achieve those targets, nor are they expected to be the sole source of VMT reduction.

- Interactions between land use projects, and also between land use and transportation projects, existing and future, together affect VMT.

- Because location within the region is the most important determinant of VMT, in some cases, streamlining CEQA review of projects in travel efficient locations may be the most effective means of reducing VMT.

- When assessing climate impacts of some types of land use projects, use of an efficiency metric (e.g., per capita, per employee) may provide a better measure of impact than an absolute numeric threshold. (*Center for Biological Diversity*, *supra*.)

Public Resources Code section 21099 directs OPR to propose criteria for determining the significance of transportation impacts. In this Technical Advisory, OPR provides its recommendations to assist lead agencies in selecting a significance threshold that may be appropriate for their particular projects. While OPR's Technical Advisory is not binding on public agencies, CEQA allows lead agencies to "consider thresholds of significance . . . recommended by other public agencies, provided the decision to adopt those thresholds is supported by substantial evidence." (CEQA Guidelines, § 15064.7, subd. (c).) Based on OPR's extensive review of the applicable research, and in light of an assessment by the California Air Resources Board quantifying the need for VMT reduction in order to meet the State's long-term climate goals, **OPR recommends that a per capita or per employee VMT that is fifteen percent below that of existing development may be a reasonable threshold**.

Fifteen percent reductions in VMT are achievable at the project level in a variety of place types.[14]

Moreover, a fifteen percent reduction is consistent with SB 743's direction to OPR to select a threshold that will help the State achieve its climate goals. As described above, section 21099 states that the

[13] California Air Resources Board (May 2014) *First Update to the Climate Change Scoping Plan*, p. 46 (emphasis added).
[14] CAPCOA (2010) *Quantifying Greenhouse Gas Mitigation Measures*, p. 55, available at http://www.capcoa.org/wp-content/uploads/2010/11/CAPCOA-Quantification-Report-9-14-Final.pdf.

criteria for determining significance must "promote the reduction in greenhouse gas emissions." In its document *California Air Resources Board 2017 Scoping Plan-Identified VMT Reductions and Relationship to State Climate Goals*[15], CARB assesses VMT reduction per capita consistent with its evidence-based modeling scenario that would achieve State climate goals of 40 percent GHG emissions reduction from 1990 levels by 2030 and 80 percent GHG emissions reduction levels from 1990 by 2050. Applying California Department of Finance population forecasts, CARB finds per-capita light-duty vehicle travel would need to be approximately 16.8 percent lower than existing, and overall per-capita vehicle travel would need to be approximately 14.3 percent lower than existing levels under that scenario. Below these levels, a project could be considered low VMT and would, on that metric, be consistent with 2017 Scoping Plan Update assumptions that achieve climate state climate goals.

CARB finds per capita vehicle travel would need to be kept below what today's policies and plans would achieve.

CARB's assessment is based on data in the 2017 Scoping Plan Update and 2016 Mobile Source Strategy. In those documents, CARB previously examined the relationship between VMT and the state's GHG emissions reduction targets. The Scoping Plan finds:

> "While the State can do more to accelerate and incentivize these local decisions, local actions that reduce VMT are also necessary to meet transportation sector-specific goals and achieve the 2030 target under SB 32. Through developing the Scoping Plan, CARB staff is more convinced than ever that, in addition to achieving GHG reductions from cleaner fuels and vehicles, California must also reduce VMT. Stronger SB 375 GHG reduction targets will enable the State to make significant progress toward needed reductions, but alone will not provide the VMT growth reductions needed; there is a gap between what SB 375 can provide and what is needed to meet the State's 2030 and 2050 goals."[16]

Note that, at present, consistency with RTP/SCSs does not necessarily lead to a less-than-significant VMT impact.[17] As the Final 2017 Scoping Plan Update states,

> VMT reductions are necessary to achieve the 2030 target and must be part of any strategy evaluated in this Plan. Stronger SB 375 GHG reduction targets will enable the State to make significant progress toward this goal, but alone will not provide all of the VMT growth reductions that will be needed. There is a gap between what SB 375 can provide and what is needed to meet the State's 2030 and 2050 goals."[18]

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[15] California Air Resources Board (Jan. 2019) *California Air Resources Board 2017 Scoping Plan-Identified VMT Reductions and Relationship to State Climate Goals*, available at https://ww2.arb.ca.gov/resources/documents/carb-2017-scoping-plan-identified-vmt-reductions-and-relationship-state-climate.

[16] California Air Resources Board (Nov. 2017) *California's 2017 Climate Change Scoping Plan*, p. 101.

[17] California Air Resources Board (Feb. 2018) *Updated Final Staff Report: Proposed Update to the SB 375 Greenhouse Gas Emission Reduction Targets*, Figure 3, p. 35, available at https://www.arb.ca.gov/cc/sb375/sb375_target_update_final_staff_report_feb2018.pdf.

[18] California Air Resources Board (Nov. 2017) *California's 2017 Climate Change Scoping Plan*, p. 75.

Also, in order to capture the full effects of induced travel resulting from roadway capacity projects, an RTP/SCS would need to include an assessment of land use effects of those projects, and the effects of those land uses on VMT. (See section titled "*Estimating VMT Impacts from Transportation Projects"* below.) RTP/SCSs typically model VMT using a collaboratively-developed land use "vision" for the region's land use, rather than studying the effects on land use of the proposed transportation investments.

In summary, achieving 15 percent lower per capita (residential) or per employee (office) VMT than existing development is both generally achievable and is supported by evidence that connects this level of reduction to the State's emissions goals.

1. Screening Thresholds for Land Use Projects

Many agencies use "screening thresholds" to quickly identify when a project should be expected to cause a less-than-significant impact without conducting a detailed study. (See e.g., CEQA Guidelines, §§ 15063(c)(3)(C), 15128, and Appendix G.) As explained below, this technical advisory suggests that lead agencies may screen out VMT impacts using project size, maps, transit availability, and provision of affordable housing.

Screening Threshold for Small Projects

Many local agencies have developed screening thresholds to indicate when detailed analysis is needed. Absent substantial evidence indicating that a project would generate a potentially significant level of VMT, or inconsistency with a Sustainable Communities Strategy (SCS) or general plan, projects that generate or attract fewer than 110 trips per day[19] generally may be assumed to cause a less-than-significant transportation impact.

Map-Based Screening for Residential and Office Projects

Residential and office projects that locate in areas with low VMT, and that incorporate similar features (i.e., density, mix of uses, transit accessibility), will tend to exhibit similarly low VMT. Maps created with VMT data, for example from a travel survey or a travel demand model, can illustrate areas that are

[19] CEQA provides a categorical exemption for existing facilities, including additions to existing structures of up to 10,000 square feet, so long as the project is in an area where public infrastructure is available to allow for maximum planned development and the project is not in an environmentally sensitive area. (CEQA Guidelines, § 15301, subd. (e)(2).) Typical project types for which trip generation increases relatively linearly with building footprint (i.e., general office building, single tenant office building, office park, and business park) generate or attract an additional 110-124 trips per 10,000 square feet. Therefore, absent substantial evidence otherwise, it is reasonable to conclude that the addition of 110 or fewer trips could be considered not to lead to a significant impact.

currently below threshold VMT (see recommendations below). Because new development in such locations would likely result in a similar level of VMT, such maps can be used to screen out residential and office projects from needing to prepare a detailed VMT analysis.

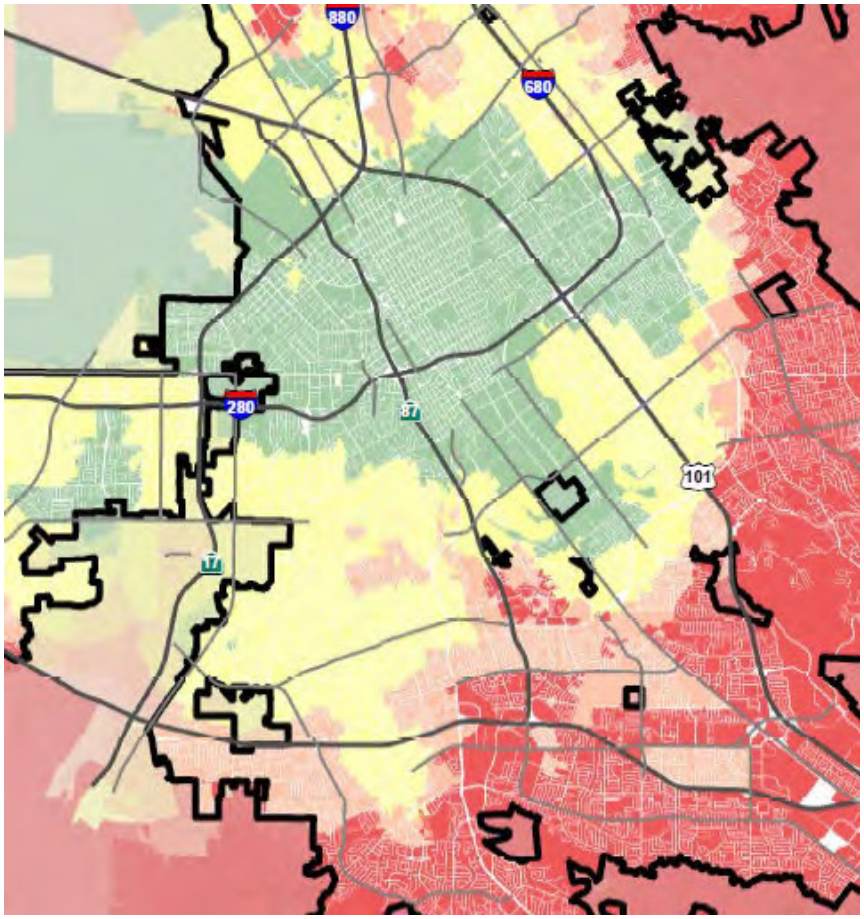

Figure 2. Example map of household VMT that could be used to delineate areas eligible to receive streamlining for VMT analysis. (Source: City of San José, Department of Transportation, draft output of City Transportation Model.)

Presumption of Less Than Significant Impact Near Transit Stations

Proposed CEQA Guideline Section 15064.3, subdivision (b)(1), states that lead agencies generally should presume that certain projects (including residential, retail, and office projects, as well as projects that are a mix of these uses) proposed within ½ mile of an existing major transit stop[20] or an existing stop

[20] Pub. Resources Code, § 21064.3 ("'Major transit stop' means a site containing an existing rail transit station, a ferry terminal served by either a bus or rail transit service, or the intersection of two or more major bus routes with a frequency of service interval of 15 minutes or less during the morning and afternoon peak commute periods.").

along a high quality transit corridor[21] will have a less-than-significant impact on VMT. This presumption would not apply, however, if project-specific or location-specific information indicates that the project will still generate significant levels of VMT. For example, the presumption might not be appropriate if the project:

- Has a Floor Area Ratio (FAR) of less than 0.75
- Includes more parking for use by residents, customers, or employees of the project than required by the jurisdiction (if the jurisdiction requires the project to supply parking)
- Is inconsistent with the applicable Sustainable Communities Strategy (as determined by the lead agency, with input from the Metropolitan Planning Organization)
- Replaces affordable residential units with a smaller number of moderate- or high-income residential units

A project or plan near transit which replaces affordable residential units[22] with a smaller number of moderate- or high-income residential units may increase overall VMT because the increase in VMT of displaced residents could overwhelm the improvements in travel efficiency enjoyed by new residents.[23]

If any of these exceptions to the presumption might apply, the lead agency should conduct a detailed VMT analysis to determine whether the project would exceed VMT thresholds (see below).

Presumption of Less Than Significant Impact for Affordable Residential Development

Adding affordable housing to infill locations generally improves jobs-housing match, in turn shortening commutes and reducing VMT.[24,25] Further, "… low-wage workers in particular would be more likely to choose a residential location close to their workplace, if one is available."[26] In areas where existing jobs-housing match is closer to optimal, low income housing nevertheless generates less VMT than market-

[21] Pub. Resources Code, § 21155 ("For purposes of this section, a high-quality transit corridor means a corridor with fixed route bus service with service intervals no longer than 15 minutes during peak commute hours.").
[22] Including naturally-occurring affordable residential units.
[23] Chapple et al. (2017) *Developing a New Methodology for Analyzing Potential Displacement,* Chapter 4, pp. 159-160, available at https://www.arb.ca.gov/research/apr/past/13-310.pdf.
[24] Karner and Benner (2016) *The convergence of social equity and environmental sustainability: Jobs-housing fit and commute distance* ("[P]olicies that advance a more equitable distribution of jobs and housing by linking the affordability of locally available housing with local wage levels are likely to be associated with reduced commuting distances").
[25] Karner and Benner (2015) *Low-wage jobs-housing fit: identifying locations of affordable housing shortages.*
[26] Karner and Benner (2015) *Low-wage jobs-housing fit: identifying locations of affordable housing shortages.*

rate housing.[27,28] Therefore, a project consisting of a high percentage of affordable housing may be a basis for the lead agency to find a less-than-significant impact on VMT. Evidence supports a presumption of less than significant impact for a 100 percent affordable residential development (or the residential component of a mixed-use development) in infill locations. Lead agencies may develop their own presumption of less than significant impact for residential projects (or residential portions of mixed use projects) containing a particular amount of affordable housing, based on local circumstances and evidence. Furthermore, a project which includes any affordable residential units may factor the effect of the affordability on VMT into the assessment of VMT generated by those units.

2. Recommended Numeric Thresholds for Residential, Office, and Retail Projects

Recommended threshold for residential projects: A proposed project exceeding a level of 15 percent below existing VMT per capita may indicate a significant transportation impact. Existing VMT per capita may be measured as regional VMT per capita or as city VMT per capita. Proposed development referencing a threshold based on city VMT per capita (rather than regional VMT per capita) should not cumulatively exceed the number of units specified in the SCS for that city, and should be consistent with the SCS.

Residential development that would generate vehicle travel that is 15 or more percent below the existing residential VMT per capita, measured against the region or city, may indicate a less-than-significant transportation impact. In MPO areas, development measured against city VMT per capita (rather than regional VMT per capita) should not cumulatively exceed the population or number of units specified in the SCS for that city because greater-than-planned amounts of development in areas above the region-based threshold would undermine the VMT containment needed to achieve regional targets under SB 375.

For residential projects in unincorporated county areas, the local agency can compare a residential project's VMT to (1) the region's VMT per capita, or (2) the aggregate population-weighted VMT per capita of all cities in the region. In MPO areas, development in unincorporated areas measured against aggregate city VMT per capita (rather than regional VMT per capita) should not cumulatively exceed the population or number of units specified in the SCS for that city because greater-than-planned amounts of development in areas above the regional threshold would undermine achievement of regional targets under SB 375.

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[27] Chapple et al. (2017) *Developing a New Methodology for Analyzing Potential Displacement*, available at https://www.arb.ca.gov/research/apr/past/13-310.pdf.
[28] CAPCOA (2010) *Quantifying Greenhouse Gas Mitigation Measures*, pp. 176-178, available at http://www.capcoa.org/wp-content/uploads/2010/11/CAPCOA-Quantification-Report-9-14-Final.pdf.

These thresholds can be applied to either household (i.e., tour-based) VMT or home-based (i.e., trip-based) VMT assessments.[29] It is critical, however, that the agency be consistent in its VMT measurement approach throughout the analysis to maintain an "apples-to-apples" comparison. For example, if the agency uses a home-based VMT for the threshold, it should also be use home-based VMT for calculating project VMT and VMT reduction due to mitigation measures.

Recommended threshold for office projects: A proposed project exceeding a level of 15 percent below existing regional VMT per employee may indicate a significant transportation impact.

Office projects that would generate vehicle travel exceeding 15 percent below existing VMT per employee for the region may indicate a significant transportation impact. In cases where the region is substantially larger than the geography over which most workers would be expected to live, it might be appropriate to refer to a smaller geography, such as the county, that includes the area over which nearly all workers would be expected to live.

Office VMT screening maps can be developed using tour-based data, considering either total employee VMT or employee work tour VMT. Similarly, tour-based analysis of office project VMT could consider either total employee VMT or employee work tour VMT. Where tour-based information is unavailable for threshold determination, project assessment, or assessment of mitigation, home-based work trip VMT should be used throughout all steps of the analysis to maintain an "apples-to-apples" comparison.

Recommended threshold for retail projects: A net increase in total VMT may indicate a significant transportation impact.

Because new retail development typically redistributes shopping trips rather than creating new trips,[30] estimating the total change in VMT (i.e., the difference in total VMT in the area affected with and without the project) is the best way to analyze a retail project's transportation impacts.

By adding retail opportunities into the urban fabric and thereby improving retail destination proximity, local-serving retail development tends to shorten trips and reduce VMT. Thus, lead agencies generally may presume such development creates a less-than-significant transportation impact. Regional-serving retail development, on the other hand, which can lead to substitution of longer trips for shorter ones, may tend to have a significant impact. Where such development decreases VMT, lead agencies should consider the impact to be less-than-significant.

Many cities and counties define local-serving and regional-serving retail in their zoning codes. Lead agencies may refer to those local definitions when available, but should also consider any project-

[29] See Appendix 1 for a description of these approaches.
[30] Lovejoy, et al. (2013) *Measuring the impacts of local land-use policies on vehicle miles of travel: The case of the first big-box store in Davis, California, The Journal of Transport and Land Use*.

specific information, such as market studies or economic impacts analyses that might bear on customers' travel behavior. Because lead agencies will best understand their own communities and the likely travel behaviors of future project users, they are likely in the best position to decide when a project will likely be local-serving. Generally, however, retail development including stores larger than 50,000 square feet might be considered regional-serving, and so lead agencies should undertake an analysis to determine whether the project might increase or decrease VMT.

Mixed-Use Projects

Lead agencies can evaluate each component of a mixed-use project independently and apply the significance threshold for each project type included (e.g., residential and retail). Alternatively, a lead agency may consider only the project's dominant use. In the analysis of each use, a project should take credit for internal capture. Combining different land uses and applying one threshold to those land uses may result in an inaccurate impact assessment.

Other Project Types

Of land use projects, residential, office, and retail projects tend to have the greatest influence on VMT. For that reason, OPR recommends the quantified thresholds described above for purposes of analysis and mitigation. Lead agencies, using more location-specific information, may develop their own more specific thresholds, which may include other land use types. In developing thresholds for other project types, or thresholds different from those recommended here, lead agencies should consider the purposes described in section 21099 of the Public Resources Code and regulations in the CEQA Guidelines on the development of thresholds of significance (e.g., CEQA Guidelines, § 15064.7).

Strategies and projects that decrease local VMT but increase total VMT should be avoided. Agencies should consider whether their actions encourage development in a less travel-efficient location by limiting development in travel-efficient locations.

Redevelopment Projects

Where a project replaces existing VMT-generating land uses, if the replacement leads to a net overall decrease in VMT, the project would lead to a less-than-significant transportation impact. If the project leads to a net overall increase in VMT, then the thresholds described above should apply.

As described above, a project or plan near transit which replaces affordable[31] residential units with a smaller number of moderate- or high-income residential units may increase overall VMT, because

[31] Including naturally-occurring affordable residential units.

displaced residents' VMT may increase.[32] A lead agency should analyze VMT for such a project even if it otherwise would have been presumed less than significant. The assessment should incorporate an estimate of the aggregate VMT increase experienced by displaced residents. That additional VMT should be included in the numerator of the VMT per capita assessed for the project.

If a residential or office project leads to a net increase in VMT, then the project's VMT per capita (residential) or per employee (office) should be compared to thresholds recommended above. Per capita and per employee VMT are efficiency metrics, and, as such, apply only to the existing project without regard to the VMT generated by the previously existing land use.

If the project leads to a net increase in provision of locally-serving retail, transportation impacts from the retail portion of the development should be presumed to be less than significant. If the project consists of regionally-serving retail, and increases overall VMT compared to with existing uses, then the project would lead to a significant transportation impact.

RTP/SCS Consistency (All Land Use Projects)

Section 15125, subdivision (d), of the CEQA Guidelines provides that lead agencies should analyze impacts resulting from inconsistencies with regional plans, including regional transportation plans. For this reason, if a project is inconsistent with the Regional Transportation Plan and Sustainable Communities Strategy (RTP/SCS), the lead agency should evaluate whether that inconsistency indicates a significant impact on transportation. For example, a development may be inconsistent with an RTP/SCS if the development is outside the footprint of development or within an area specified as open space as shown in the SCS.

3. Recommendations Regarding Land Use Plans

As with projects, agencies should analyze VMT outcomes of land use plans across the full area over which the plan may substantively affect travel patterns, including beyond the boundary of the plan or jurisdiction's geography. And as with projects, VMT should be counted in full rather than split between origin and destination. (Emissions inventories have sometimes spit cross-boundary trips in order to sum to a regional total, but CEQA requires accounting for the full impact without truncation or discounting). Analysis of specific plans may employ the same thresholds described above for projects. A general plan, area plan, or community plan may have a significant impact on transportation if proposed new residential, office, or retail land uses would in aggregate exceed the respective thresholds recommended above. Where the lead agency tiers from a general plan EIR pursuant to CEQA Guidelines sections 15152 and 15166, the lead agency generally focuses on the environmental impacts that are specific to the later project and were not analyzed as significant impacts in the prior EIR. (Pub. Resources Code, § 21068.5; Guidelines, § 15152, subd. (a).) Thus, in analyzing the later project, the lead agency

[32] Chapple et al. (2017) *Developing a New Methodology for Analyzing Potential Displacement,* Chapter 4, pp. 159-160, available at https://www.arb.ca.gov/research/apr/past/13-310.pdf.

would focus on the VMT impacts that were not adequately addressed in the prior EIR. In the tiered document, the lead agency should continue to apply the thresholds recommended above.

Thresholds for plans in non-MPO areas may be determined on a case-by-case basis.

4. Other Considerations

Rural Projects Outside of MPOs

In rural areas of non-MPO counties (i.e., areas not near established or incorporated cities or towns), fewer options may be available for reducing VMT, and significance thresholds may be best determined on a case-by-case basis. Note, however, that clustered small towns and small town main streets may have substantial VMT benefits compared to isolated rural development, similar to the transit oriented development described above.

Impacts to Transit

Because criteria for determining the significance of transportation impacts must promote "the development of multimodal transportation networks" pursuant to Public Resources Code section 21099, subd. (b)(1), lead agencies should consider project impacts to transit systems and bicycle and pedestrian networks. For example, a project that blocks access to a transit stop or blocks a transit route itself may interfere with transit functions. Lead agencies should consult with transit agencies as early as possible in the development process, particularly for projects that are located within one half mile of transit stops.

When evaluating impacts to multimodal transportation networks, lead agencies generally should not treat the addition of new transit users as an adverse impact. An infill development may add riders to transit systems and the additional boarding and alighting may slow transit vehicles, but it also adds destinations, improving proximity and accessibility. Such development also improves regional vehicle flow by adding less vehicle travel onto the regional network.

Increased demand throughout a region may, however, cause a cumulative impact by requiring new or additional transit infrastructure. Such impacts may be adequately addressed through a fee program that fairly allocates the cost of improvements not just to projects that happen to locate near transit, but rather across a region to all projects that impose burdens on the entire transportation system, since transit can broadly improve the function of the transportation system.

F. Considering the Effects of Transportation Projects on Vehicle Travel

Many transportation projects change travel patterns. A transportation project which leads to additional vehicle travel on the roadway network, commonly referred to as "induced vehicle travel," would need to quantify the amount of additional vehicle travel in order to assess air quality impacts, greenhouse gas emissions impacts, energy impacts, and noise impacts. Transportation projects also are required to

examine induced growth impacts under CEQA. (See generally, Pub. Resources Code, §§ 21065 [defining "project" under CEQA as an activity as causing either a direct or reasonably foreseeable indirect physical change], 21065.3 [defining "project-specific effect" to mean all direct or indirect environmental effects], 21100, subd. (b) [required contents of an EIR].) For any project that increases vehicle travel, explicit assessment and quantitative reporting of the amount of additional vehicle travel should not be omitted from the document; such information may be useful and necessary for a full understanding of a project's environmental impacts. (See Pub. Resources Code, §§ 21000, 21001, 21001.1, 21002, 21002.1 [discussing the policies of CEQA].) A lead agency that uses the VMT metric to assess the transportation impacts of a transportation project may simply report that change in VMT as the impact. When the lead agency uses another metric to analyze the transportation impacts of a roadway project, changes in amount of vehicle travel added to the roadway network should still be analyzed and reported.[33]

While CEQA does not require perfection, it is important to make a reasonably accurate estimate of transportation projects' effects on vehicle travel in order to make reasonably accurate estimates of GHG emissions, air quality emissions, energy impacts, and noise impacts. (See, e.g., *California Clean Energy Com. v. City of Woodland* (2014) 225 Cal.App.4th 173, 210 [EIR failed to consider project's transportation energy impacts]; *Ukiah Citizens for Safety First v. City of Ukiah* (2016) 248 Cal.App.4th 256, 266.) Appendix 2 describes in detail the causes of induced vehicle travel, the robust empirical evidence of induced vehicle travel, and how models and research can be used in conjunction to quantitatively assess induced vehicle travel with reasonable accuracy.

If a project would likely lead to a measurable and substantial increase in vehicle travel, the lead agency should conduct an analysis assessing the amount of vehicle travel the project will induce. Project types that would likely lead to a measurable and substantial increase in vehicle travel generally include:

- Addition of through lanes on existing or new highways, including general purpose lanes, HOV lanes, peak period lanes, auxiliary lanes, or lanes through grade-separated interchanges

Projects that would not likely lead to a substantial or measurable increase in vehicle travel, and therefore generally should not require an induced travel analysis, include:

- Rehabilitation, maintenance, replacement, safety, and repair projects designed to improve the condition of existing transportation assets (e.g., highways; roadways; bridges; culverts; Transportation Management System field elements such as cameras, message signs, detection, or signals; tunnels; transit systems; and assets that serve bicycle and pedestrian facilities) and that do not add additional motor vehicle capacity
- Roadside safety devices or hardware installation such as median barriers and guardrails

[33] See, e.g., California Department of Transportation (2006) *Guidance for Preparers of Growth-related, Indirect Impact Analyses*, available at http://www.dot.ca.gov/ser/Growth-related_IndirectImpactAnalysis/GRI_guidance06May_files/gri_guidance.pdf.

- Roadway shoulder enhancements to provide “breakdown space,” dedicated space for use only by transit vehicles, to provide bicycle access, or to otherwise improve safety, but which will not be used as automobile vehicle travel lanes
- Addition of an auxiliary lane of less than one mile in length designed to improve roadway safety
- Installation, removal, or reconfiguration of traffic lanes that are not for through traffic, such as left, right, and U-turn pockets, two-way left turn lanes, or emergency breakdown lanes that are not utilized as through lanes
- Addition of roadway capacity on local or collector streets provided the project also substantially improves conditions for pedestrians, cyclists, and, if applicable, transit
- Conversion of existing general purpose lanes (including ramps) to managed lanes or transit lanes, or changing lane management in a manner that would not substantially increase vehicle travel
- Addition of a new lane that is permanently restricted to use only by transit vehicles
- Reduction in number of through lanes
- Grade separation to separate vehicles from rail, transit, pedestrians or bicycles, or to replace a lane in order to separate preferential vehicles (e.g., HOV, HOT, or trucks) from general vehicles
- Installation, removal, or reconfiguration of traffic control devices, including Transit Signal Priority (TSP) features
- Installation of traffic metering systems, detection systems, cameras, changeable message signs and other electronics designed to optimize vehicle, bicycle, or pedestrian flow
- Timing of signals to optimize vehicle, bicycle, or pedestrian flow
- Installation of roundabouts or traffic circles
- Installation or reconfiguration of traffic calming devices
- Adoption of or increase in tolls
- Addition of tolled lanes, where tolls are sufficient to mitigate VMT increase
- Initiation of new transit service
- Conversion of streets from one-way to two-way operation with no net increase in number of traffic lanes
- Removal or relocation of off-street or on-street parking spaces
- Adoption or modification of on-street parking or loading restrictions (including meters, time limits, accessible spaces, and preferential/reserved parking permit programs)
- Addition of traffic wayfinding signage
- Rehabilitation and maintenance projects that do not add motor vehicle capacity
- Addition of new or enhanced bike or pedestrian facilities on existing streets/highways or within existing public rights-of-way
- Addition of Class I bike paths, trails, multi-use paths, or other off-road facilities that serve non-motorized travel
- Installation of publicly available alternative fuel/charging infrastructure
- Addition of passing lanes, truck climbing lanes, or truck brake-check lanes in rural areas that do not increase overall vehicle capacity along the corridor

1. Recommended Significance Threshold for Transportation Projects

As noted in Section 15064.3 of the CEQA Guidelines, lead agencies for roadway capacity projects have discretion, consistent with CEQA and planning requirements, to choose which metric to use to evaluate transportation impacts. This section recommends considerations for evaluating impacts using vehicle miles traveled. Lead agencies have discretion to choose a threshold of significance for transportation projects as they do for other types of projects. As explained above, Public Resources Code section 21099, subdivision (b)(1), provides that criteria for determining the significance of transportation impacts must promote the reduction of greenhouse gas emissions, the development of multimodal transportation networks, and a diversity of land uses. (*Id.;* see generally, adopted CEQA Guidelines, § 15064.3, subd. (b) [Criteria for Analyzing Transportation Impacts].) With those goals in mind, OPR prepared and the Agency adopted an appropriate transportation metric.

Whether adopting a threshold of significance, or evaluating transportation impacts on a case-by-case basis, a lead agency should ensure that the analysis addresses:

- Direct, indirect and cumulative effects of the transportation project (CEQA Guidelines, § 15064, subds. (d), (h))
- Near-term and long-term effects of the transportation project (CEQA Guidelines, §§ 15063, subd. (a)(1), 15126.2, subd. (a))
- The transportation project's consistency with state greenhouse gas reduction goals (Pub. Resources Code, § 21099)[34]
- The impact of the transportation project on the development of multimodal transportation networks (Pub. Resources Code, § 21099)
- The impact of the transportation project on the development of a diversity of land uses (Pub. Resources Code, § 21099)

The CARB Scoping Plan and the CARB Mobile Source Strategy delineate VMT levels required to achieve legally mandated GHG emissions reduction targets. A lead agency should develop a project-level threshold based on those VMT levels, and may apply the following approach:

1. Propose a fair-share allocation of those budgets to their jurisdiction (e.g., by population);

[34] The California Air Resources Board has ascertained the limits of VMT growth compatible with California containing greenhouse gas emissions to levels research shows would allow for climate stabilization. (See *The 2017 Climate Change Scoping Plan: The Strategy for Achieving California's 2030 Greenhouse Gas Target* (p. 78, p. 101); *Mobile Source Strategy* (p. 37).) CARB's *Updated Final Staff Report on Proposed Update to the SB 375 Greenhouse Gas Emission Reduction Targets* illustrates that the current Regional Transportation Plans and Sustainable Communities Strategies will fall short of achieving the necessary on-road transportation-related GHG emissions reductions called for in the 2017 Scoping Plan (Figure 3, p. 35). Accordingly, OPR recommends not basing GHG emissions or transportation impact analysis for a transportation project solely on consistency with an RTP/SCS.

2. Determine the amount of VMT growth likely to result from background population growth, and subtract that from their "budget";
3. Allocate their jurisdiction's share between their various VMT-increasing transportation projects, using whatever criteria the lead agency prefers.

2. Estimating VMT Impacts from Transportation Projects

CEQA requires analysis of a project's potential growth-inducing impacts. (Pub. Resources Code, § 21100, subd. (b)(5); CEQA Guidelines, § 15126.2, subd. (d).) Many agencies are familiar with the analysis of growth inducing impacts associated with water, sewer, and other infrastructure. This technical advisory addresses growth that may be expected from roadway expansion projects.

Because a roadway expansion project can induce substantial VMT, incorporating quantitative estimates of induced VMT is critical to calculating both transportation and other impacts of these projects. Induced travel also has the potential to reduce or eliminate congestion relief benefits. An accurate estimate of induced travel is needed to accurately weigh costs and benefits of a highway capacity expansion project.

The effect of a transportation project on vehicle travel should be estimated using the "change in total VMT" method described in *Appendix 1*. This means that an assessment of total VMT without the project and an assessment with the project should be made; the difference between the two is the amount of VMT attributable to the project. The assessment should cover the full area in which driving patterns are expected to change. As with other types of projects, the VMT estimation should not be truncated at a modeling or jurisdictional boundary for convenience of analysis when travel behavior is substantially affected beyond that boundary.

Transit and Active Transportation Projects

Transit and active transportation projects generally reduce VMT and therefore are presumed to cause a less-than-significant impact on transportation. This presumption may apply to all passenger rail projects, bus and bus rapid transit projects, and bicycle and pedestrian infrastructure projects. Streamlining transit and active transportation projects aligns with each of the three statutory goals contained in SB 743 by reducing GHG emissions, increasing multimodal transportation networks, and facilitating mixed use development.

Roadway Projects

Reducing roadway capacity (for example, by removing or repurposing motor vehicle travel lanes) will generally reduce VMT and therefore is presumed to cause a less-than-significant impact on transportation. Generally, no transportation analysis is needed for such projects.

Building new roadways, adding roadway capacity in congested areas, or adding roadway capacity to areas where congestion is expected in the future, typically induces additional vehicle travel. For the types of projects previously indicated as likely to lead to additional vehicle travel, an estimate should be made of the change in vehicle travel resulting from the project.

For projects that increase roadway capacity, lead agencies can evaluate induced travel quantitatively by applying the results of existing studies that examine the magnitude of the increase of VMT resulting from a given increase in lane miles. These studies estimate the percent change in VMT for every percent change in miles to the roadway system (i.e., "elasticity").[35] Given that lead agencies have discretion in choosing their methodology, and the studies on induced travel reveal a range of elasticities, lead agencies may appropriately apply professional judgment in studying the transportation effects of a particular project. The most recent major study, estimates an elasticity of 1.0, meaning that every percent change in lane miles results in a one percent increase in VMT.[36]

To estimate VMT impacts from roadway expansion projects:

1. Determine the total lane-miles over an area that fully captures travel behavior changes resulting from the project (generally the region, but for projects affecting interregional travel look at all affected regions).
2. Determine the percent change in total lane miles that will result from the project.
3. Determine the total existing VMT over that same area.
4. Multiply the percent increase in lane miles by the existing VMT, and then multiply that by the elasticity from the induced travel literature:

[% increase in lane miles] x [existing VMT] x [elasticity] = [VMT resulting from the project]

A National Center for Sustainable Transportation tool can be used to apply this method: https://ncst.ucdavis.edu/research/tools

This method would not be suitable for rural (non-MPO) locations in the state which are neither congested nor projected to become congested. It also may not be suitable for a new road that provides new connectivity across a barrier (e.g., a bridge across a river) if it would be expected to substantially

[35] See U.C. Davis, Institute for Transportation Studies (Oct. 2015) *Increasing Highway Capacity Unlikely to Relieve Traffic Congestion*; Boarnet and Handy (Sept. 2014) *Impact of Highway Capacity and Induced Travel on Passenger Vehicle Use and Greenhouse Gas Emissions*, California Air Resources Board Policy Brief, available at https://www.arb.ca.gov/cc/sb375/policies/hwycapacity/highway_capacity_brief.pdf.
[36] See Duranton and Turner (2011) *The Fundamental Law of Road Congestion: Evidence from US cities*, available at http://www.nber.org/papers/w15376.

shorten existing trips. If it is likely to be substantial, the trips-shortening effect should be examined explicitly.

The effects of roadway capacity on vehicle travel can also be applied at a programmatic level. For example, in a regional planning process the lead agency can use that program-level analysis to streamline later project-level analysis. (See CEQA Guidelines, § 15168.) A program-level analysis of VMT should include effects of the program on land use patterns, and the VMT that results from those land use effects. In order for a program-level document to adequately analyze potential induced demand from a project or program of roadway capacity expansion, lead agencies cannot assume a fixed land use pattern (i.e., a land use pattern that does not vary in response to the provision of roadway capacity). A proper analysis should account for land use investment and development pattern changes that react in a reasonable manner to changes in accessibility created by transportation infrastructure investments (whether at the project or program level).

Mitigation and Alternatives

Induced VMT has the potential to reduce or eliminate congestion relief benefits, increase VMT, and increase other environmental impacts that result from vehicle travel.[37] If those effects are significant, the lead agency will need to consider mitigation or alternatives. In the context of increased travel that is induced by capacity increases, appropriate mitigation and alternatives that a lead agency might consider include the following:

- Tolling new lanes to encourage carpools and fund transit improvements
- Converting existing general purpose lanes to HOV or HOT lanes
- Implementing or funding off-site travel demand management
- Implementing Intelligent Transportation Systems (ITS) strategies to improve passenger throughput on existing lanes

Tolling and other management strategies can have the additional benefit of preventing congestion and maintaining free-flow conditions, conferring substantial benefits to road users as discussed above.

G. Analyzing Other Impacts Related to Transportation

While requiring a change in the methodology of assessing transportation impacts, Public Resources Code section 21099 notes that this change "does not relieve a public agency of the requirement to analyze a project's potentially significant transportation impacts related to air quality, noise, safety, or any other impact associated with transportation." OPR expects that lead agencies will continue to

[37] See National Center for Sustainable Transportation (Oct. 2015) *Increasing Highway Capacity Unlikely to Relieve Traffic Congestion*, available at http://www.dot.ca.gov/newtech/researchreports/reports/2015/10-12-2015-NCST_Brief_InducedTravel_CS6_v3.pdf; see Duranton and Turner (2011) *The Fundamental Law of Road Congestion: Evidence from US cities*, available at http://www.nber.org/papers/w15376.

address mobile source emissions in the air quality and noise sections of an environmental document and the corresponding studies that support the analysis in those sections. Lead agencies should continue to address environmental impacts of a proposed project pursuant to CEQA's requirements, using a format that is appropriate for their particular project.

Because safety concerns result from many different factors, they are best addressed at a programmatic level (i.e., in a general plan or regional transportation plan) in cooperation with local governments, metropolitan planning organizations, and, where the state highway system is involved, the California Department of Transportation. In most cases, such an analysis would not be appropriate on a project-by-project basis. Increases in traffic volumes at a particular location resulting from a project typically cannot be estimated with sufficient accuracy or precision to provide useful information for an analysis of safety concerns. Moreover, an array of factors affect travel demand (e.g., strength of the local economy, price of gasoline), causing substantial additional uncertainty. Appendix B of OPR's General Plan Guidelines summarizes research which could be used to guide a programmatic analysis under CEQA. Lead agencies should note that automobile congestion or delay does not constitute a significant environmental impact (Pub. Resources Code, §21099(b)(2)), and safety should not be used as a proxy for road capacity.

H. VMT Mitigation and Alternatives

When a lead agency identifies a significant impact, it must identify feasible mitigation measures that could avoid or substantially reduce that impact. (Pub. Resources Code, § 21002.1, subd. (a).) Additionally, CEQA requires that an environmental impact report identify feasible alternatives that could avoid or substantially reduce a project's significant environmental impacts.

Indeed, the California Court of Appeal recently held that a long-term regional transportation plan was deficient for failing to discuss an alternative which could significantly reduce total vehicle miles traveled. In *Cleveland National Forest Foundation v. San Diego Association of Governments, et al.* (2017) 17 Cal.App.5th 413, the court found that omission "inexplicable" given the lead agency's "acknowledgment in its Climate Action Strategy that the state's efforts to reduce greenhouse gas emissions from on-road transportation will not succeed if the amount of driving, or vehicle miles traveled, is not significantly reduced." (*Cleveland National Forest Foundation*, *supra*, 17 Cal.App.5th at p. 436.) Additionally, the court noted that the project alternatives focused primarily on congestion relief even though "the [regional] transportation plan is a long-term and congestion relief is not necessarily an effective long-term strategy." (*Id.* at p. 437.) The court concluded its discussion of the alternatives analysis by stating: "Given the acknowledged long-term drawbacks of congestion relief alternatives, there is not substantial evidence to support the EIR's exclusion of an alternative focused primarily on significantly reducing vehicle trips." (*Ibid*.)

Several examples of potential mitigation measures and alternatives to reduce VMT are described below. However, the selection of particular mitigation measures and alternatives are left to the discretion of

the lead agency, and mitigation measures may vary, depending on the proposed project and significant impacts, if any. Further, OPR expects that agencies will continue to innovate and find new ways to reduce vehicular travel.

Potential measures to reduce vehicle miles traveled include, but are not limited to:

- Improve or increase access to transit.
- Increase access to common goods and services, such as groceries, schools, and daycare.
- Incorporate affordable housing into the project.
- Incorporate neighborhood electric vehicle network.
- Orient the project toward transit, bicycle and pedestrian facilities.
- Improve pedestrian or bicycle networks, or transit service.
- Provide traffic calming.
- Provide bicycle parking.
- Limit or eliminate parking supply.
- Unbundle parking costs.
- Provide parking cash-out programs.
- Implement roadway pricing.
- Implement or provide access to a commute reduction program.
- Provide car-sharing, bike sharing, and ride-sharing programs.
- Provide transit passes.
- Shifting single occupancy vehicle trips to carpooling or vanpooling, for example providing ride-matching services.
- Providing telework options.
- Providing incentives or subsidies that increase the use of modes other than single-occupancy vehicle.
- Providing on-site amenities at places of work, such as priority parking for carpools and vanpools, secure bike parking, and showers and locker rooms.
- Providing employee transportation coordinators at employment sites.
- Providing a guaranteed ride home service to users of non-auto modes.

Notably, because VMT is largely a regional impact, regional VMT-reduction programs may be an appropriate form of mitigation. In lieu fees have been found to be valid mitigation where there is both a commitment to pay fees and evidence that mitigation will actually occur. (*Save Our Peninsula Committee v. Monterey County Bd. of Supervisors* (2001) 87 Cal.App.4th 99, 140-141; *Gentry v. City of Murrieta* (1995) 36 Cal.App.4th 1359; *Kings County Farm Bureau v. City of Hanford* (1990) 221 Cal.App.3d 692, 727–728.) Fee programs are particularly useful to address cumulative impacts. (CEQA Guidelines, § 15130, subd. (a)(3) [a "project's incremental contribution is less than cumulatively considerable if the project is required to implement or fund its fair share of a mitigation measure or measures designed to alleviate the cumulative impact"].) The mitigation program must undergo CEQA evaluation, either on the program as a whole, or the in-lieu fees or other mitigation must be evaluated

on a project-specific basis. (*California Native Plant Society v. County of El Dorado* (2009) 170 Cal.App.4th 1026.) That CEQA evaluation could be part of a larger program, such as a regional transportation plan, analyzed in a Program EIR. (CEQA Guidelines, § 15168.)

Examples of project alternatives that may reduce vehicle miles traveled include, but are not limited to:

- Locate the project in an area of the region that already exhibits low VMT.
- Locate the project near transit.
- Increase project density.
- Increase the mix of uses within the project or within the project's surroundings.
- Increase connectivity and/or intersection density on the project site.
- Deploy management strategies (e.g., pricing, vehicle occupancy requirements) on roadways or roadway lanes.

Appendix 1. Considerations About Which VMT to Count

Consistent with the obligation to make a good faith effort to disclose the environmental consequences of a project, lead agencies have discretion to choose the most appropriate methodology to evaluate project impacts.[38] A lead agency can evaluate a project's effect on VMT in numerous ways. The purpose of this document is to provide technical considerations in determining which methodology may be most useful for various project types.

Background on Estimating Vehicle Miles Traveled

Before discussing specific methodological recommendations, this section provides a brief overview of modeling and counting VMT, including some key terminology.

Here is an illustrative example of some methods of estimating vehicle miles traveled. Consider the following hypothetical travel day (all by automobile):

1. Residence to Coffee Shop
2. Coffee Shop to Work
3. Work to Sandwich Shop
4. Sandwich Shop to Work
5. Work to Residence
6. Residence to Store
7. Store to Residence

Trip-based assessment of a project's effect on travel behavior counts VMT from individual trips to and from the project. It is the most basic, and traditionally the most common, method of counting VMT. A trip-based VMT assessment of the residence in the above example would consider segments 1, 5, 6 and 7. For residential projects, the sum of home-based trips is called *home-based* VMT.

A *tour-based* assessment counts the entire home-back-to-home tour that includes the project. A tour-based VMT assessment of the residence in the above example would consider segments 1, 2, 3, 4, and 5 in one tour, and 6 and 7 in a second tour. A tour-based assessment of the workplace would include segments 1, 2, 3, 4, and 5. Together, all tours comprise *household* VMT.

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[38] The California Supreme Court has explained that when an agency has prepared an environmental impact report:

> [T]he issue is not whether the [lead agency's] studies are irrefutable or whether they could have been better. The relevant issue is only whether the studies are sufficiently credible to be considered as part of the total evidence that supports the [lead agency's] finding[.]

(*Laurel Heights Improvement Assn. v. Regents of the University of California* (1988) 47 Cal.3d 376, 409; see also *Eureka Citizens for Responsible Gov't v. City of Eureka* (2007) 147 Cal.App.4th 357, 372.)

Both trip- and tour-based assessments can be used as measures of transportation efficiency, using denominators such as per capita, per employee, or per person-trip.

Trip- and Tour-based Assessment of VMT

As illustrated above, a tour-based assessment of VMT is a more complete characterization of a project's effect on VMT. In many cases, a project affects travel behavior beyond the first destination. The location and characteristics of the home and workplace will often be the main drivers of VMT. For example, a residential or office development located near high quality transit will likely lead to some commute trips utilizing transit, affecting mode choice on the rest of the tour.

Characteristics of an office project can also affect an employee's VMT beyond the work tour. For example, a workplace located at the urban periphery, far from transit, can require an employee to own a car, which in turn affects the entirety of an employee's travel behavior and VMT. For this reason, when estimating the effect of an office development on VMT, it may be appropriate to consider total employee VMT if data and tools, such as tour-based models, are available. This is consistent with CEQA's requirement to evaluate both direct and *indirect* effects of a project. (See CEQA Guidelines, § 15064, subd. (d)(2).)

Assessing Change in Total VMT

A third method, estimating the *change in total VMT* with and without the project, can evaluate whether a project is likely to divert existing trips, and what the effect of those diversions will be on total VMT. This method answers the question, "What is the net effect of the project on area VMT?" As an illustration, assessing the total change in VMT for a grocery store built in a food desert that diverts trips from more distant stores could reveal a net VMT reduction. The analysis should address the full area over which the project affects travel behavior, even if the effect on travel behavior crosses political boundaries.

Using Models to Estimate VMT

Travel demand models, sketch models, spreadsheet models, research, and data can all be used to calculate and estimate VMT (see Appendix F of the preliminary discussion draft). To the extent possible, lead agencies should choose models that have sensitivity to features of the project that affect VMT. Those tools and resources can also assist in establishing thresholds of significance and estimating VMT reduction attributable to mitigation measures and project alternatives. When using models and tools for those various purposes, agencies should use comparable data and methods, in order to set up an "apples-to-apples" comparison between thresholds, VMT estimates, and VMT mitigation estimates.

Models can work together. For example, agencies can use travel demand models or survey data to estimate existing trip lengths and input those into sketch models such as CalEEMod to achieve more

accurate results. Whenever possible, agencies should input localized trip lengths into a sketch model to tailor the analysis to the project location. However, in doing so, agencies should be careful to avoid double counting if the sketch model includes other inputs or toggles that are proxies for trip length (e.g., distance to city center). Generally, if an agency changes any sketch model defaults, it should record and report those changes for transparency of analysis. Again, trip length data should come from the same source as data used to calculate thresholds to be sure of an "apples-to-apples" comparison.

Additional background information regarding travel demand models is available in the California Transportation Commission's "2010 Regional Transportation Plan Guidelines," beginning at page 35.

Appendix 2. Induced Travel: Mechanisms, Research, and Additional Assessment Approaches

Induced travel occurs where roadway capacity is expanded in an area of present or projected future congestion. The effect typically manifests over several years. Lower travel times make the modified facility more attractive to travelers, resulting in the following trip-making changes:

- **Longer trips.** The ability to travel a long distance in a shorter time increases the attractiveness of destinations that are farther away, increasing trip length and vehicle travel.
- **Changes in mode choice.** When transportation investments are devoted to reducing automobile travel time, travelers tend to shift toward automobile use from other modes, which increases vehicle travel.
- **Route changes.** Faster travel times on a route attract more drivers to that route from other routes, which can increase or decrease vehicle travel depending on whether it shortens or lengthens trips.
- **Newly generated trips.** Increasing travel speeds can induce additional trips, which increases vehicle travel. For example, an individual who previously telecommuted or purchased goods on the internet might choose to accomplish those tasks via automobile trips as a result of increased speeds.
- **Land Use Changes.** Faster travel times along a corridor lead to land development farther along that corridor; that new development generates and attracts longer trips, which increases vehicle travel. Over several years, this induced growth component of induced vehicle travel can be substantial, making it critical to include in analyses.

Each of these effects has implications for the total amount of vehicle travel. These effects operate over different time scales. For example, changes in mode choice might occur immediately, while land use changes typically take a few years or longer. CEQA requires lead agencies to analyze both short-term and long-term effects.

Evidence of Induced Vehicle Travel. A large number of peer reviewed studies[39] have demonstrated a causal link between highway capacity increases and VMT increases. Many provide quantitative estimates of the magnitude of the induced VMT phenomenon. Collectively, they provide high quality evidence of the existence and magnitude of the induced travel effect.

[39] See, e.g., Boarnet and Handy (Sept. 2014) Impact of Highway Capacity and Induced Travel on Passenger Vehicle Use and Greenhouse Gas Emissions, California Air Resources Board Policy Brief, available at https://www.arb.ca.gov/cc/sb375/policies/hwycapacity/highway_capacity_brief.pdf; National Center for Sustainable Transportation (Oct. 2015) *Increasing Highway Capacity Unlikely to Relieve Traffic Congestion*, available at http://www.dot.ca.gov/research/researchreports/reports/2015/10-12-2015-NCST_Brief_InducedTravel_CS6_v3.pdf.

Most of these studies express the amount of induced vehicle travel as an "elasticity," which is a multiplier that describes the additional vehicle travel resulting from an additional lane mile of roadway capacity added. For example, an elasticity of 0.6 would signify an 0.6 percent increase in vehicle travel for every 1.0 percent increase in lane miles. Many of these studies distinguish "short run elasticity" (increase in vehicle travel in the first few years) from "long run elasticity" (increase in vehicle travel beyond the first few years). Long run elasticity is larger than short run elasticity, because as time passes, more of the components of induced vehicle travel materialize. Generally, short run elasticity can be thought of as excluding the effects of land use change, while long run elasticity includes them. Most studies find a long run elasticity between 0.6 and just over 1.0,[40] meaning that every increase in lanes miles of one percent leads to an increase in vehicle travel of 0.6 to 1.0 percent. The most recent major study finds the elasticity of vehicle travel by lanes miles added to be 1.03; in other words, each percent increase in lane miles results in a 1.03 percent increase in vehicle travel.[41] (An elasticity greater than 1.0 can occur because new lanes induce vehicle travel that spills beyond the project location.) In CEQA analysis, the long-run elasticity should be used, as it captures the full effect of the project rather than just the early-stage effect.

Quantifying Induced Vehicle Travel Using Models. Lead agencies can generally achieve the most accurate assessment of induced vehicle travel resulting from roadway capacity increasing projects by applying elasticities from the academic literature, because those estimates include vehicle travel resulting from induced land use. If a lead agency chooses to use a travel demand model, additional analysis would be needed to account for induced land use. This section describes some approaches to undertaking that additional analysis.

Proper use of a travel demand model can capture the following components of induced VMT:

- Trip length (generally increases VMT)
- Mode shift (generally shifts from other modes toward automobile use, increasing VMT)
- Route changes (can act to increase or decrease VMT)
- Newly generated trips (generally increases VMT)
    - Note that not all travel demand models have sensitivity to this factor, so an off-model estimate may be necessary if this effect could be substantial.

However, estimating long-run induced VMT also requires an estimate of the project's effects on land use. This component of the analysis is important because it has the potential to be a large component of

[40] See Boarnet and Handy (Sept. 2014) *Impact of Highway Capacity and Induced Travel on Passenger Vehicle Use and Greenhouse Gas Emissions*, California Air Resources Board Policy Brief, p. 2, available at https://www.arb.ca.gov/cc/sb375/policies/hwycapacity/highway_capacity_brief.pdf.

[41] Duranton and Turner (2011) *The Fundamental Law of Road Congestion: Evidence from US cities*, available at http://www.nber.org/papers/w15376.

the overall induced travel effect. Options for estimating and incorporating the VMT effects that are caused by the subsequent land use changes include:

1. *Employ an expert panel.* An expert panel could assess changes to land use development that would likely result from the project. This assessment could then be analyzed by the travel demand model to assess effects on vehicle travel. Induced vehicle travel assessed via this approach should be verified using elasticities found in the academic literature.
2. *Adjust model results to align with the empirical research.* If the travel demand model analysis is performed without incorporating projected land use changes resulting from the project, the assessed vehicle travel should be adjusted upward to account for those land use changes. The assessed VMT after adjustment should fall within the range found in the academic literature.
3. *Employ a land use model, running it iteratively with a travel demand model.* A land use model can be used to estimate the land use effects of a roadway capacity increase, and the traffic patterns that result from the land use change can then be fed back into the travel demand model. The land use model and travel demand model can be iterated to produce an accurate result.

A project which provides new connectivity across a barrier, such as a new bridge across a river, may provide a shortened path between existing origins and destinations, thereby shortening existing trips. In rare cases, this trip-shortening effect might be substantial enough to reduce the amount of vehicle travel resulting from the project below the range found in the elasticities in the academic literature, or even lead a net reduction in vehicle travel overall. In such cases, the trip-shortening effect could be examined explicitly.

Whenever employing a travel demand model to assess induced vehicle travel, any limitation or known lack of sensitivity in the analysis that might cause substantial errors in the VMT estimate (for example, model insensitivity to one of the components of induced VMT described above) should be disclosed and characterized, and a description should be provided on how it could influence the analysis results. A discussion of the potential error or bias should be carried into analyses that rely on the VMT analysis, such as greenhouse gas emissions, air quality, energy, and noise.

From:	Kristi Bascom
To:	Clerk
Cc:	Edward T. Schexnayder; Carmen J. Borg
Subject:	Public comment on 8/14/2024 City Council agenda Item ID 25-1026 - Email 2 of 2
Date:	Tuesday, August 12, 2025 6:09:40 PM
Attachments:	image001.png SMW-SFCA letter Attachments K-N.pdf

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External Email: Use caution with links and attachments

Second email with attachments to comment letter on behalf of South Fresno Community Alliance for 8/14/2025 City Council agenda item # ID 25-1026. Attachments K, L, M, and N included in this email.

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Attachment K

Community Emissions Reduction Program

South Central Fresno

September 19, 2019

San Joaquin Valley
AIR POLLUTION CONTROL DISTRICT

EXECUTIVE SUMMARY

The air quality challenges that the communities in the San Joaquin Valley face are unmatched by any other region in the nation. The San Joaquin Valley, due to its unique geography, topography, and meteorology, continues to face daunting challenges in meeting the latest federal health-based air quality standards. Since 1992, the San Joaquin Valley Air Pollution Control District (District) has implemented nearly 650 rules and regulations to control air pollution in the Valley Air Basin. Numerous plans to improve Valley air quality and attain state and federal air quality standards have detailed a wide-range of strategies, including regulatory measures, extensive incentive investment to promote clean-air technologies in Valley communities, and other first-of-their kind measures.

As a result of the District's stringent and comprehensive air quality management strategy, along with significant investments made by Valley businesses and residents, PM2.5 and ozone levels are now at historically low levels, and the Valley continues to be in attainment of the PM10 federal air quality standard. Emissions from stationary sources have been reduced by 85%, cancer risk from exposure to air pollutants has been reduced by 95%, population exposure to elevated PM2.5 levels have been reduced by 85%, and population exposure to elevated ozone levels have been reduced by 90%.

Despite these regional air quality improvements, significant concern has been expressed by the California legislature about potential localized impacts of air pollution in disadvantaged communities throughout the state. In answer to that concern, Assembly Bill (AB) 617, signed into law in July 2017, initiated a state-wide effort to monitor and reduce air pollution, and improve public health, in communities that experience disproportionate burdens from exposure to air pollutants through new community-focused and community-driven actions. The community of South Central Fresno was prioritized by the Air District and subsequently selected by the California Air Resources Board (CARB) as one of two first-year communities in the San Joaquin Valley to receive clean air resources newly available under AB 617, based on a technical analysis of several pollution and poverty-related criteria.

AB 617 provides mechanisms and resources to implement community-specific air quality monitoring networks; to develop, implement, and track emission reduction programs; to improve availability of data and other technical information; and to invest substantial funding in the community through voluntary incentive funding measures. Importantly, these measures are guided by advice and knowledge of local community members, through their input and involvement on Steering Committees for each AB 617-selected community.

Air pollution emission reduction and exposure reduction measures implemented under AB 617 programs will further advance ongoing state and District efforts to reduce regional and community exposure to air pollutants. In the preparation of this

Community Emissions Reduction Program, the District has worked closely with CARB, the Community Steering Committee, and the public, including other local agencies, community-based organizations, community members, environmental organizations, regulated industry representatives, and other key stakeholders to develop strategies and an implementation plan to reduce harmful air pollutants in the community of South Central Fresno. The plan developed through this collaborative process employs proven and innovative strategies, and significant resources, to improve community health by reducing exposure to air pollutants in South Central Fresno.

This Community Emission Reduction Program (CERP) provides a description of the community of South Central Fresno, including geographical boundaries and socioeconomic factors impacting community residents. A technical analysis describes the sources of pollution impacting the community, as well as the location of sensitive receptors within the community. Sources of pollution that are of particular concern to community members are highlighted, and possible strategies for reducing pollution impacts from these sources are evaluated. The strategies that were ultimately selected for implementation in the community are outlined, including incentive funding measures, public engagement strategies, enforcement strategies, regulatory strategies, and strategies that will be completed in partnership with other agencies and local organizations. Finally, an implementation schedule and metrics for tracking emission reductions in annual reporting and at the five-year milestone are discussed in detail.

This draft CERP anticipates investing $44.3 million in emission reduction incentives for cleaner cars and trucks, and a variety of other clean air projects in the South Central Fresno area. Additional measures have been developed to reduce exposure to air pollution for sensitive receptors, including schools and residences. These efforts are projected to achieve approximately 278 tons of PM2.5 reductions and 1662 tons of NOx reductions as well as significant reductions in air toxics emissions in the community, particularly with respect to diesel particulate matter from mobile sources, the main contributor to community air toxics health risk. Additional regulatory and outreach strategies will provide for further reductions and increased awareness of the community's air quality challenges and the resources available to help the public reduce emissions and avoid exposure to air pollution.

TABLE OF CONTENTS

Executive Summary 1
1. Introduction 5
1.1 Implementation of AB 617 in South Central Fresno 5
1.2 Health Based Air Quality Objectives 7
2. Community Partnerships and Public Engagement 10
2.1 Community Kick-off Meeting 10
2.2 Community Steering Committee 11
2.3 Community Steering Committee Charter 14
2.4 Community Webpage 15
2.5 Community Partners 16
2.6 Additional Community Engagement 17
3. Understanding the Community 18
3.1 Community Profile 18
3.2 Technical Assessment to Understand Community Pollution Impacts 23
3.2.1 Community Emissions Inventory Approach 23
3.2.2 Community Emissions Inventory Overview 23
3.2.3 Agency Collaborations 24
3.2.4 Community Emission Inventory Summaries 24
3.2.5 Sensitive Receptors and Land Use 31
3.3 Existing Air Quality Programs 35
4. Strategies to Reduce The Cumulative Exposure Burden in South Central Fresno 46
4.1 Community Identified Air Quality Priorities 46
Heavy Duty Mobile Sources 49
Older/High Polluting Passenger Cars 61
Residential Burning 65
Agricultural Operations 69
Industrial Sources 76
Emissions Exposure Due and Land Use 87
Solar Deployment in the Community 95
Commercial Cooking 98
Dust in the Community 101
Lawn and Garden Equipment 105
Public Fleets 108
Exposure Reduction Strategies for Sensitive Receptors 111
Exposure Reduction Strategies for Schools 113
Indoor Air Quality 116
Urban Greening 118
Vegetative Barriers in South Central Fresno 122
Reducing Automobile Idling Near Sensitive Receptors 125
Community Outreach Strategies 127
Additional Regulatory measures to reduce emissions in the community 131
BARCT Expedited Schedule 131

Permitting: BACT and T-BACT Determinations 137
Facility Risk Reduction Audits-Ab 2588 (Air Toxics Hot Spots Information And Assessment Act) 137
Enforcement Strategies 141
Statewide Strategies 142
Overview of California Air Resources Board's Statewide Actions 142
Regulatory Programs 143
Enforcement Programs 144
Incentive Programs 145
CARB Actions Related to the South Central Fresno Community 146
Emission Reduction Targets 152
5. Enforcement Plan 155
5.1 Introduction 155
5.2 Overview of San Joaquin Valley Air Pollution Control District Enforcement Program 155
5.3 San Joaquin Valley Air Pollution Control District Enforcement History in South Central Fresno Community 160
5.3.1 Response to Public Air Pollution Complaints 160
5.3.2 District Enforcement Actions 164
5.4 California Air Resources Board Program Overview and Enforcement History in South Central Fresno Community 166
5.4.1 California Air Resources Board Three Year Enforcement History 167
5.4.2 Motor Vehicle Fuels 171
5.4.3 Consumer Products Program Descriptions 172
5.4.4 Summary of Complaints Received and Their Resolution 173
5.5 Leveraging Community Involvement in Enforcing Rules to Reduce Air Pollution 173
5.6 Enforcement Strategies 174
5.6.1 District Enforcement Strategies 174
5.6.2 CARB Enforcement Strategies 176
6. Metrics to Track Progress 179
6.1 Metrics to Track Progress in Annual Reports 179
6.2 Metrics for Five-Year Milestone Evaluation 180
7. California Environmental Quality Act (CEQA) Project Review 186

A. Appendix A: Community Outreach Materials A-1
B. Appendix B: Steering Committee Charter B-1
C. Appendix C: Source Apportionment and Community Inventories C-1
D. Appendix D: Public Resource:Existing Control of Sources of Concern D-1
E. Appendix E: Facility Risk Reduction Audits under AB 2588-Facility Reassessment Status E.1
F. Appendix F: Enforcement Plan Attachments F-1
G. Appendix G: Health Impacts of Air Pollution G-1
H. Appendix H. Letters Received from Steering Committee Members H.1
I. Appendix I: Comments and Responses I-1

1. INTRODUCTION

1.1 IMPLEMENTATION OF AB 617 IN SOUTH CENTRAL FRESNO

The implementation of Assembly Bill (AB) 617 (C. Garcia, Chapter 136, Statutes of 2017) has brought additional clean air resources and strategies to Valley communities that are burdened by socioeconomic disadvantages and air pollution, despite significant emissions reductions that have already been achieved regionally. AB 617 provides mechanisms and resources to adopt expedited schedules for the implementation of advanced control technologies for existing stationary source facilities; increased stringency of reporting requirements for stationary sources; to develop and implement community-specific air quality monitoring networks; to implement, and track localized emission reduction programs; to improve availability of data and other technical information; and to invest substantial funding in the community through voluntary incentive funding measures. Resources available through this legislation have allowed the San Joaquin Valley Air Pollution Control District (District), through a comprehensive public outreach and community engagement process, to expand regional programs for community protection and develop a robust plan for reducing local exposure to fine particulate matter and toxic air contaminants in the AB 617-selected community of South Central Fresno.

Several requirements of AB 617 will serve to reduce air pollution in disadvantaged communities throughout the San Joaquin Valley. AB 617 legislation requires districts that are in nonattainment for one or more air pollutants to adopt expedited schedules by January 2019 for the implementation of Best Available Retrofit Control Technology (BARCT). The District Governing Board adopted this schedule at a public hearing held in December 2018, which set the path forward for the District to research and potentially amend applicable rules. The expedited BARCT implementation schedule is discussed in more detail later in this document. Additionally, AB 617 requires "Stationary Sources" to report their criteria pollutant emissions inventory as well as their air toxics emissions inventory to the State on an annual basis. These emissions inventories will be presented in the Uniform Statewide Reporting System, once developed by California Air Resources Board (CARB). Under AB 617, a Stationary Source is defined as facility meeting any one of the following:

- Required to submit Greenhouse Gas emissions under the CH&SC § 38530 (Mandatory GHG Emissions Reporting),
- A facility that is authorized by a permit issued by a district to emit 250 or more tons per year of any nonattainment pollutant or its precursors, or
- A facility that receives an elevated prioritization score based on cancer or noncancer health impacts pursuant to Section CH&SC § 44360 (Air Toxics Hot Spots, Chapter 4: Risk Assessment).

The District has worked with closely with CARB, regulated entities, and other stakeholders to implement this new reporting requirement in the Valley. Further information on the implementation of the AB 617 stationary source criteria pollutant emissions inventory reporting requirement is available at:

https://ww2.arb.ca.gov/news/carb-adopts-uniform-statewide-system-reporting-criteria-air-pollution-emissions-data

The District's initial community identification and prioritization analysis for the first year of AB 617 implementation was based on extensive air quality analysis, numerous health indicators from the state's CalEnviroScreen model (version 3.0), and various other socioeconomic indicators. In developing San Joaquin Valley community recommendations for additional clean air resources and public engagement under AB 617, the District conducted an extensive public engagement process to seek input from Valley residents, businesses, agencies, and other stakeholders through a variety of public workshops and meetings throughout the Valley.

Based on this extensive public engagement effort and the District's comprehensive identification and prioritization analysis, South Central Fresno was recommended by the District Governing Board as a first-year community. Located Sources that affect South Central Fresno include freight operations, industry, and freeways. The South Central Fresno community has a high cumulative air pollution exposure burden, a significant number of sensitive receptors, and includes census tracts designated as disadvantaged communities. After further technical review and public engagement, the community of South Central Fresno was ultimately selected by the CARB Governing Board for the development of a community air monitoring plan and an emissions reduction program designed to reduce pollution impacts in the selected community.

In accordance with the community-driven nature of AB 617 directives, in September 2018, the District Governing Board directed staff to immediately convene a community steering committee under a set of guiding principles. The selected Steering Committee is comprised of residents, businesses, non-governmental organizations, and public agencies, acting in an advisory capacity to the District in the development of community air monitoring plans and community emission reduction programs. To ensure successful implementation of AB 617, residents, businesses, non-profits, agencies, and other stakeholders from all sectors within selected communities must be involved in the development of community-specific plans. Towards that end, the District has worked closely with the Community Steering Committees to develop effective strategies, including engaging with Valley residents, businesses, agencies, and other stakeholders to identify and move forward with clean air investments in AB 617 communities.

The South Central Fresno community air monitoring plan was developed with the advice of the community Steering Committee, and deployed beginning in June, 2019. This community-specific air monitoring network provides an expanded monitoring capacity designed to provide scalable, portable, and rapidly deployable air monitoring equipment to the community. This includes a combination of air monitoring platforms equipped with highly specialized analyzers capable of monitoring a full range of criteria and toxic pollutants. Various monitoring platforms include larger air monitoring trailers, mobile air monitoring vans, and compact air monitoring sensors. Monitoring data from these sensors is made available to members of the public in real-time, and can be found at the following location http://community.valleyair.org/selected-communities/south-central-

fresno/air-monitoring/. The full community air monitoring plan, with further details on selected monitoring equipment and monitoring locations, is available at http://community.valleyair.org/media/1308/fresno_camp_v1_2019_july-1.pdf.

As a culmination of the community-driven actions and engagement called for under AB 617, the District has developed and begun implementation of a Community Emissions Reduction Program, or CERP, in partnership with CARB, residents, affected sources, and local government bodies in the affected community. Steering Committee input and other comments received from the public in the community have provided instrumental information, critical to implementing community-specific measures and addressing community concerns. Strong collaboration between the District, CARB, other local agencies, and community members has resulted in the development of an ambitious plan for reducing localized pollution and associated health impacts in South Central Fresno.

This CERP provides a description of the community of South Central Fresno, including geographical boundaries and socioeconomic factors impacting community residents. A technical analysis describes the sources of pollution impacting the community, as well as the location of sensitive receptors within the community. Sources of pollution that are of particular concern to community members are highlighted, and possible strategies for reducing pollution impacts from these sources are evaluated. The strategies that were ultimately selected for implementation in the community are outlined, including incentive funding measures, public engagement strategies, enforcement strategies, regulatory strategies, and strategies that will be completed in partnership with other agencies and local organizations. Finally, an implementation schedule and metrics for tracking emission reductions in annual reporting and at the five-year milestone are discussed in detail.

1.2 HEALTH BASED AIR QUALITY OBJECTIVES

Community Emission Reduction Programs implemented under AB 617 are designed to reduce emissions of pollutants that have been shown to have adverse impacts on public health, including fine particulate matter and toxic air contaminants. As specified in CARB's Community Air Protection Program Blueprint, Appendix C (Criteria for Community Emission Reduction Programs), this plan will focus on reducing individual criteria air pollutant and toxic air contaminant emissions to address the impacts of community exposure to multiple pollutants. While each community faces distinct health-based challenges, CARB guidance states that broad health-based air quality objectives provide a consistent foundation for determining the appropriate levels of emissions reductions for CERPs statewide.

The U.S. Environmental Protection Agency and the State of California have established ambient air quality standards, which set health-protective levels for the following criteria pollutants: ozone, particulate matter with a diameter of 10 microns or smaller (PM10), particulate matter with a diameter of 2.5 microns or smaller (PM2.5), carbon monoxide, nitrogen dioxide, sulfur dioxide, and lead. California also has standards for sulfates, vinyl chloride, and hydrogen sulfide. Due to the implementation of the most stringent

control measures in the nation for emissions from stationary sources, and an effective incentive program to reduce emissions from sources not under the District's regulatory authority, the Valley Air Basin is in attainment for many of these standards. However, due to the region's topography and meteorology, the Valley is classified as Serious nonattainment for the federal PM2.5 standards, and Extreme nonattainment for federal ozone standards.

Particulate Matter: Particulate matter is a mixture of solid particles and liquid droplets in the air. PM can be emitted directly into the atmosphere (primary PM), or can form as secondary particulates in the atmosphere through the photochemical reactions of precursors (when precursors are energized by sunlight). Thus, PM is made up of a number of components, including acids (such as nitrates and sulfates), organic chemicals, metals, and soil or dust particles. PM10 is particulate matter that is 10 microns or less in diameter, and the PM2.5 subset includes smaller particles that are 2.5 microns or less in diameter.

Any particles 10 microns or less are considered respirable, meaning they can be inhaled into the body through the mouth or nose. PM10 can generally pass through the nose and throat and enter the lungs. PM2.5 can be inhaled more deeply into the gas exchange tissues of the lungs, where it can be absorbed into the bloodstream and carried to other parts of the body. The potential health impacts of particle pollution are linked to the size of the particles, with the smaller particles having larger impacts. Numerous studies link PM2.5 to a variety of health problems, including aggravated asthma, increased respiratory symptoms (irritation of the airways, coughing, difficulty breathing), decreased lung function in children, development of chronic bronchitis, irregular heartbeat, non-fatal heart attacks, increased respiratory and cardiovascular hospitalizations, lung cancer, and premature death. Children, older adults, and individuals with heart or lung diseases are the most likely to be affected by PM2.5.

Many studies have quantified and documented the health benefits of attaining the U.S. Environmental Protection Agency (EPA) air quality standards for PM. The Valley Air Basin is in attainment of the federal standards for PM10, but is currently classified as Serious nonattainment for the federal PM2.5 standards. The District, in partnership with CARB, recently released the *2018 Plan for the 1997, 2006, and 2012 PM2.5 Standards,* which details strategies to move the region towards attainment of the federal PM2.5 standards. More information is available at: http://valleyair.org/pmplans. This plan is also discussed in further detail in Chapter 3.

Ozone: Ozone is a regional air pollutant that is formed through complex chemical reactions in the atmosphere. In contrast, PM2.5 concentrations are the result of both local and regional emissions, and reducing localized emissions of PM2.5 can reduce disparities in exposure experienced in communities with high cumulative exposure burdens. CARB Office of Community Air Protection guidance states that, because ozone formation is driven by regional rather than localized source contributions, ozone should be addressed in regional air quality improvement efforts through the State Implementation Plan. Therefore, ozone and related precursors have not been

addressed as a part of this CERP development. The District's current plan for attainment of health-based ozone standards throughout the San Joaquin Valley Air Basin can be found here: http://valleyair.org/Air_Quality_Plans/Ozone_Plans.htm

Toxic air contaminants: Toxic air contaminants (TACs) also contribute to a community's cumulative exposure burden. Exposure to TACs can increase the risk of acute and chronic health impacts as well as cancer. Diesel particulate matter is a large concern in areas with high exposure to diesel engine emissions, such as the community of South Central Fresno. Other toxic air contaminants can contribute to localized health risks, including metals; air toxics related to fossil fuel production, such as benzene and toluene; and compounds associated with combustion, including polycyclic aromatic hydrocarbons and dioxins. The California Office of Environmental Health Hazard Assessment (OEHHA) establishes threshold concentrations for toxic air contaminants at which exposure is not expected to trigger non-cancer health effects. For carcinogens, OEHHA guidance states that there are no safe exposure thresholds. Reducing emissions in the community will be based on identifying technologies and practices that offer the maximum level of toxic air contaminant emissions reductions achievable to address both types of health effects

With the support of community members, this CERP will build upon regional efforts to improve air quality throughout the Valley Air Basin. The South Central Fresno CERP focuses on reducing emissions of and exposure to PM2.5 and toxic air contaminants from localized sources that contribute to cumulative exposure burdens within the community. Pollution reduction strategies, targets, goals, and metrics included in this CERP have been developed in accordance with these health-based air quality objectives and are presented in more detail in Section 4 of this document.

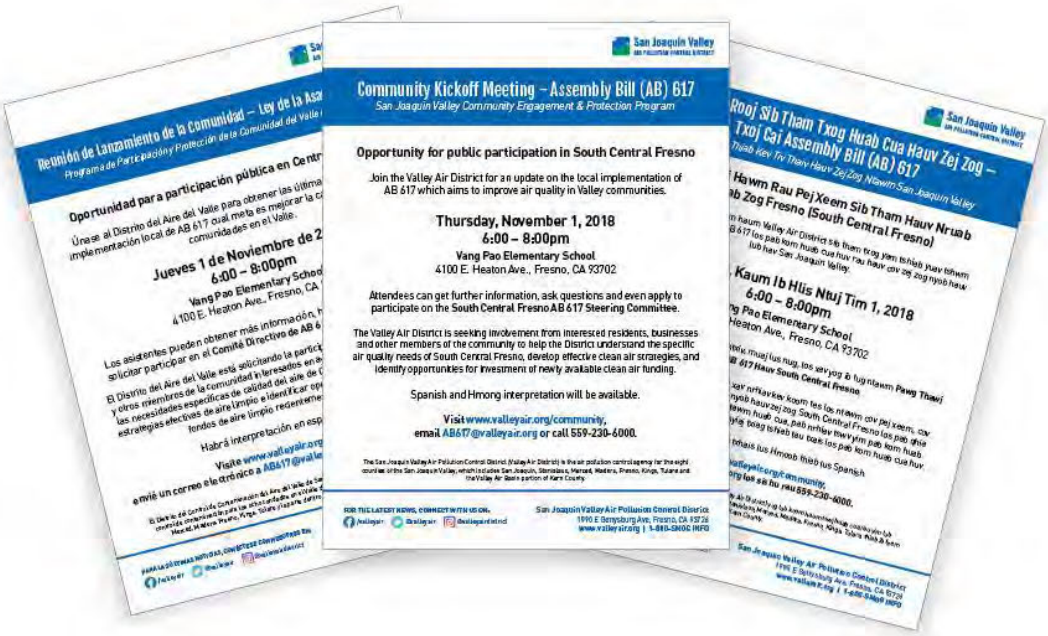
2. COMMUNITY PARTNERSHIPS AND PUBLIC ENGAGEMENT

Meaningful community engagement, significant outreach and a robust public process have guided the development of this Community Emissions Reduction Plan (CERP). Key features of these efforts included hosting a kick-off meeting and conducting initial public outreach; establishing a Community Steering Committee; holding monthly facilitated bilingual meetings; presentations by entities such as the District, local government, CARB, and the City of Fresno; providing materials in multiple languages via email, mail and a webpage; and live-streaming and recording of all Community Steering Committee meetings. In addition, numerous interactions between Community Steering Committee members and District staff occurred in one-on-one or small group meetings allowing for in-depth discussions on joint development of the CERP. See the community webpage (http://community.valleyair.org/selected-communities/south-central-fresno) for more details.

2.1 COMMUNITY KICK-OFF MEETING

In October 2018, District staff conducted multilingual outreach, worked collaboratively with environmental justice organizations, distributed trilingual flyers (Figure 2-1) to local schools, and invested approximately $3,500 in social media advertisements targeted at the South Central Fresno zip codes to encourage attendance at the official kick-off meeting.

Figure 2-1: Trilingual Community Flyers Distributed



The Community Kick-Off Meeting in the South Central Fresno Community was held on Thursday, November 1, 2018, at Vang Pao Elementary School (Figure 2-2). Approximately 70 people attended the meeting. In addition to information about AB 617, attendees were invited to visit booths, which provided information about monitoring technology and District incentive programs. Spanish and Hmong interpretation was provided for the meeting. Community members were encouraged to apply to be on the South Central Fresno Community Steering Committee at the Kick-off meeting, and additional time was given for individuals to apply via email or mail.

Figure 2-2: South Central Fresno Kick-off Meeting

2.2 COMMUNITY STEERING COMMITTEE

Two rounds of Community Steering Committee member solicitation occurred, one prior to the initial Community Steering Committee meeting, and a second after the Community Steering Committee made the decision to expand the community boundaries in March, 2019.

Of the 65 individuals who applied to be on the Community Steering Committee, the final committee consisted of 25 community residents; 25 individuals representing either an environmental justice organization working in the community, a health care organization, an educational entity or a business within the community; and six non-voting government officials with some of these members having an alternate. A full roster of membership is available in Table 2-1.

Table 2-1: South Central Fresno Steering Committee Members, and Alternates

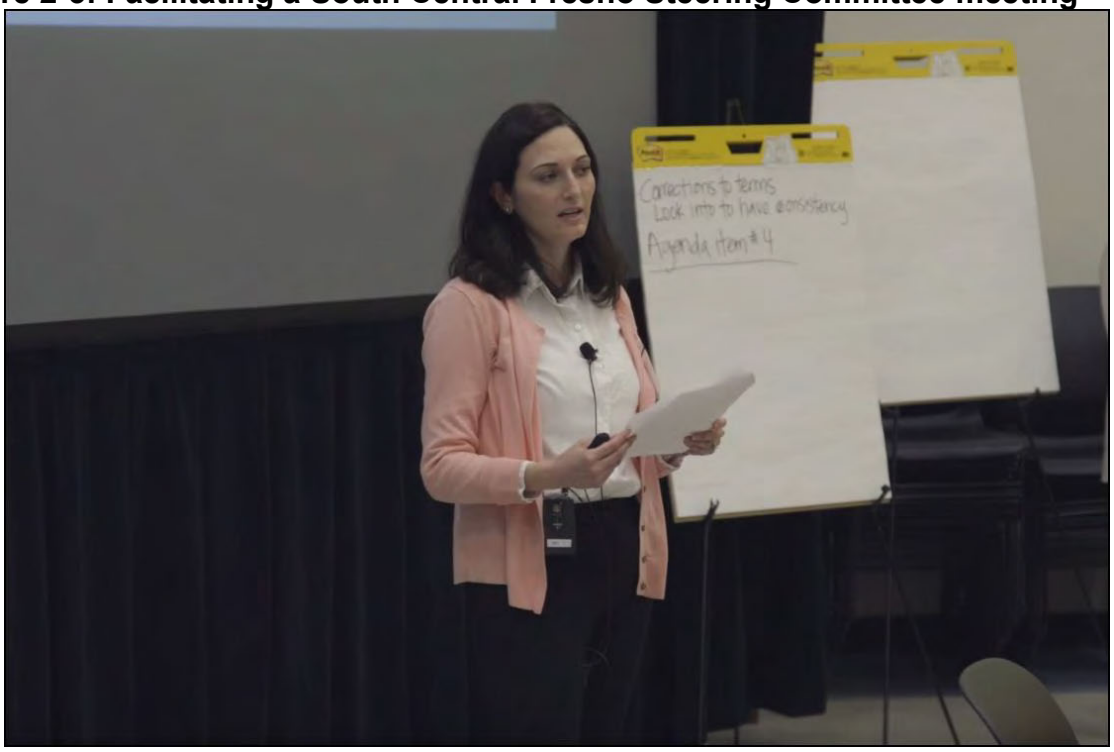
SOUTH CENTRAL FRESNO COMMUNITY STEERING COMMITTEE

First Name	Last Name		*Alternate*
Resident Committee Members			
Lilia	Becerril	Resident	
Josie	Cardenas	Resident	
Nick	Cardenas	Resident	
Venise	Curry	Resident	
Gloria	Covarrubias	Resident	
Mercedes	Delgadillo	Resident	
Jeffrey	Eisinger	Resident	
Genevieve	Gale	Resident	*Monica Limon*
Irma	Hernandez	Resident	
Hilda	Lopez	Resident	
Franki	Martinez	Resident	
Jessica	Martinez-Hernandez	Resident	
Eugenia	Melesio	Resident	
Samuel	Molina	Resident	*Martha Lopez*
Dalia	Mondragon	Resident	
Daniel	O'Connell	Resident	
Estela	Ortega	Resident	
Eric	Payne	Resident	
Carmen	Salazar	Resident	*Ilda Villa*
Celina	Sandoval	Resident	*Marcela Sagrero*
Larry	Taylor	Resident	
Peter	Thompson	Resident	*Steven Brudenell*
Isabel	Vargas	Resident	
Catalina	Ventura	Resident	
Beatriz	Zavala	Resident	
All Others Selected for Steering Committee			
Andy	Burgin	Business in Community	
Santokh	Dhillon	Business in Community	
Lisa	Flores	Business in Community	
Janet	Gardner	Business in Community	
Sylvesta	Hall	Business in Community	
Kevin	Hamilton	EJ Advocate	*Tim Tyner*
Dana	Horne	Business in Community	
Bill	Jensen	Business in Community	
Victor	Lai	Business in Community	
Janelle	Lee	Health care	*David Amsalem*
Oralia	Maceda Mendez	EJ Advocate	
Janice	Mathurin	EJ Advocate	
Nayamin	Martinez	EJ Advocate	*Jesus Mendoza*

Kimberly	McCoy	EJ Advocate	
David	Meeker	Business in Community	*Alejandro Hernandez*
Laura	Moreno	EJ Advocate	
Micah	Olivas	School	
Oscar	Robinson	Business in Community	
Abraham	Saghbini	Business in Community	
Ivanka	Saunders	EJ Advocate	
Lee	Smith	Business in Community	*Larry Westerlund*
Rick	Spurlock	Business in Community	*Hector Lara Jr*
Jerry	Steward	Business in Community	
Jody	Swacker	Business in Community	*James Anderson*
Ed	Ward	Business in Community	
Government Official Committee Participants			
Gregory	Barfield	Government Official	
Braden	Duran	Government Official	*Meg Prince*
Mohammad	Khorsand	Government Official	
Scott	Mozier	Government Official	*Andrew Benelli*
Manuel	Vilanova	Government Official	
Lupe	Perez	Government Official	

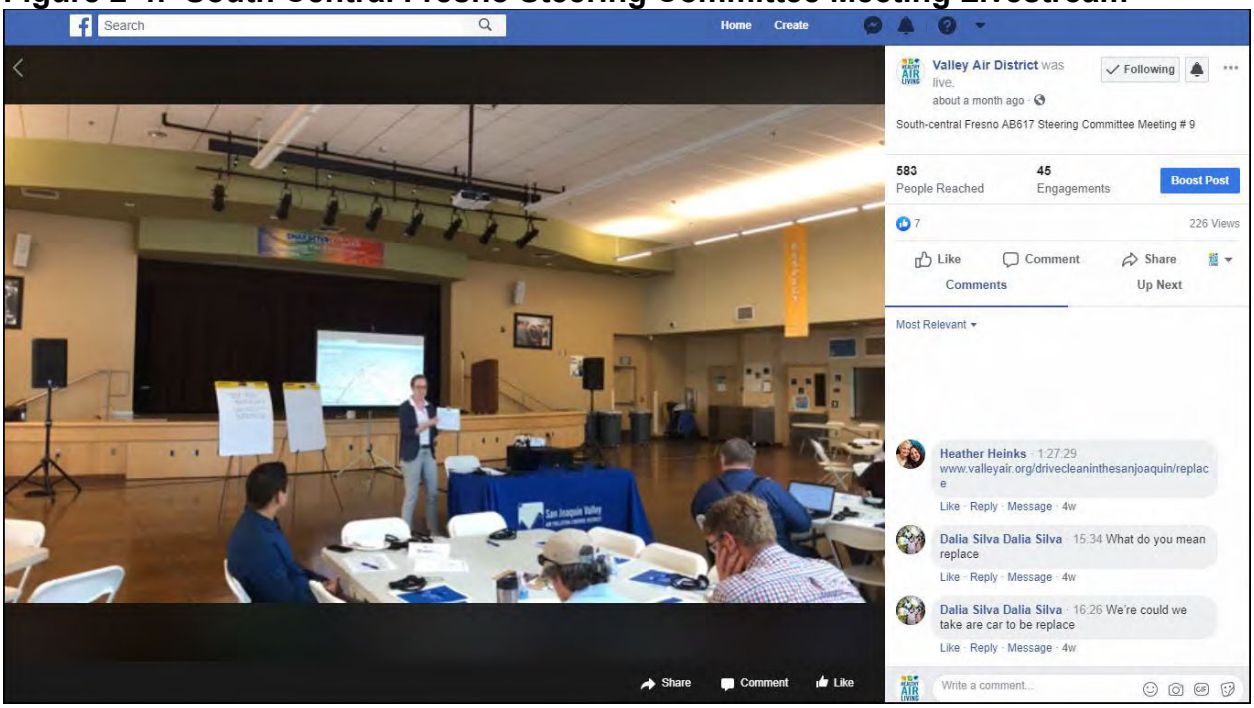
The South Central Community Steering Committee met at least once a month, usually on the second Wednesday of the month at the various locations within the community. These meetings were initially facilitated by Southwest Strategies (Figure 2-3). With the end of the District's fiscal year in June, the Institute for Local Government was brought on board to facilitate meetings from August onward.

Figure 2-3: Facilitating a South Central Fresno Steering Committee meeting



Meals were provided at each meeting, as well as kid's activities. Real-time English and Spanish interpretation was provided with all members being given headsets and all materials distributed in both languages. High quality video recordings were made by the Community Media Access Collaborative (CMAC) at each meeting and posted to the South Central community website as well as on CMAC public access government television channel. In addition, Facebook was used to Livestream the meetings in real-time for the public to watch, while also providing a video archive of the meetings (Figure 2-4).

Figure 2-4: South Central Fresno Steering Committee Meeting Livestream



See Appendix A for full documentation of meeting dates, agendas, attendance, materials and summaries.

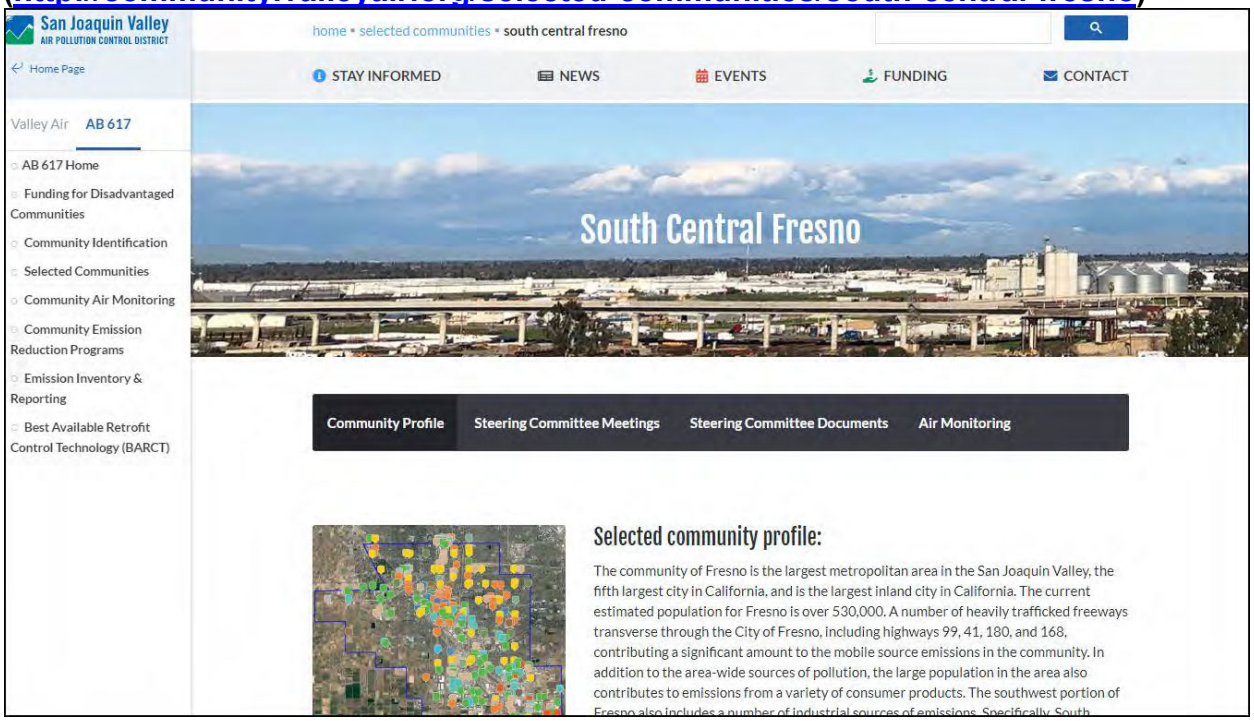
2.3 COMMUNITY STEERING COMMITTEE CHARTER

A Charter was developed for the South Central Fresno Community Steering Committee and a draft was presented to the members at Meeting #1, in December, 2018. The Charter and a potential expansion to the community boundary to include the area of Fresno targeted through the Transformative Climate Communities (TCC) program was discussed at several subsequent meetings. Both the charter and the expanded boundary were finalized after Meeting #4, in March, 2019 (see maps on subsequent pages). The final Charter can be found in Appendix B, and at http://community.valleyair.org/selected-communities/south-central-fresno/steering-committee-documents/.

2.4 COMMUNITY WEBPAGE

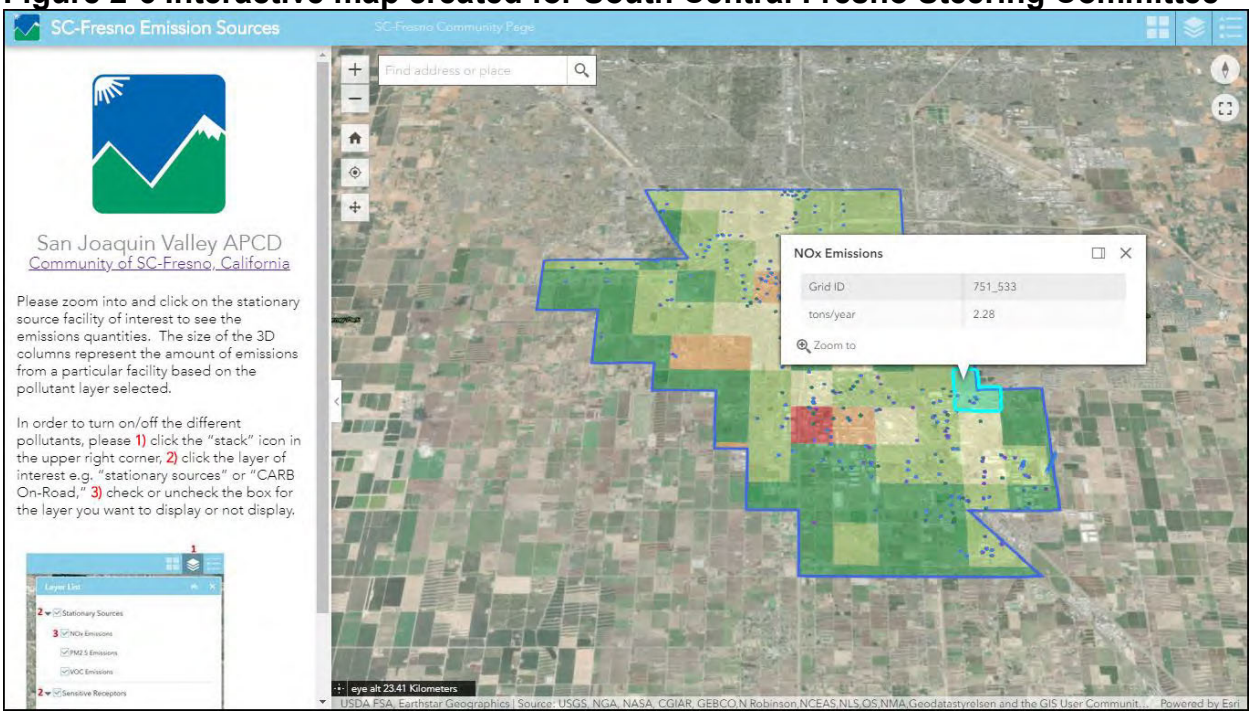
A community webpage has been created for the South Central Fresno AB 617 community, and is regularly updated with new information (http://community.valleyair.org/selected-communities/south-central-fresno). The webpage includes information about upcoming meetings, meeting materials (flyers, agendas, presentations, handouts, audio and video links, meeting summaries), interactive maps, community steering committee roster and committee charter, membership process, and the Community Air Monitoring Plan (CAMP) and CERP documents. All documents were made available in English and Spanish. A screenshot of the community webpage is shown in Figure 2-5.

Figure 2-5 Community Webpage for South Central Fresno (http://community.valleyair.org/selected-communities/south-central-fresno)



In addition to being a portal for access to meeting materials and documents, the webpage also includes interactive maps that present data about the community (https://sjvapcd.maps.arcgis.com/apps/webappviewer3d/index.html?id=f81aaec7a1b8404b88072190e92fc48e). Figure 2-6 is an example of an interactive map that was created for the South Central Fresno community. These interactive maps provide data on land use, locations of facilities, schools, hospitals, and the air quality concerns identified by the South Central Fresno Steering Committee and members of the public. This information was provided to help inform air quality priorities for the CERP.

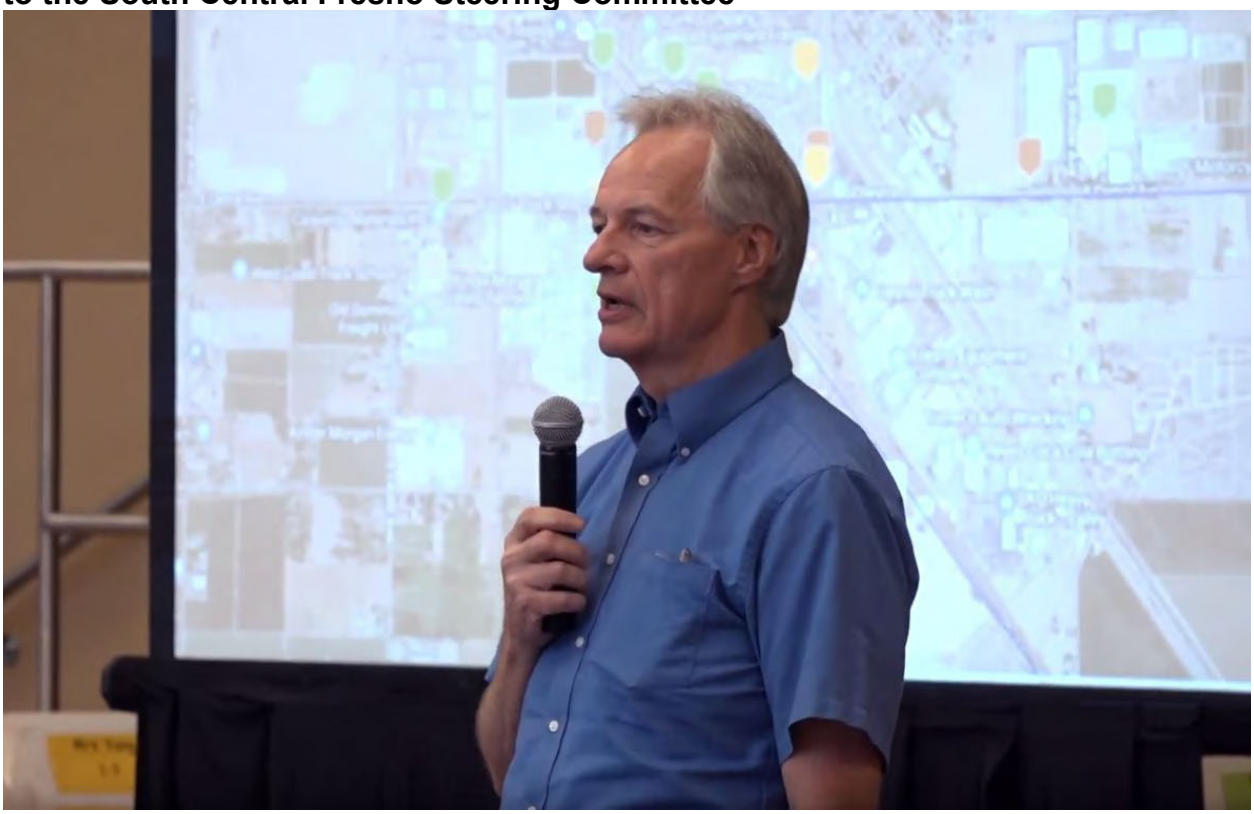
Figure 2-6 Interactive map created for South Central Fresno Steering Committee



2.5 COMMUNITY PARTNERS

After the South Central Fresno Community Steering Committee identified priorities for the community, partner agencies and organizations were invited to the meetings to provide updates, input and presentations on current and future efforts. CARB staff attended meetings regularly and provided information to the committee. California Department of Transportation staff presented current and future transportation projects affecting the community (Figure 2-7). The City of Fresno also attended regularly and provided an update on planning efforts in the community and the TCC program. Coordination with the TCC program will be ongoing.

Figure 2-7: California Department of Transportation Project Manager presenting to the South Central Fresno Steering Committee



2.6 ADDITIONAL COMMUNITY ENGAGEMENT

Since late 2018, District staff has worked to engage and educate the public with regard to AB 617 and the efforts being made in the South Central Fresno Community, including inviting public comment at each Steering Committee meeting. Staff has met with community members, environmental justice organizations, industry and other stakeholders to provide assistance and/or prompt responses to concerns raised about the AB 617 process. Staff also attended and often made presentations at local civic organizations, city and county government meetings, the District's Environmental Justice Advisory Group meetings, the District's Citizens Advisory Committee meetings, the District's Governing Board meetings, environmental justice meetings, and industry professional group meetings to promote participation in the development and implementation of the CERP. In addition, staff often discussed AB 617 at media interviews and during outreach events and health fairs. A full list of outreach is available in Appendix A.

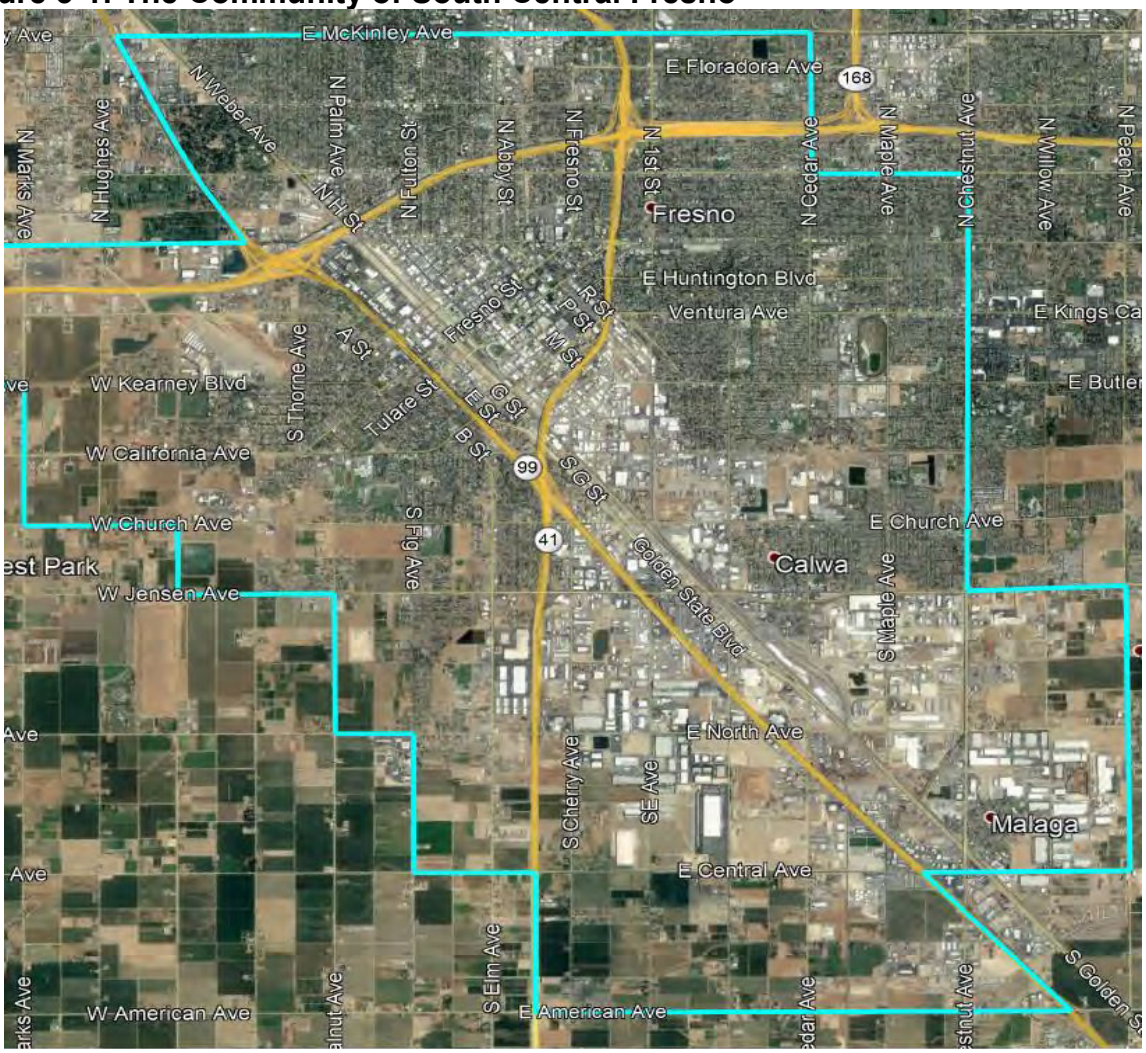
Staff will continue to work with the South Central Fresno Community Steering Committee to implement the CERP actions after its adoption in September, 2019, by the District Governing Board, and to provide periodic community updates on implementation progress. Community engagement is essential to the success of the CERP as well as the AB 617 program as a whole, and all parties are committed to build and improve upon existing outreach efforts in the coming months and years.

3. UNDERSTANDING THE COMMUNITY

3.1 COMMUNITY PROFILE

The AB 617-selected community of South Central Fresno is a densely populated community within the City of Fresno, downwind of emissions from the northern portion of Fresno. As shown in Figure 3-1, this community is geographically bounded by McKinley Avenue to the north, Chestnut Avenue to the east, American Avenue to the south, and includes the community of Malaga and its surrounding industrial area to the southeast. The western portion of the boundary ranges from Nielsen and Brawley Avenues in the northwest to Hwy 41 and American Avenue in the southwest, which incorporates residential neighborhoods and industrial areas along Hwy 99 and west of Hwy 41, such as the Industrial Triangle and parts of West Fresno. The South Central Fresno community also includes downtown Fresno, Chinatown, Roeding Park, and encompasses multiple hospitals, schools, small businesses, and densely populated residential areas. The total population in this South Central Fresno community is estimated to be over 150,000.

Figure 3-1: The Community of South Central Fresno



The city of Fresno is the largest metropolitan area in the San Joaquin Valley, the fifth largest city in California, and is the largest inland city in California. The current estimated population for Fresno is over 530,000. A number of heavily trafficked freeways transverse through the City of Fresno, including highways 99, 41, 180, and 168, contributing a significant amount to the mobile source emissions in the community. The population in the San Joaquin Valley is expected to be one of the fastest growing regions in the state. The Demographic Research Unit of the Department of Finance released interim revised population growth projections in March 2019 and expects approximately 22% population growth in Fresno County during the 2019 to 2039 period[1].

The majority of emissions impacting the South Central Fresno community come from passenger vehicle and heavy-duty truck emissions from major freeways, interchanges, and main regional roads that run through the community. In addition to the emissions originating from mobile sources in the area, this community also includes industrial development and area-wide sources of pollution such as gas stations, commercial cooking, and consumer products that also contribute significantly to the community's emissions levels. Based on emissions inventory and current air monitoring data in this community, pollutants of concern include particulate matter less than 2.5 micrometers in diameter (PM2.5), Black Carbon (BC), Oxides of Nitrogen (NOx), Carbon Monoxide (CO), Ozone (O_3) and Volatile Organic Compounds (VOCs). Refer to the *South Central Fresno Community Air Monitoring Plan* for further details.

Based on District air quality analysis modeling, the South Central Fresno community was found to have exceeded the 24-hour average PM2.5 concentration prioritization factor levels of 12, 35, 55, and 65 $\mu g/m^3$ a total of 134, 22, 7, and 4 days, annually, on average during the 2014-2016 period, respectively. In addition, this community was found to have exceeded the 8-hour average ozone concentration prioritization factor levels of 70, 75, and 84 ppb a total of 39, 21, and 5 days, annually, on average during the 2014-2016 period, respectively. Details about the nature and formation of local air pollution and its adverse health impacts on the community of South Central Fresno is summarized in *Appendix G*.

The South Central Fresno community is impacted across a number of health indicators. The following table summarizes the average and highest percentile scores (based on statewide comparison) from CalEnviroScreen among the census tracts located with the community boundaries for a number of key indicators. As this summary indicates, the South Central Fresno community includes high average percentiles among its census tracts within the majority of indicators, with many averages exceeding the 90th percentile for the state. Specifically, the average Overall CalEnviroScreen Score and Population Characteristics values are both above the 97th percentile.

[1] State Population Projections (2010-2060). Total Population by County (1-year increments). (2018, January) Retrieved from: http://www.dof.ca.gov/Forecasting/Demographics/Projections/

Table 3-1 Summary of Health Indicators among Census Tracts in South Central Fresno Community (Source: CalEnviroScreen 3.0)

Health Indicator	Average Percentile of Census Tracts in Community	Highest Percentile of all Census Tracts in Community
Overall CES Score	97.59	100.00
Asthma	91.15	98.00
Cardiovascular Disease	87.18	99.00
Low Birth Weight	83.50	100.00
Poverty	74.84	92.10
Unemployment	84.97	99.00
Population Characteristics	96.62	100.00
Pollution Burden	89.59	100.00
Diesel Particulate Matter	80.15	97.00
Traffic Density	30.94	73.00
Toxics Releases from Facilities	84.21	100.00

It should be noted that, in addition to selection by CARB for the development of community monitoring and a community emissions reduction program, neighborhoods in the AB 617-selected community were selected by California's Strategic Growth Council for significant investment. In November of 2016, the California Strategic Growth Council selected Fresno as one of three cities in the state to be a pilot for their new Transformative Climate Communities Program (TCC). This program was created "to fund the development and implementation of neighborhood-level transformative climate community plans that include multiple coordinated greenhouse gas emissions reduction projects that provide local economic, environmental and health benefits to disadvantaged communities". The program allocates funds toward a few larger investments, rather than more comparatively smaller awards, in order to attract catalytic private resources and have greater transformational impact. Because these are funds from the state's cap and trade auction proceeds, there are significant restrictions on the types of projects that can be funded, yet many of the projects align well with the goals of AB617 and strategies outlined in this CERP.

The Fresno Transformative Climate Communities Collaborative began with a participatory process to identify a series of projects to invest in that will result in significant environmental and economic benefits downtown, Chinatown, and southwest Fresno. Anyone who lived worked or owned property in these areas was encouraged to participate. The purpose of the TCC was to promote and nurture creative project ideas, develop local criteria to define the type of catalytic and connective impact projects should have, and provide the City of Fresno with direction on the proposal of integrated projects included in the application to the Strategic Growth Council for funding. The Collaborative met regularly from July through September 2017 and resulted in an active, engaged, 164 member Community Steering Committee and a project list submitted to the SGC for the $66.5 million from the TCC (see table 3-2). More information about the TCC project implemented in the City of Fresno is available online: http://sgc.ca.gov/programs/tcc/docs/20190201-TCC_Awardee_Fresno.pdf

Table 3-2 Projects Selected Through Fresno Transformative Climate Communities Process

Project	Partner(s)	Project Type	TCC Funding	Total Leverage Commitment
Chinatown Housing Project	Fresno Housing Authority	Affordable Housing and Sustainable Communities	$11,785,221.00	$12,822,370.00
EOC Partnership for Energy Savings and GHG Reductions in SW Fresno	Fresno Economic Opportunities Commission	Low-Income Weatherization	$3,208,377.70	
GRID Solar Collaborative Single-Family Partnership	GRID Alternatives	Low-Income Weatherization	$883,826.41	$535,807.55
GRID Solar Collaborative Multi-Family Partnership	GRID Alternatives	Low-Income Weatherization	$352,549.43	$109,999.95
Southwest Fresno Trail	City of Fresno	Urban Greening	$1,978,959.00	
Chinatown Urban Greening	City of Fresno	Urban Greening	$6,965,696.00	
Clean Shared Mobility Network	Fresno Metro Black Chamber of Commerce	Low Carbon Transportation: Car Sharing and Mobility	$7,717,014.21	$2,292,900.00
Annadale Mode Shift	Self Help Enterprises	Active Transportation	$343,000.00	$150,000.00
Mariposa Plaza	City of Fresno	Urban Greening	$3,859,000.00	
ERP Green Toddler Park	Early Readers Preschool	Urban Greening	$59,140.00	
Southwest Urban Forest Expansion	City of Fresno	Urban and Community Forestry	$212,199.21	
Yosemite Village Permaculture Community Garden & Urban Farm Incubator	Fresno Metro Ministry	Urban and Community Forestry	$367,500.00	$434,153.00
Park at MLK Magnet Core	City of Fresno	Urban Greening	$5,430,466.53	$1,500,000.00
Inside Out Community Garden	Fresno Economic Opportunities Commission	Urban and Community Forestry	$98,000.00	
Southwest Fresno Community Food Hub: Community Orchard	Fresno Food Commons	Urban and Community Forestry	$262,500.00	$436,255.00
Southwest Fresno Community Food Hub: Urban Heat Island Mitigation	Fresno Food Commons	Urban Greening	$62,220.00	$70,500.00

Project	Partner(s)	Project Type	TCC Funding	Total Leverage Commitment
Southwest Fresno Community Food Hub: Edible Food Rescue and Distribution	Fresno Food Commons	Food Waste Prevention and Rescue	$1,488,280.00	$2,062,365.80
Fresno City College: West Fresno Satellite Campus	State Center Community College District	Urban Greening	$16,542,745.66	$70,000,000.00
Chinatown Property Based Improvement District	City of Fresno	Leverage Only		$75,000.00
EOC Partnership for Energy Savings and GHG Reductions in SW Fresno: EFMP Plus-Up Vehicle Replacement and Incentives	Fresno Economic Opportunities Commission	Leverage Only		$530,000.00
TCC Connector	City of Fresno	Leverage Only		$3,532,774.00
Southwest Offsite Improvements	City of Fresno	Leverage Only		$15,732,648.00

Supporting the selection of the area as a TCC and AB 617 community, South Central Fresno includes the census tract with the highest Population Characteristics score in the entire state, which represents a number of health and socioeconomic factors (asthma, cardiovascular disease, low birth weight, educational attainment, housing burdened low-income households, linguistic isolation, poverty, and unemployment). This community includes census tracts with health indicators that exceed the 97th percentile in a majority of the listed categories, clearly indicating that this community includes areas heavily impacted by environmental challenges.

Due to the factors discussed above, this CERP includes strategies for emission reductions from mobile sources, residential sources, as well as commercial and industrial sources that contribute to the South Central Fresno air quality challenges. These strategies focus on measures that will bring additional economic resources to the residents and businesses located in the community, as well as achieving significant local emissions reductions.

3.2 TECHNICAL ASSESSMENT TO UNDERSTAND COMMUNITY POLLUTION IMPACTS

Conducting a technical assessment is a necessary step in community emissions reduction program development. The technical assessment relies on results from a variety of analyses to characterize emissions in the community and inform community emissions reduction program development and implementation. This assessment will provide the baseline from which emissions reductions can be measured.

The source attribution technical approach established by CARB provides a methodology for assessing, identifying, and estimating the relative contribution of sources or categories of sources, including but not limited to mobile, stationary, and area-wide sources, to elevated exposure to air pollution in impacted communities. The District's source attribution analysis is based on the following:

- Assesses the share of mobile, area-wide, and stationary source emissions generated in the community,
- Is based on best available data in order to characterize the contribution of emissions sources in the community,
- Follows one of CARB's recommended source attribution approaches.

Based on the above, the District has implemented CARB's Community Emissions Inventory Approach. The following section discusses the community emissions inventory approach and summarizes emission sources in the community. A detailed community-level inventory and source apportionment are included in Appendix C.

3.2.1 COMMUNITY EMISSIONS INVENTORY APPROACH

A community level emissions inventory estimates air pollutant emissions from mobile sources (e.g., cars, heavy-duty trucks, locomotives), area-wide sources (e.g., fireplaces, charbroilers, fugitive dust), and stationary sources (e.g., gas stations, auto body shops, manufacturing facilities) within the community.

The community level inventory consists of the mobile, area-wide, and stationary sources spatially allocated in the community. A community emissions inventory is the compilation of criteria pollutant and air toxics emissions data from air pollution sources that are within the community. The community emissions inventory includes emissions of volatile organic compounds / reactive organic gases (VOC/ROG), oxides of nitrogen (NOx), particulate matter of 2.5 microns (PM2.5), and toxic air contaminants (e.g. diesel PM).

3.2.2 COMMUNITY EMISSIONS INVENTORY OVERVIEW

Emissions inventories are estimates of the amount and type of pollutants emitted into the atmosphere by industrial facilities, mobile sources, and area-wide sources. Additionally, emission inventories are the foundation for any emission reduction program and provide information on the existing air emissions and related air quality in the community, and support development of emission reduction strategies and future emission targets to improve air quality in the community.

Existing traditional criteria pollutant and air toxics emission inventories (that provide combined coverage of mobile and stationary sources) are generally regional in geographic scale and may not adequately characterize emission impacts at the community-level. Developing community-scale emission inventories for understanding existing baseline emissions and tracking future emission reductions within communities selected for community emission reduction programs and monitoring plans is an important piece of AB 617.

3.2.3 AGENCY COLLABORATIONS

CARB and District staff worked in parallel to develop a comprehensive set of emissions inventory data for the community. The District worked with stationary source facilities in the community to develop the point source emission estimates. CARB staff developed the community-level emission inventory for mobile and area-wide sources. CARB worked with several State and local agencies such as the Department of Transportation (Caltrans), the Department of Motor Vehicles (DMV), the Department of Pesticide Regulation (DPR), and the California Energy Commission (CEC) to assemble activity information necessary to develop the community-level mobile and area-wide source emission estimates. CARB and District staff conducted a thorough review of the community inventory to ensure that the emission estimates reflect the most recent data for stationary sources, and that estimates for mobile and area-wide sources are based on the most recent models and methodologies.

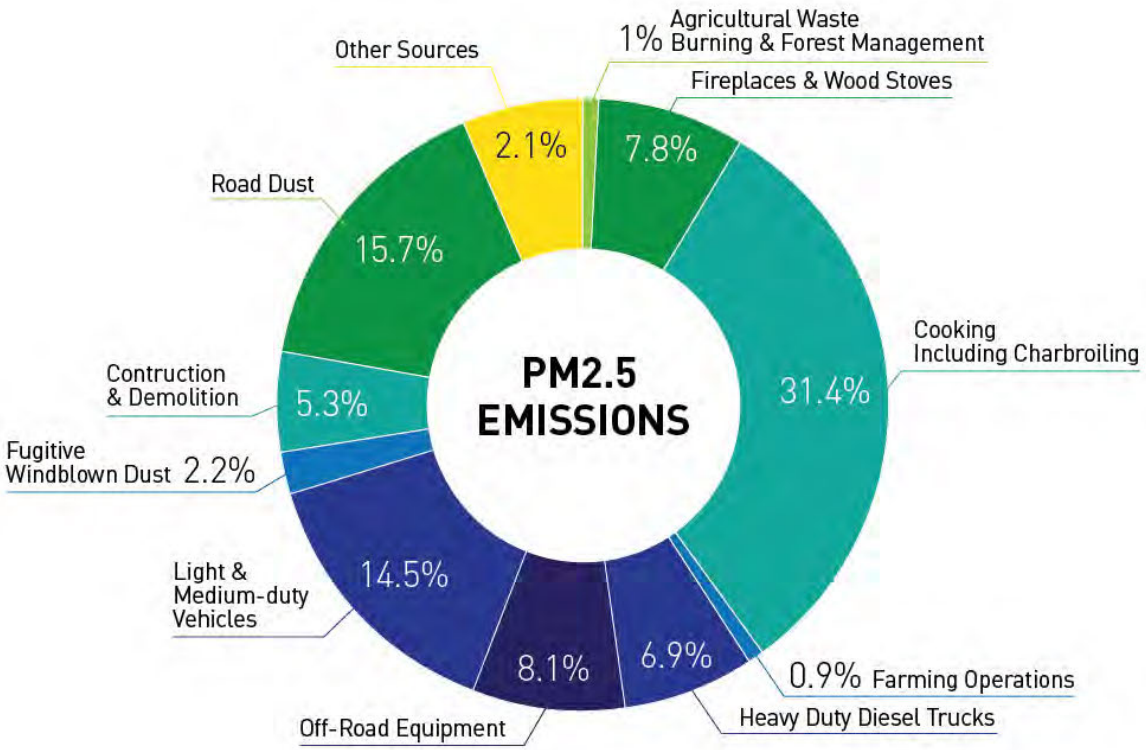
The emissions inventory also includes future forecasted values. The forecasted community-level emissions inventory is based on the growth profiles for stationary sources, mobile, and area-wide source categories provided by CARB. Forecasted emissions include growth and control factors that reflect historical trends, current conditions, and recent economic and demographic forecasts.

3.2.4 COMMUNITY EMISSION INVENTORY SUMMARIES

What types of sources contribute to air pollution in Shafter?

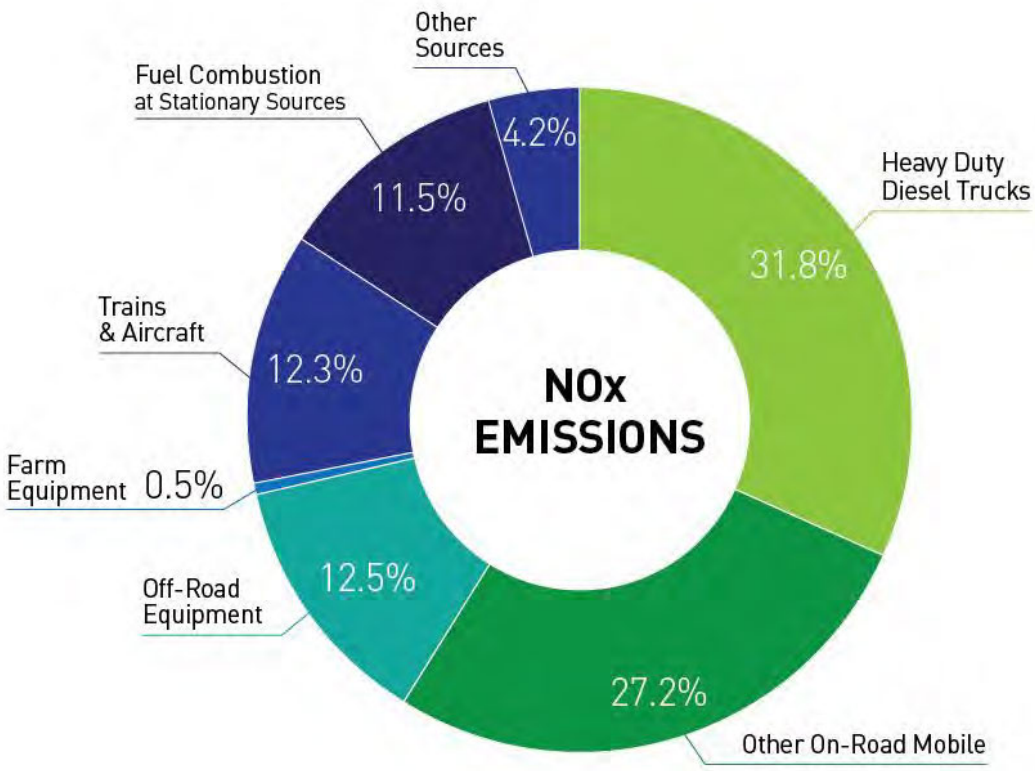
Permitted stationary sources in the area include gasoline dispensing operations, manufacturers, and distribution centers. The largest sources of emissions in and around the community include heavy duty vehicles, medium duty vehicles, and passenger cars, as well as trains, truck refrigeration units, and commercial equipment. Paved road dust, residential fuel combustion, construction emissions, and commercial cooking also contribute significantly to the community's emissions inventory.

Figure 3-2: Sources of PM2.5 Pollution in the Community



The largest sources of PM2.5 emissions in South Central Fresno are cooking and on-road mobile vehicles. Road dust, off-road equipment, and residential wood burning are also significant sources of PM2.5 in the community.

Figure 3-3: Sources of NOx Emissions in the Community



The majority of NOx emissions in South Central Fresno are from mobile sources. On road mobile sources account for 59% of NOx emissions in South Central Fresno, including 31.8% of the NOx inventory from heavy duty diesel trucks. Off road mobile sources, including trains, aircraft, and equipment such as yard trucks, produce 25% of the NOx emissions in the community. Fuel combustion at stationary sources is also a significant source of NOx emissions in the community.

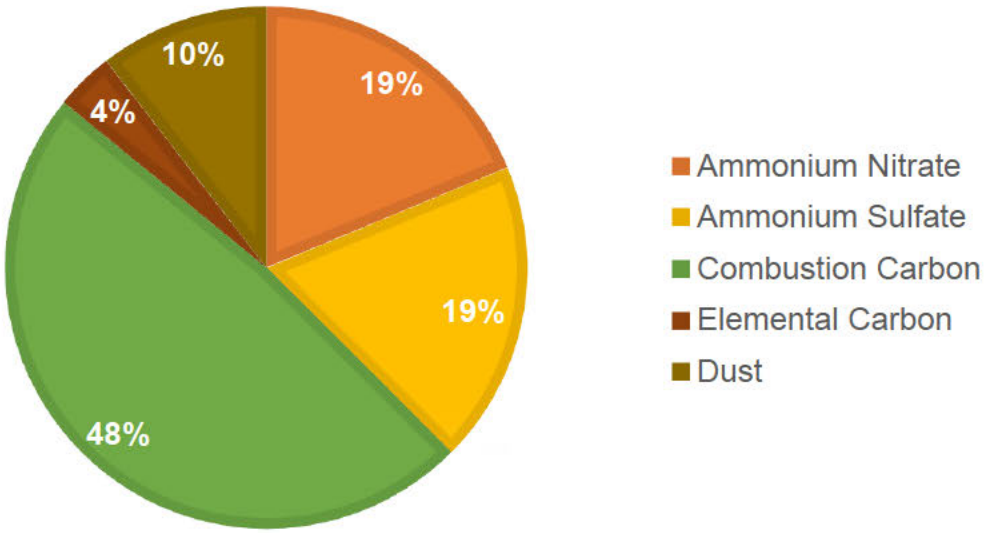
PM2.5 Speciation: What type of PM2.5 is in the ambient air?

PM2.5 in South Central Fresno is comprised of many species that contribute to the total PM2.5 concentration measured by air monitors, as summarized in Table 3-3 below. This complex mixture is attributable to stationary, mobile, and area-wide sources described above, as well as naturally occurring emissions. Although the list of species contributing to PM2.5 in South Central Fresno is lengthy, it can be grouped into larger representative categories. The following is a brief description of how each of these larger species categories are formed and emitted into the atmosphere. The following figures show the speciation of PM2.5 in Shafter, based on modeling data.

Table 3-3: Summary of PM2.5 Species

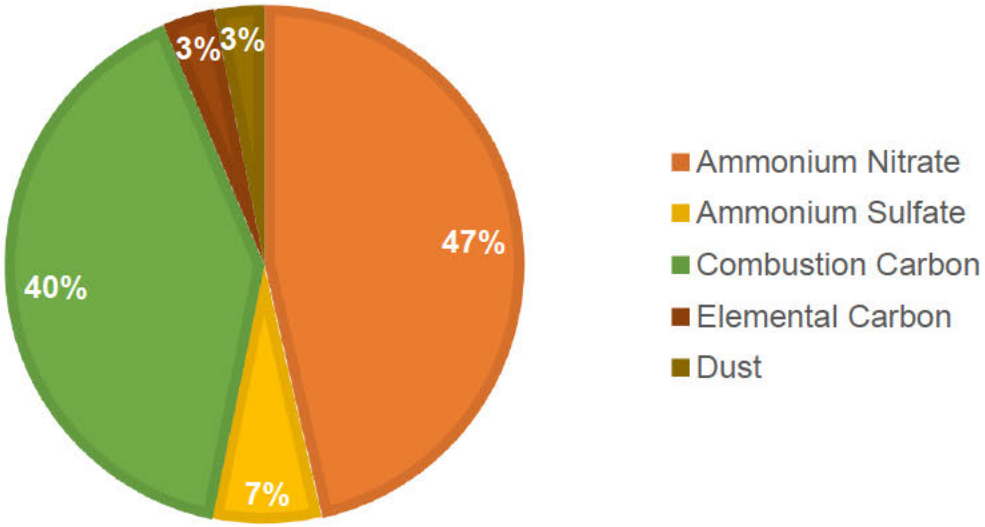
PM2.5 Species	Description
Organic carbon (Combustion Carbon)	Directly emitted, primarily from combustion sources (e.g. residential wood combustion). Also, smaller amounts attached to geologic material and road dusts. May also be emitted directly by natural/biogenic sources.
Elemental carbon	Also called soot or black carbon; formed during incomplete combustion of fuels (e.g. diesel engines).
Geologic material (Dust)	Road dust and soil dust that are entrained in the air from activity, such as soil disturbance or airflow from traffic.
Trace metals	Identified as components from soil emissions or found in other particulates having been emitted in connection with combustion from engine wear, brake wear, and similar processes. Can also be emitted from fireworks.
Secondary organic aerosol	Secondary particulates formed from photochemical reactions of organic carbon.
Ammonium nitrate	Reaction of ammonia and nitric acid, where the nitric acid is formed from nitrogen oxide emissions, creating nitric acid in photochemical processes or nighttime reactions with ozone.
Ammonium sulfate	Reaction of ammonia and sulfuric acid, where the sulfuric acid is formed primarily from sulfur oxide emissions in photochemical processes, with smaller amounts forming from direct emissions of sulfur.
Combined water	A water molecule attached to one of the above molecules. Combined water is not included when measuring mass of PM2.5 for regulatory purposes, and is therefore excluded from the following charts.

Figure 3-4 Species Contribution to Annual Average PM2.5 Concentrations in the Community



Ammonium nitrate, ammonium sulfate, and combustion carbon all are significant species of PM2.5 emissions on an average day in South Central Fresno. Although dust emissions comprise over 20% of the PM2.5 emissions inventory, dust accounts for only 10% of PM2.5 concentrations in the ambient air.

Figure 2-5 Species Contribution to Peak Day PM2.5 Concentrations in the Community



As shown in the figure above, peak PM2.5 emission days in the community see a large increase in ammonium nitrate, which is created from the chemical reaction of NOx and ammonia, largely from fuel combustion during multiday stagnation events. However,

ammonium nitrate is generally regarded as having relatively low toxicity compared to other PM2.5 species like elemental carbon.

How will the community inventory change in the future?

The tables and graphs below summarize the total South Central Fresno emissions inventories for years 2017, 2024, and 2029: These graphs show the proportion of PM2.5, NOx, and VOC emissions that originate from stationary, area, and mobile sources of emissions. The projected inventories show how the South Central Fresno community-level inventory is expected to change into the future in years 2024 and 2029.

Figure 3-6: Year 2017, South Central Fresno Emissions Inventories

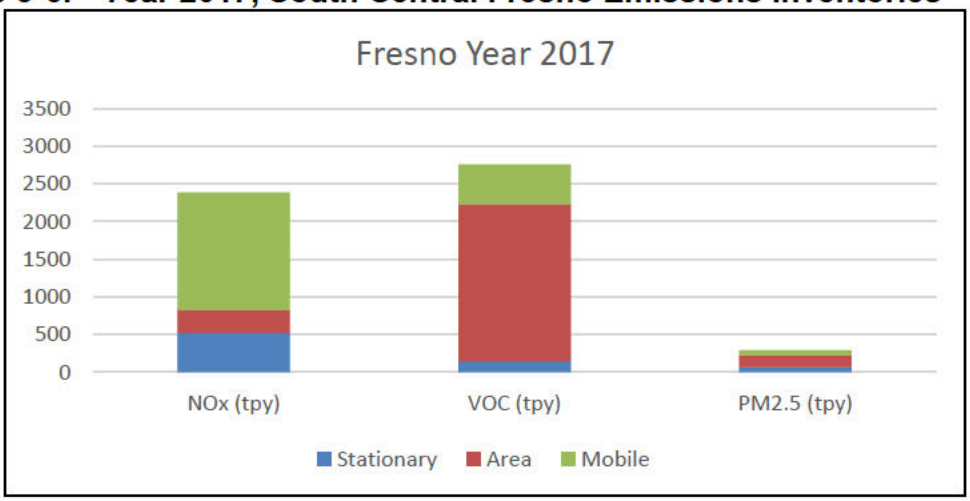


Table 3-4: 2017 Fresno Emissions Inventory

Source Categories	NOx (tpy)	VOC (tpy)	PM2.5 (tpy)
Stationary Sources	526.59	148.01	66.84
Area Source	294.58	2087.48	159.40
Mobile Sources	1565.72	527.44	66.14

Figure 3-7: Year 2024, South Central Fresno Projected Emissions Inventories

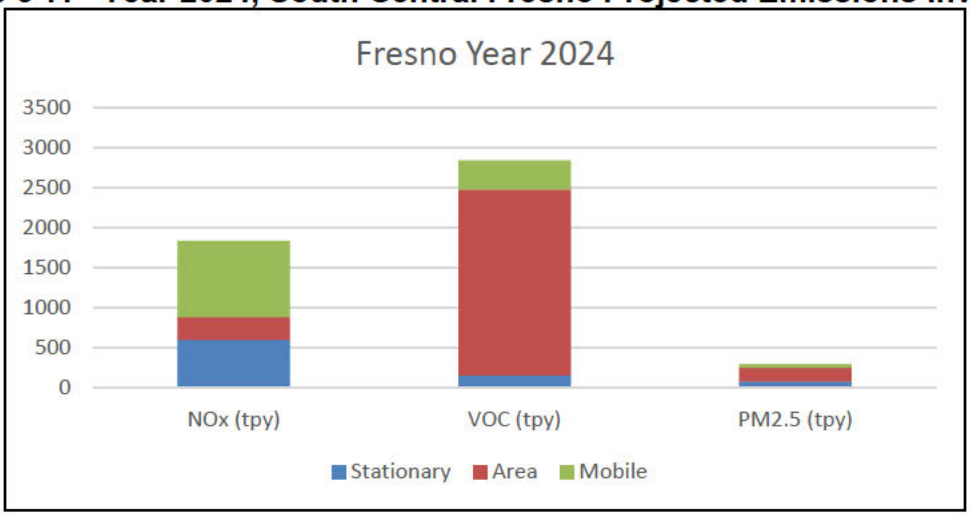


Table 3-5: 2024 Fresno Emissions Inventory

Source Categories	NOx (tpy)	VOC (tpy)	PM2.5 (tpy)
Stationary Sources	597.74	148.48	72.78
Area Source	281.61	2325.95	171.62
Mobile Sources	954.04	364.91	48.92

Figure 3-8: Year 2029, South Central Fresno Projected Emissions Inventories

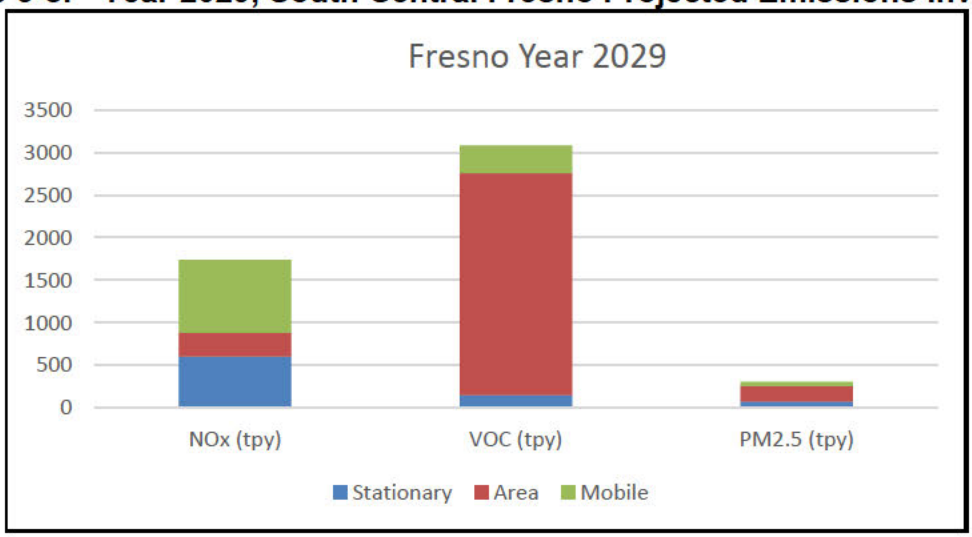


Table 3-6: 2029 Fresno Emissions Inventory

Source Categories	NOx (tpy)	VOC (tpy)	PM2.5 (tpy)
Stationary Sources	605.23	152.83	76.00
Area Source	277.82	2605.50	180.14
Mobile Sources	857.46	325.26	48.20

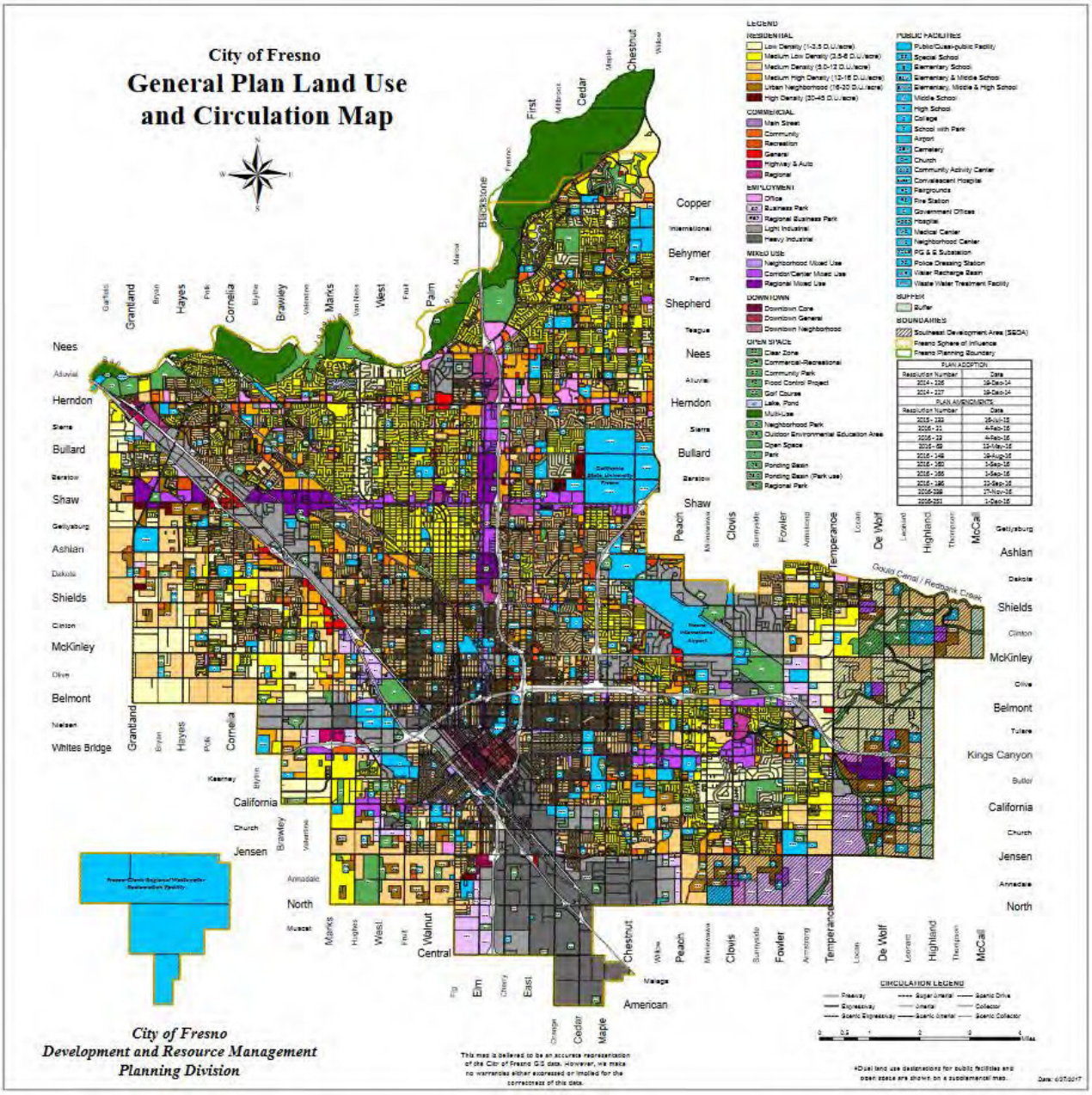
For further information about the emissions inventory for South Central Fresno, including the stationary source emissions inventory, projected emissions inventory for District permitted facilities, mobile source inventory, and area-wide sources inventory please refer to Appendix C.

3.2.5 SENSITIVE RECEPTORS AND LAND USE

As illustrated in the City of Fresno General Plan Land Use and Circulation map, below, the South Central Fresno community contains mixed land uses including light and heavy industrial zoning, commercial areas, residential neighborhoods ranging from low density to urban neighborhoods, and the City's downtown core. Main transportation corridors transect the community, including highways 99, 41, 180, and 168. Areas zoned for heavy industrial use are located in the southern portion of the city, with future industrial expansion planned for as detailed in the City's South Industrial Priority Area Specific Plan. Further information about the City's General Plan and Specific Plans are available at: https://www.fresno.gov/darm/general-plan-development-code/#tab-13

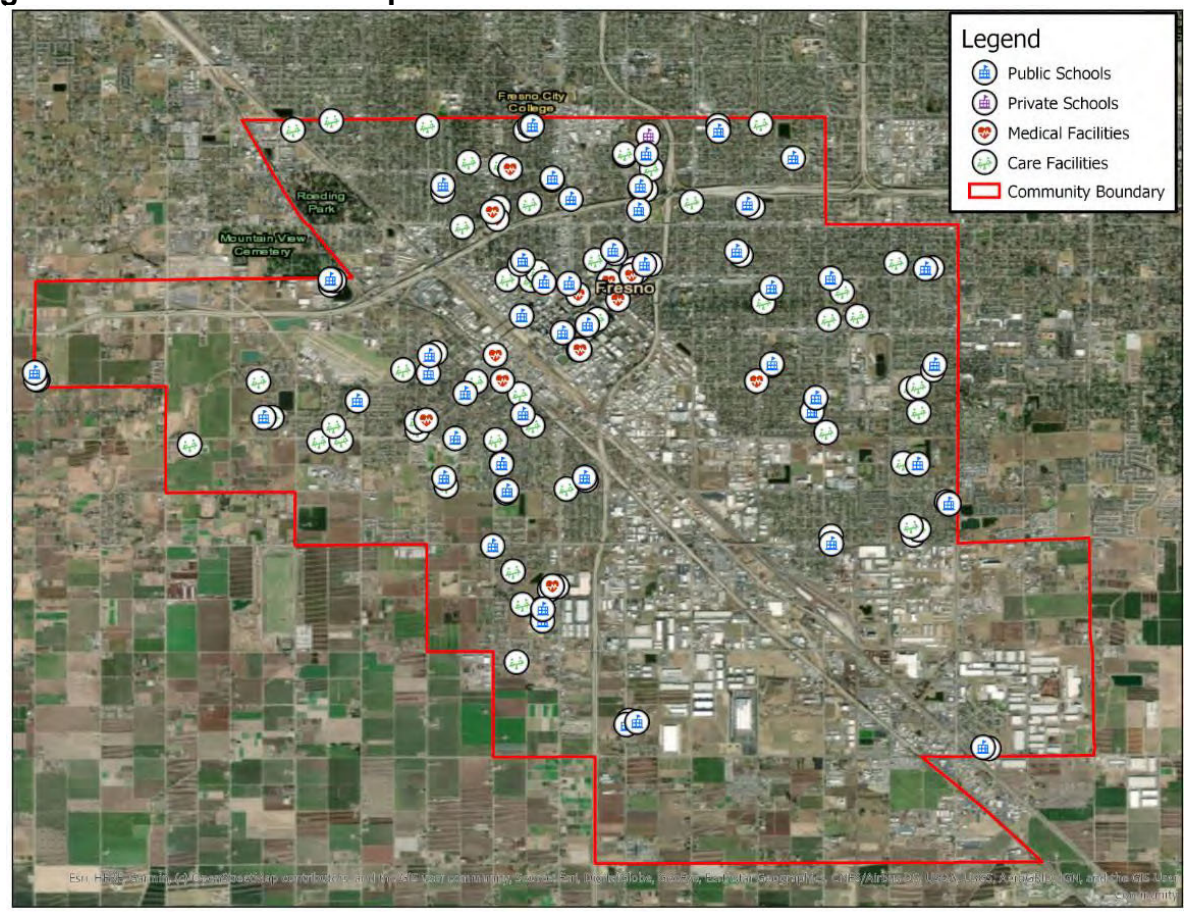
The below City of Fresno General Plan Land Use map is available with full resolution on the City of Fresno website: https://www.fresno.gov/publicworks/wp-content/uploads/sites/17/2017/10/5-City-of-Fresno-General-Plan-Land-Use-and-Circulation-Map.pdf

Figure 3-9: City of Fresno General Plan Land Use and Circulation Map



The location of sensitive receptors is important to assess the impacts of emissions on public health. Sensitive Receptors are defined as people that have an increased sensitivity to air pollution or environmental contaminants. Sensitive receptor locations include schools, parks and playgrounds, daycare centers, nursing homes, hospitals, and residential dwelling unit(s). The map below shows sensitive receptor locations within the community. The sensitive receptors currently in the community include 49 schools, 88 licensed daycare facilities, and 17 medical care facilities. Sensitive receptors within the community are located in proximity to manufacturing and industrial sources, train routes, off-road mobile equipment, residential fuel combustion sources, and mobile on-road sources.

Figure 3-10: Sensitive Receptor Locations in SC Fresno



Where can I get more information about air pollution in South Central Fresno?

To provide detailed community-level data to the Steering Committee and the general public, District staff have created an interactive mapping tool that shows the locations of sensitive receptors, as well as the locations of and emissions inventory for stationary sources, area sources, and both on-road and off-road mobile emissions. Examples of the emissions data available through this mapping tool are shown in the figures below. Please visit the District website to zoom in and explore the community: https://sjvapcd.maps.arcgis.com/apps/webappviewer3d/index.html?id=f81aaec7a1b840

Figure 3-11: District mapping tool showing types and locations of stationary source operations within community

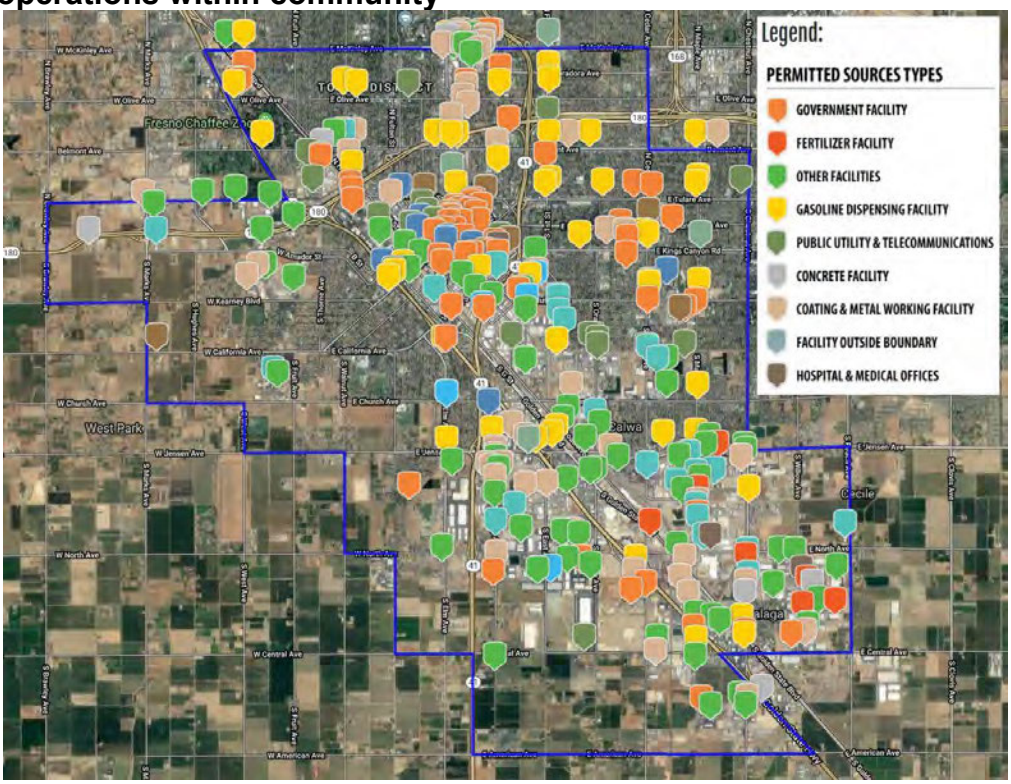
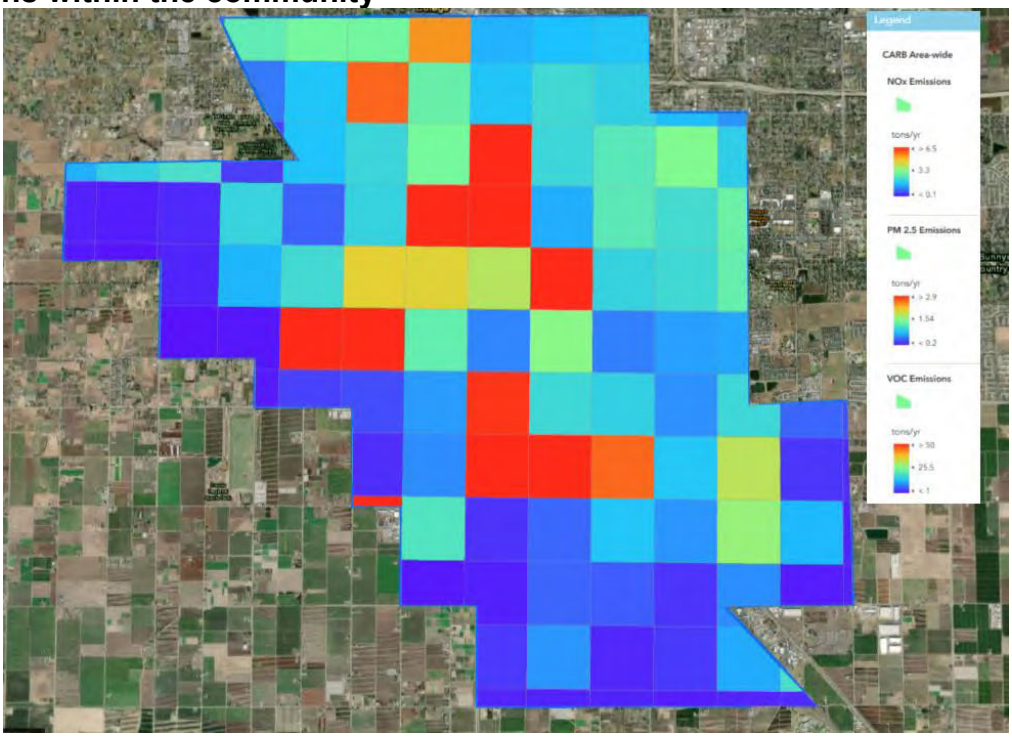


Figure 3-12: District mapping tool showing concentrations of area-wide emissions within the community



3.3 EXISTING AIR QUALITY PROGRAMS

District Plans for Attainment of Health-Based Air Quality Standards

For more than two decades, the District has adopted numerous attainment plans to reduce ozone and particulate precursor emissions. The District's multifaceted approach to reducing emissions in the San Joaquin Valley consists of a combination of innovative regulatory and non-regulatory measures. The U.S. Environmental Protection Agency (EPA) periodically reviews and establishes health-based national air quality standards (also referred to as NAAQS) for ozone, particulates, and other criteria air pollutants guided by the Clean Air Act. The District has adopted numerous air quality attainment plans over the years that identify measures needed in the Valley to attain EPA's increasingly stringent health-based NAAQS.

The District's plans include emissions inventories that identify sources of air pollutants, evaluations for feasibility of implementing potential opportunities to reduce emissions, sophisticated computer modeling to estimate future levels of pollution, and a strategy for how air pollution will be further reduced. District plans also include innovative alternative strategies for accelerating attainment through non-regulatory measures such as incentive programs; technology advancement programs; the District's legislative platform; community outreach and education programs; and additional strategies such as energy efficiency, eco-driving, green purchasing and contracting, supporting urban heat island mitigation efforts, and encouraging cleaner methods of generating electrical energy and mechanical power.

Measures implemented for these Valley-wide strategies also apply to the AB 617 community of South Central Fresno and have resulted in tremendous emissions reductions being achieved, to the benefit of the health of all Valley residents. Most recently, after an extensive 3-year public process, the District, in coordination with CARB and EPA, adopted the *2018 PM2.5 Plan*. This historic plan builds on decades of air quality improvement efforts and establishes a comprehensive strategy for continuing to improve the Valley's air quality and meet the latest federal PM2.5 standards. Further information on the comprehensive rules, regulations, and other programs that have been developed as a part of the District's attainment planning process are detailed in the District's plans for attainment of state and federal air quality standards, with links provided to each attainment plan below:

PM2.5 Plans for Attainment

- *2018 Plan for the 1997, 2006, and 2012 PM2.5 Standards*
  The District adopted the *2018 Plan for the 1997, 2006, and 2012 PM2.5 Standards* on November 15, 2018. This plan addresses the EPA federal 1997 annual PM2.5 standard of 15 µg/m³ and 24-hour PM2.5 standard of 65 µg/m³; the 2006 24-hour PM2.5 standard of 35 µg/m³; and the 2012 annual PM2.5 standard of 12 µg/m³.

- *2016 Moderate Area Plan for the 2012 PM2.5 Standard*
  The District adopted the *2016 Moderate Area Plan for the 2012 PM2.5 Standard* on September 15, 2016. This plan addresses the EPA federal annual PM2.5

standard of 12 µg/m³, established in 2012. This plan includes an attainment impracticability demonstration and request for reclassification of the Valley from Moderate nonattainment to Serious nonattainment.

- *2015 Plan for the 1997 PM2.5 Standard*
  The District adopted the *2015 Plan for the 1997 PM2.5 Standard* on April 16, 2015. This plan addresses EPA's annual PM2.5 standard of 15 µg/m³ and 24-hour PM2.5 standard of 65 µg/m³, established in 1997.

- *2012 PM2.5 Plan*
  The District adopted the *2012 PM2.5 Plan* in December, 2012. This plan addresses EPA's 24-hour PM2.5 standard of 35 µg/m³, which was established by EPA in 2006.

- *2008 PM2.5 Plan*
  The District adopted the *2008 PM2.5 Plan* in April, 2008. This plan addresses EPA's annual PM2.5 standard of 15 µg/m³, which was established by EPA in 1997.

PM10 Plans for Attainment

- *2007 PM10 Maintenance Plan*
  The District adopted the *2007 PM10 Maintenance Plan* in September, 2007, to assure the San Joaquin Valley's continued attainment of EPA's PM10 standard. EPA designated the Valley as an attainment/maintenance area for PM10.

Ozone Plans for Attainment

- *2016 Plan for the 2008 8-Hour Ozone Standard*
  The District adopted the *2016 Plan for the 2008 8-Hour Ozone Standard* in June 2016. This plan satisfies Clean Air Act requirements and ensures expeditious attainment of the 75 parts per billion 8-hour ozone standard.

- *2014 RACT SIP*
  The District adopted the *Reasonably Available Control Technology (RACT) Demonstration for the 8-Hour Ozone State Implementation Plan* in June, 2014.

- *2013 Plan for the Revoked 1-Hour Ozone Standard*
  The District adopted the *2013 Plan for the Revoked 1-Hour Ozone Standard* in September, 2013.

- *2009 RACT SIP*
  The District adopted the *Reasonably Available Control Technology (RACT) Demonstration for Ozone State Implementation Plans (SIP)* in April, 2009.

- *2007 Ozone Plan*
  The District adopted the *2007 Ozone Plan* in April 2007. This plan addresses

EPA's 8-hour ozone standard of 84 parts per billion (ppb), which was established by EPA in 1997.

As a result of the District's stringent and comprehensive air quality management strategy along with significant investments made by Valley businesses and residents, PM2.5 and ozone levels are now at historically low levels, and the Valley continues to be in attainment of the PM10 NAAQS. Emissions from stationary sources have been reduced by 85%, cancer risk from exposure to air pollutants has been reduced by 95%, population exposure to elevated PM2.5 levels have been reduced by 85%, and population exposure to elevated ozone levels have been reduced by 90%. This success in reducing emissions Valley-wide provides assurance that targeted strategies will provide the desired results in helping to improve the air quality in AB 617 selected communities.

Regulatory Measures

The District has implemented a comprehensive regulatory control strategy for decades. Since 1992, the District has adopted nearly 650 rules to implement this aggressive control strategy. Many current rules are fourth or fifth generation, meaning that they have been revised and emissions limits have been lowered several times, as new emission control technology has become available and cost effective. Building on decades of developing and implementing active and effective air pollution control strategies, District rules implement the most stringent measures, best available control measures, and best available retrofit control technologies feasible to require in the San Joaquin Valley. The District's stringent and innovative rules have set benchmarks for other air agencies throughout California and the nation. Regulations implemented by the District have reduced emissions from stationary sources by over 80% to date and will continue to achieve significant emissions reductions in the coming years.

District rules reduce emissions of criteria air pollutants and toxic air contaminants from sources in and around the community. Emission sources in and around the community of South Central Fresno that are regulated by the District include residential wood burning, construction activities, restaurants, agricultural crop production operations, automotive body repair and paint shops, concrete batch plants, cotton ginning, crude oil and natural gas production, drywall manufacturing, fabricated metal products, fire protection facilities, gasoline dispensing operations, government services, health centers, metal fabrication, metal parts coatings, skilled nursing care facilities, soil and groundwater remediation, and telecommunications facilities. District rules that reduce emissions from local sources in the community of South Central Fresno are outlined in the following table:

Table 3-2: District Rules Reducing South Central Fresno Air Pollution

Rule #	Rule Description
4101	Visible Emissions
4102	Nuisance
4103	Open Burning
4104	Reduction of Animal Matter
4201	Particulate Matter Concentration
4203	Particulate Matter Emissions from Incineration of Combustible Refuse
4301	Fuel Burning Equipment
4302	Incinerator Burning
4305	Boilers, Steam Generators, And Process Heaters - Phase 2
4306	Boilers, Steam Generators, and Process Heaters - Phase 3
4307	Boilers, Steam Generators, and Process Heaters - 2.0 MMBtu/hr TO 5.0 MMBtu/hr
4309	Dryers, Dehydrators, and Ovens
4320	Advanced Emission Reduction Options For Boilers, Steam Generators, and Process Heaters Greater than 5.0 MMBtu/hr
4354	Glass Melting Furnaces
4455	Components At Petroleum Refineries, Gas Liquids Processing Facilities, And Chemical Plants
4601	Architectural Coatings
4602	Motor Vehicle Assembly Coatings
4603	Surface Coating Of Metal Parts And Products, Plastic Parts And Products, And Pleasure Crafts
4606	Wood Products And Flat Wood Paneling Products Coating Operations
4607	Graphic Arts And Paper, Film, Foil And Fabric Coatings
4612	Motor Vehicle And Mobile Equipment Coating Operations
4621	Gasoline Transfer Into Stationary Storage Containers, Delivery Vessels, And Bulk Plants
4622	Gasoline Transfer Into Motor Vehicle Fuel Tanks
4623	Storage Of Organic Liquids
4653	Adhesives And Sealants
4661	Organic Solvents
4692	Commercial Charbroiling
4701	Internal Combustion Engines - Phase 1
4702	Internal Combustion Engines
4703	Stationary Gas Turbines
4801	Sulfur Compounds
4901	Wood Burning Fireplaces and Wood Burning Heaters
4902	Residential Water Heaters
4905	Natural Gas-Fired, Fan-Type Central Furnaces
8011	General Requirements
8021	Construction, Demolition Excavation, Extraction, and Other Earthmoving Activities
8031	Bulk Materials
8041	Carryout and Trackout
8051	Open Areas
8061	Paved and Unpaved Roads
8071	Unpaved Vehicle/Equipment Traffic Areas
9310	School Bus Fleets
9410	Employer Based Trip Reduction
9510	Indirect Source Review

While California and the federal government have direct authority to regulate tailpipe emissions from mobile sources, the District has also adopted innovative regulations such as the Indirect Source Review (discussed in more detail later in this section) and Employer-based Trip Reduction rules to reduce emissions from mobile sources within the District's limited jurisdiction over these sources. A complete listing of the District's current rules and regulations is available at the following link: http://www.valleyair.org/rules/1ruleslist.htm

For the recently adopted *2018 Plan for the 1997, 2006, and 2012 PM2.5 Standards* 2018 PM2.5 Plan, the District performed an exhaustive evaluation of all potential additional opportunities for reducing emissions and committed to amend several rules to achieve expeditious attainment of the health-based federal PM2.5 air quality standards (see Section IV). This comprehensive analysis also demonstrated that the District's rules and regulations are at least as stringent, or more stringent, than all other rules in the nation. Furthermore, in accordance with AB 617 requirements, the District adopted an expedited schedule in December, 2018, for performing further determination of best available retrofit control technology to ensure that applicable sources are utilizing the cleanest technologies feasible (see Chapter 4).

District New and Modified Stationary Source Review

Beyond District rules that apply to specific categories of stationary sources, District Rule 2201 (New and Modified Stationary Sources Review) applies to all new stationary sources and all modifications to existing stationary sources that are subject to District permit requirements. District Rule 2201, and the associated permitting process, ensure that new or modified stationary sources of air pollution are subject to the most effective emissions controls feasible for implementation; that emissions from the project do not create a public health risk (including a modeled analysis of cancer risks resulting from the project and possible health hazard risks resulting from both acute and chronic exposure to emissions for nearby residences and worksites); and that the project does not increase the potential for a violation of State or National Ambient Air Quality Standards. More information about the District's rigorous permitting process is available at http://www.valleyair.org/busind/pto/ptoprocess.htm, and is also summarized below.

Under Rule 2201, new facilities or facilities modifying equipment must obtain an Authority to Construct (ATC) permit prior to construction, and are subject to stringent requirements, including:

- Best Available Control Technology (BACT)
- Risk Management Review (RMR)
- Toxic Best Available Control Technology (T-BACT)
- Ambient Air Quality Analysis (AAQA)

Best Available Control Technology (BACT): For each emissions unit (specific piece of equipment) that has the potential to emit over the 2 lb/day BACT threshold, the

District requires the use of the best available air pollution control technology commonly used to control emissions from similar type of equipment. The District also conducts an analysis to determine if, based on specific criteria, cleaner technologies that are not commonly used for these type of equipment could be used to further reduce emissions from the proposed equipment. This very stringent requirement ensures that the most effective air pollution control technique is utilized resulting in reduced public exposure to air pollutants and toxic air contaminants.

As a part of the District's BACT Policy (publicly available at https://www.valleyair.org/busind/pto/bact/bactidx.htm), District staff maintain a BACT Clearinghouse, updated and published quarterly, that includes available control technologies and methods that meet one of the following conditions:

A. The control technologies or methods have been achieved in practice for an emissions unit and class of source; or
B. Are contained in any SIP approved by the EPA for an emissions unit category and class of source; or
C. Are any other emission limitation or control technique, including process and equipment changes of basic or control equipment, found to be technologically feasible for such class or category of sources or for a specific source.

AB 617 legislation requires that CARB develop and maintain a state-wide Technology Clearinghouse for BACT and T-BACT. Once available, District staff will review the Technology Clearinghouse as an additional resource when updating the District's BACT Clearinghouse.

Risk Management Reviews: The District conducts Risk Management Reviews to ensure that the public exposure to toxic air contaminants from projects required to obtain an ATC is less than significant. Very complex computer models and the most conservative assumptions are used to assess the project's maximum impact on resident's health. Projects resulting in estimated significant health risk for the public are not approved.

Toxic Best Available Control Technology (T-BACT): When T-BACT is triggered under a Risk Management Review analysis, the District conducts a T-BACT analysis to ensure the most stringent control technique is utilized resulting in reduced public exposure to toxic air contaminants. T-BACT is required for units emitting air toxic emissions that result in a cancer risk of greater than one-in-a-million, and projects that would pose significant impacts to nearby residences or businesses. Projects resulting in estimated significant health risk for the public are not approved.

Ambient Air Quality Analysis (AAQA): The U.S. Environmental Protection Agency (EPA) and the California Air Resources Board (CARB) have established National Ambient Air Quality Standards (NAAQS) and California Ambient Air Quality Standards (CAAQS), respectively, for numerous pollutants. Under Rule 2201, the District conducts AAQAs to ensure that project related emissions would not cause or make worse a violation of the State or National ambient air quality standard. This

analysis ensures that the public exposure to certain criteria air pollutants is less than the maximum allowed concentration in outdoor air without harm to public.

AB 2588 (Air Toxics Hot Spots Information and Assessment Act)
The District's implementation of AB 2588, California's Air Toxics "Hot Spots" Information and Assessment Act, has resulted in dramatic reductions in emissions of air toxics from existing sources in the San Joaquin Valley. Under this right-to-know law, the District has worked with 5,700 Valley facilities to quantify emissions of air toxics, determine the health risk caused by those emissions, report emissions and any significant risks through written public reports and neighborhood public meetings, and take steps to reduce such risks. As a result of these efforts, and the subsequent reductions in air toxics, since 2007 there have been no Valley facilities that pose a significant risk to any Valley resident under the "Hot Spots" program. A detailed discussion of AB 2588 and facility risk reduction audits conducted to date in the community is included in Section IV.

Implementation of State Airborne Toxic Control Measures
The District's integrated air toxics program incorporates Airborne Toxic Control Measure (ATCM) regulations promulgated by the Air Resources Board. State-issued ATCMs are designed to reduce toxic air emissions from various types or categories of equipment by imposing prescribed air pollution control measures. Implementing ATCMs result in reductions of toxics exposure from targeted type or category that could cause significant risks at a regional level. These ATCMs are implemented primarily through the District's permitting process. Examples of emissions sources that have drastically reduced toxic air contaminant emissions in the San Joaquin Valley because of such rules and regulations include dry cleaners, chrome platers, gas stations, and diesel internal combustion engines.

Implementation of Federal National Emissions Standards for Hazardous Air Pollutants (NESHAPS) and Maximum Achievable Control Technology (MACT) Standards
The District's integrated air toxics program fulfills federal mandates under Title III of the federal Clean Air Act, which requires specific types of sources of air toxic emissions to directly reduce emissions through NESHAPS and MACT standards. These standards apply to a variety of source categories, ranging from diesel internal combustion engines to chrome platers, and from refineries to power plants.

Implementation of Federal New Source Performance Standards (NSPS)
The District also fulfills federal mandates under Title I of the federal Clean Air Act, which requires specific types of new, modified, and reconstructed facilities subject to NSPS to directly reduce emissions of criteria air pollutants. These standards apply to a variety of source categories, ranging from hot mix asphalt facilities to sewage treatment plants, and from landfills to boilers.

District Indirect Source Requirements
District Rule 9510 is the only rule of its kind in the State of California and throughout the nation which applies to new residential and commercial development projects. The District's rule is recognized as the benchmark, or best available control, for regulating these indirect sources of emissions, such as from construction equipment and mobile sources associated with new developments. This rule requires mitigation of the growth in emissions from mobile and area sources associated with construction and operation of new development projects in the Valley.

District Air Quality Assistance and Guidance to Public Agencies
The District provides assistance and guidance to other public agencies, including cities and counties in the San Joaquin Valley, to help them assess, minimize, and mitigate air quality impacts of projects undergoing their land-use approval processes, over which the District has no statutory authority. For instance, the District provides comments under the California Environmental Quality Act (CEQA) to public agencies on hundreds of proposed projects each year, designed to minimize air quality impacts. In addition, the District maintains and makes available an extensive suite of guidance documents and tools for assessing and mitigating air quality impacts, including criteria and air toxic emissions, from stationary source projects and other development projects.

Mobile Source Regulations
Mobile source emissions make up over 85% of the Valley's NOx emissions, the primary driver in the formation of particulate and ozone pollution, and therefore reductions in mobile source emissions have become an ever-increasingly important part of the Valley's attainment strategy of federal air quality standards. States and the federal government, unlike the District, have the authority to directly regulate tailpipe emissions from mobile sources. CARB has adopted tough regulations for heavy-duty trucks, off-road equipment, and other mobile sources. Additionally, the District has adopted innovative regulations such as the Indirect Source Review and Employer-based Trip Reduction rules to reduce emissions from mobile sources within the District's limited jurisdiction over these sources. Local air districts do not have the authority to implement regulations requiring ultra-low tailpipe emissions standards on mobile sources.

With authority to regulate mobile source emissions, CARB has adopted and amended a number of regulations aimed at reducing exposure to diesel PM and NOx from fuel sources, freight transport sources like heavy-duty diesel trucks, transportation sources like passenger cars and buses, and off-road sources like large construction equipment. Phased implementation of these regulations will produce emission reduction benefits in the coming years as the regulated fleets are retrofitted, and as older and dirtier fleet units are replaced with newer and cleaner models at an accelerated pace. CARB's ongoing comprehensive measures to reduce emissions from mobile sources throughout the state are detailed in Chapter 4 in the "Statewide Strategies" section.

District Incentive-Based Emission Reduction Programs

The District has increasingly relied on its advocacy efforts to secure state and federal funding sources, and locally-generated funding to implement incentive programs that have become a crucial component of the District's overall strategy for achieving the emissions reductions necessary to bring the Valley into attainment and to protect public health. These programs provide an effective way to accelerate emissions reductions and encourage technology advancement, particularly from mobile sources, a sector not directly under the District's regulatory jurisdiction. Given that over 85% of the NOx emissions in the Valley come from mobile sources, these successful voluntary incentive grant programs help the Valley achieve highly cost-effective emissions reductions that are surplus of the regulatory emissions reductions.

The District operates one of the largest and most well-respected voluntary incentive programs in California. Since the District's inception in 1992, considerable funding has been invested into thousands of clean-air projects throughout the Valley. The District's incentive programs offer Valley businesses and residents the opportunity to replace their older, higher polluting equipment with newer, cleaner models. These incentive programs include options for replacing older diesel powered trucks, ag engines, tractors, locomotives, and construction equipment as well as options for replacing wood burning devices, lawn equipment and passenger vehicles. These projects have achieved significant emissions reductions with corresponding air quality and health benefits. The incentive programs listed in the table below have been implemented in the community of South Central Fresno as of September 1, 2019, achieving over 10,700 tons of combined PM, NOx, and VOC emissions reductions in the community.

Table 3-3: Grant Funding Invested in South Central Fresno-September 1, 2019

South Central Fresno Grant Funding: Incentive Program	Units	Sum of Grant Amount	Total Tons PM, NOx, VOC Emissions Reduced
Burn Cleaner Wood Stove Change Out New Device	1,512	$2,882,300.00	603.237
CAP & Trade Demonstration New Electric Vehicle	1	$4,147,862.00	0.00
Commuter Subsidy Transit Bus Subsidy	2	$387,534.00	0.00
Heavy-Duty Ag Burn Alternative Voucher	1	$8,400.00	3.50
Heavy-Duty Ag Engine Alt Fuel to Electric	10	$191,753.00	110.74
Heavy-Duty Ag Engine Diesel to Alt Fuel	2	$28,000.00	50.74
Heavy-Duty Ag Engine Diesel to Diesel	87	$1,145,875.08	674.45
Heavy-Duty Ag Engine Diesel to Electric	90	$1,708,850.56	737.21
Heavy-Duty Ag Engine New Electric	2	$9,826.64	7.74
Heavy-Duty Ag Engine Pearl Combined Fuel Types	2	$38,624.00	7.58
Heavy-Duty Ag-UTV New Electric Vehicle	1	$2,574.00	0.00
Heavy-Duty Ag-UTV Vehicle Replacement	56	$672,967.33	0.00
Heavy-Duty Forklift New Electric Vehicle	14	$122,736.34	4.36
Heavy-Duty Infrastructure CNG Fueling Station	2	$541,235.50	0.00
Heavy-Duty Infrastructure LNG Fueling Station	2	$509,664.00	0.00

South Central Fresno Grant Funding: Incentive Program	Units	Sum of Grant Amount	Total Tons PM, NOx, VOC Emissions Reduced
Heavy-Duty Locomotive Engine Repower	2	$2,295,000.00	97.43
Heavy-Duty Off-Road Ag Vehicle Replacement	528	$16,028,366.63	2,300.73
Heavy-Duty Off-Road Ag Vehicle Replacement 2 for 1	1	$364,000.00	8.34
Heavy-Duty Off-Road Engine Repower	139	$2,376,627.13	363.55
Heavy-Duty Off-Road Engine Repower & Retrofit	1	$202,325.00	13.44
Heavy-Duty Off-Road Low-Dust Harvester Replacement	4	$215,276.62	117.56
Heavy-Duty Off-Road Tractor Trade-Up	24	$2,394,403.35	42.57
Heavy-Duty On-Road DERA Vehicle Replacement	40	$1,381,725.00	59.63
Heavy-Duty On-Road Engine Repower	29	$1,609,870.00	176.63
Heavy-Duty On-Road Engine Retrofit	162	$2,730,970.00	287.84
Heavy-Duty On-Road New Purchase	3	$30,000.00	0.06
Heavy-Duty On-Road New Vehicle	135	$2,882,674.00	932.76
Heavy-Duty On-Road Prop 1B Engine Retrofit	4	$40,000.00	0.47
Heavy-Duty On-Road Prop 1B Locomotive Replacement	10	$19,200,000.00	1,151.33
Heavy-Duty On-Road Prop 1B TRU Infrastructure	2	$285,000.00	57.33
Heavy-Duty On-Road Prop 1B Vehicle Replacement	336	$16,449,000.00	2,401.34
Heavy-Duty On-Road Prop 1B Vehicle Replacement 2 for 1	1	$40,000.00	1.72
Heavy-Duty On-Road Truck Replacement	28	$845,454.37	13.732
Heavy-Duty On-Road Truck Re-Use	1	$2,500,000.00	0.00
Heavy-Duty On-Road TVP Engine Retrofit	23	$230,000.00	1.74
Heavy-Duty On-Road TVP Vehicle Replacement	142	$5,506,891.01	441.72
Heavy-Duty On-Road VIP Vehicle Replacement	7	$215,000.00	2.83
Heavy-Duty School Bus Alt Fuel Tank Replacement	3	$49,826.49	0.00
Heavy-Duty School Bus Engine Retrofit	47	$789,120.26	0.00
Heavy-Duty School Bus Vehicle Replacement	75	$9,286,152.25	45.88
Lawn & Garden Commercial Demonstration Project	14	$3,922.75	0.00
Lawn & Garden Residential New Purchase	9	$400.00	0.00
Lawn & Garden Residential Replacement	435	$99,510.02	0.00
Light-Duty Charge Up EV Charger-Private	6	$220,000.00	0.00
Light-Duty Charge Up EV Charger-Public	25	$754,000.00	0.00
Light-Duty Drive Clean EV Vehicle Rebate	911	$2,537,339.34	15.1456
Light-Duty EFMP Replacement	206	$1,572,741.96	
Light-Duty E-Mobility Trip Reduction	3	$264,114.92	6.23
Light-Duty TITU Repairs	3,653	$2,025,605.15	
Light-Duty Van Pool Voucher	1,235	$584,340.00	8.61
Public Benefit Advanced Transit & Transportation Strategy	1	$2,999,410.25	0.00
Public Benefit Alternative Fuel Infrastructure	1	$804,123.00	0.00

South Central Fresno Grant Funding: Incentive Program	Units	Sum of Grant Amount	Total Tons PM, NOx, VOC Emissions Reduced
Public Benefit Alternative Fuel New Vehicle	105	$1,576,987.50	0.00
Remove II Alternate Fuel Training	3	$42,000.00	0.00
Remove II Light and Medium Duty EV Purchase	4	$12,000.00	0.03
Remove II Pearl Data New Vehicle Purchase	9	$18,000.00	0.01
Total	**10,151**	**$113,860,379.45**	**10,748.21**

District Technology Advancement Efforts

The District Governing Board approved creation of the Technology Advancement Program in March, 2010, to accelerate development of technologies that can help reduce emissions in the Valley. Meeting EPA's increasingly stringent ozone and PM2.5 air quality standards requires significant advancements in low-emissions technologies from mobile and stationary sources. The Technology Advancement Program provides a strategic and comprehensive means to identify, solicit, and support technology advancement opportunities. Ongoing refinement of the program's technology focus areas targets efforts to achieve the greatest impact on the Valley's attainment and other health-based goals. This program has resulted in the development and deployment of electric feed mixers for dairy operations, clean fuel technologies for trucks, and solar-electric truck refrigeration units. Many of these advanced clean-air technologies are currently operating in the community of South Central Fresno.

Public Air Quality Education and Outreach

Providing accurate and up to date air quality information to Valley residents is a top priority for the District, especially when circumstances such as wildfires overwhelm all clean air measures and lead to high pollution concentrations. Under these circumstances, the best course of action is to provide notifications to Valley residents so that sensitive individuals, in particular, can take precautions to minimize exposure. The District has expended significant resources on public notification and risk prevention measures, such as the Real-Time Air Advisory Network (RAAN) and Real-Time Outdoor Activity Risk (ROAR) Guidelines. The following are some additional examples of District outreach programs designed to help Valley residents understand air quality and what they can do to reduce their own impacts:

- Real-Time Air Quality Display (READ)
- Web-based Archived Air Quality System (WAAQS)
- Healthy Air Living
- Healthy Air Living Schools
- Healthy Air Living Partners
- Check Before You Burn
- Air Alerts

The above programs are available to community members, and have helped residents and school administrators take health protective action during poor air quality episodes.

4. STRATEGIES TO REDUCE THE CUMULATIVE EXPOSURE BURDEN IN SOUTH CENTRAL FRESNO

COMMUNITY IDENTIFIED AIR QUALITY PRIORITIES

Throughout the AB 617 process, the Community Steering Committee and members of the public have participated in a variety of facilitated exercises to identify and rank their top source categories of concern. Meeting materials and exercise worksheets were also sent to committee members and posted on the District's community page http://community.valleyair.org to allow additional opportunity to participate in identifying sources of concern. Some top source categories of concern in South Central Fresno include:

To provide additional information about existing control programs for community members not familiar with ongoing air pollution control efforts, District staff prepared an informational document titled, "*Existing Control of Air Pollution Sources of Concern,*" (included for reference as Appendix D), and gave several presentations about existing District control programs. Additionally, the District held "World Café" style meetings, where Steering Committee members and the public could have conversations and question and answer sessions with staff from various agencies. These informative meetings served to build capacity to assist in developing new emission reduction measures for implementation in the community.

In partnership with community members and other agencies, District staff have developed a suite of targeted measures to reduce emissions from community identified sources of concern. In addition to the emission reductions achieved through expedited implementation of BARCT in community facilities, the adoption or amendment of rules that further reduce PM2.5 and toxics in the Valley, and enhanced enforcement in the community, these local measures provide accelerated emissions reductions in the community.

AB 617 legislation requires that community emission reduction programs identify cost-effective measures to achieve emission reduction targets in the community. During Steering Committee discussions to review potential strategies for implementation in the community, Committee members consistently supported and prioritized measures that would reduce emissions from residential sources of emissions while also providing tangible benefits to residents in the community. To that end, in addition to measures to reduce emissions from stationary, area, and mobile sources that are large contributors to the community emissions inventory, many of the measures supported by the Steering Committee and proposed for implementation in the South Central CERP include targeted incentive programs and interagency partnerships that provide co-benefits in the community, in addition to air quality improvements. The measures described in this chapter encompass a range of strategies to reduce community level exposure burden, including regulatory, enforcement, outreach and education, and voluntary incentive-based programs, as well as partnerships with other agencies to address issues outside of the District's direct jurisdiction.

It should be noted that the identified funding amounts for each measure are designed assuming that future-year state budget appropriations and funding allocations are similar to those approved by the legislature and CARB for current use in the AB 617 program, and are available in future District budget appropriations.

Incentive program guidelines also generally contain strict requirements that include specific project types and funding amounts. To maximize emission reductions in the AB 617-selected community of South Central Fresno, the CERP includes measures that also leverage existing District incentive funding allocations, above and beyond funding amounts available through AB 617-related funding allocations.

Some of the incentive measures included in the CERP are proposed to operate under existing authority and approved program guidelines, while other measures will require the development of new program guidelines and associated approval by the District Governing Board and CARB. As the CARB Blueprint states, CARB and the District will continue developing regulatory and incentive actions through separate public processes. Subsequent implementation of proposed CERP measures will be conditional on the successful completion of applicable public processes, necessary financing approvals, technical feasibility analyses, economic competitiveness, safety, and environmental reviews.

The District will continue to work with the Steering Committee to receive community input as program guidelines are developed and projects are implemented within the

community. As experience is gained in implementing the measures contained in the CERP, it may become evident that certain measures are more successful than others in reducing emissions and/or exposure, and are more popular with the community. Committee input on these considerations, and discussions about funding availability and cost-effectiveness of projects, may lead to adjustments to strategy goals and/or funding amounts to achieve overall emission reduction targets of the CERP.

The sections that follow provide detailed information about emission and exposure reduction strategies developed for each source category of concern to the community.

HEAVY DUTY MOBILE SOURCES

HEAVY DUTY MOBILE SOURCES IN SOUTH CENTRAL FRESNO

There are a variety of heavy-duty mobile sources operating in and around the City of South Central Fresno. These can range from on-road trucks, school and transit buses, off-road equipment including agricultural and construction equipment, line-haul, short-haul and switcher locomotives. This equipment is primarily powered by diesel engines and, depending on the specific category, is regulated by one or more statewide regulation.

Emissions from this source category include oxides of nitrogen (NOx) and combustion PM from the internal combustion engines. Mobile sources account for more than 85% of the NOx inventory throughout the Valley. In the South Central Fresno community, 595 tons per year of NOx and 15 tons per year of PM2.5 are attributed to on-road heavy-duty equipment. In addition, 300 tons per year of NOx and 7.4 tons of PM2.5 are attributed to off-road heavy-duty equipment referenced in this measure.

Figure 4-1: Examples of Heavy Duty Mobile Sources

COMMUNITY CONCERNS AND COMMENTS

During the committee discussions regarding heavy-duty mobile sources, a majority of the committee ranked this source as a high priority to address. Committee member comments and suggestions included providing incentives to replace older trucks, CNG fueling infrastructure development, clean fleet requirements, shifting trucking routes away from residents, and adjusting work schedules.

CURRENT CONTROL PROGRAMS

The District does not have regulatory authority of emissions from mobile sources, including heavy-duty vehicles and equipment, locomotives, school and transit buses. Diesel powered on-road heavy-duty vehicles are subject to statewide CARB Truck and Bus Regulation which requires all equipment to get progressively cleaner over time. Off-road heavy-duty equipment is similarly controlled through the CARB Off-Road Regulation, which requires all fleets to be upgraded to newer, cleaner technologies over time. However, at this time, there are no regulatory requirements in place at the state or federal level controlling emissions from locomotives or heavy-duty agricultural

equipment including tractors, harvesting equipment and other heavy-duty equipment used in agriculture.

Due to the large amount of pollution that can be attributed to mobile sources, the District has implemented a broad suite of voluntary incentive programs, targeted at reducing emissions from heavy-duty engines operating throughout the Valley.

Heavy-Duty Trucks/Buses:
The District currently offers a variety of programs targeted at replacing or upgrading older, high-polluting trucks and buses with cleaner technology.

- The Heavy Duty Truck Replacement Program http://valleyair.org/grants/truck-replacement.htm
  This program provides incentives for the replacement of existing heavy-duty diesel trucks with new, zero or near-zero-emission technology.

- The District is currently developing a Heavy-Duty Truck Repair Pilot Program to provide financial assistance to small fleet truck owners and operators to provide durable repairs for broken emissions components or systems in summer 2019.

- The District is currently developing new program for Heavy-Duty Alternative Fuel Infrastructure which will provide local businesses and agencies incentive funding to install alternative fueling infrastructure (electric, natural gas, hydrogen, etc.) to support the increased deployment of heavy-duty advanced clean technology vehicles.

- Electric School Bus Incentive Program - http://valleyair.org/grants/electric-school-bus.htm
  This program is operated by the District and provides incentives for the replacement of existing older, higher-polluting school buses with new, electric school buses.

- Volkswagen Mitigation Trust – http://vwbusmoney.valleyair.org/
  The VW Mitigation Trust has $130 million in funds to replace older, high-polluting transit, school, and shuttle buses with new battery-electric or fuel-cell buses. Replacing an older bus with a zero-emission bus eliminates particulate matter and other pollutants that impact children and residents riding the buses, as well as residents throughout California communities. This statewide program is being administered by the District.

Locomotives:
Freight locomotives are regulated by the U.S. EPA. The current regulation requires that all locomotives purchased in or after 2015 be at least a Tier 4 emission level. Older, lower Tier engines, which comprise the majority of Class 1 fleets, are still permitted to run. Additionally, CARB is planning actions to address freight locomotive emissions

within the State. More details can be found in the 2019 March CARB Board Meeting Informational Update: https://www.arb.ca.gov/board/books/2019/032119/19-3-2pres.pdf

The District offers two incentive programs for locomotive fleets interested in transitioning to newer, clean technology, including:

- Heavy-Duty Program – http://valleyair.org/grants/locomotive.htm. Locomotive replacements can be funded as an eligible project category under the District's utilizing funding provided to support AB 617. These projects are administered according to Carl Moyer Program guidelines and are subject to additional requirements contained within the approved AB 617 Community Air Protection Guidelines. This program is operated by the District.

- Proposition 1B - http://valleyair.org/grants/locomotives-prop1b.htm
  This program incentivizes the reduction of emissions and health risks associated with freight movement along California's trade corridors via upgrading to cleaner technologies or installation of emissions capture and control systems.

Agricultural Equipment:

The District offers the following programs targeted at replacing or repowering agricultural equipment in the Valley:

- Heavy-Duty Program Agricultural Tractors - http://valleyair.org/grants/documents/tractor/Guidelines.pdf
  Agricultural tractor replacements can be funded as an eligible project category utilizing funding provided to support AB 617. These projects are administered according to the Carl Moyer Program guidelines and are subject to additional requirements contained within the approved AB 617 Community Air Protection Guidelines. This program is operated by the District.

- FARMER Ag Truck Replacement Program - http://valleyair.org/grants/documents/FARMER/guidelines.pdf
  This program provides incentive funds for the replacement of heavy-duty diesel agricultural trucks. Eligible agricultural trucks must be in current compliance with the State of California's On-Road Truck and Bus Regulation. These projects are administered according to the FARMER Program guidelines and this program is operated by the District.

- Low-Dust Nut Harvester Incentive Program - http://valleyair.org/grants/low-dust-nut-harvester.htm
  This program provides incentives for the replacement of older, conventional harvesters or sweepers with new, low-dust technology equipment. This incentive program helps to reduce dust emissions during harvest time, and can also be

packaged with the District's Tractor Replacement funding to upgrade tractors used to pull harvesting equipment.

STRATEGIES DEVELOPED FOR IMPLEMENTATION IN COMMUNITY

Due to the priority that community members placed on reducing emissions from this source category and the large amount of emissions, including PM2.5 and toxic air contaminants (particularly diesel PM) that originate from heavy duty mobile sources in and around the community, the following strategies have been developed for implementation in the South Central Fresno community.

The following are proposed measures that are within the Air District's statutory jurisdiction to implement:

HD.1: INCENTIVE PROGRAM FOR HEAVY DUTY TRUCKS REPLACEMENT WITH ZERO AND NEAR ZERO EMISSION TECHNOLOGY

Overview: The goal of this strategy is to reduce emissions from heavy duty diesel trucks operating in the South Central Fresno community. The District currently offers incentives up to $200,000 for the replacement of an in use diesel truck with cleaner technology, including battery electric, hybrid and near zero emission trucks. Heavy duty diesel trucks are currently subject to the state on-road truck and bus regulation which will require fleet turnover to 2010 emission standard compliant engines. Advances in engine technology have resulted in cleaner engines or battery electric units in some applications. By reducing or eliminating emissions from heavy duty trucks significant PM2.5, diesel particulate matter, and NOx emissions reductions can be achieved.

Implementing Agency: SJVAPCD

Type of Action: Incentives

Implementation: 2019-2024

Description of Proposed Actions: This strategy would provide enhanced outreach and access to incentive funding for zero and near-zero emissions clean truck technologies that operate within the community. This strategy would rely on the Board-approved methodology and funding levels currently available in the District's truck replacement incentive program. This measure would replace 75 older, heavy duty diesel trucks operating in South Central Fresno with zero or near zero emission technology at an expected cost of $7,500,000. The emission reductions associated with this measure would achieve 0.66 tons of PM2.5 diesel particulate matter, and 246 tons of NOx.

HD.2: INCENTIVE PROGRAM FOR THE DEPLOYMENT OF CLEAN YARD TRUCKS, TRANSPORT REFRIGERATION UNITS, AND RELATED INFRASTRUCTURE

Overview: The goal of this strategy is to provide incentives to reduce emissions from diesel powered yard trucks and transport refrigeration units operating at warehouses,

distribution centers or other facilities within the community by replacing them with a zero emission technology. Yard trucks are used in moving trailers and containers short distances around freight terminals, port facilities or warehouses. Transport refrigeration units powered by diesel engines are designed to refrigerate or heat perishable goods that are transported in various containers. These types of equipment are in near constant operation at impacted facilities, therefore local communities and equipment operators can be exposed to PM2.5 (consisting of diesel particulate matter, a toxic air contaminant) and NOx emissions. Battery powered, zero emission units are currently available for both of these applications.

Implementing Agency: SJVAPCD

Type of Action: Incentives

Implementation: 2020-2024

Description of Proposed Actions: This strategy would provide incentive funding for operators to replace their diesel powered yard trucks or transport refrigeration units with zero emission technology. This strategy would rely on existing Board-approved methodology and established funding levels. The goal of this measure is to deploy 25 new zero emission yard trucks or transportation refrigeration units along with the associated infrastructure at a cost of $3,500,000. Emission reductions associated with this measure would achieve 0.8 tons of PM2.5 in the form of diesel particulate matter, and 4.5 tons of NOx.

HD.3: INCENTIVE PROGRAM TO REDUCE IDLING OF HEAVY DUTY TRUCKS WITHIN THE COMMUNITY: CHARGING INFRASTRUCTURE

Overview: The goal of this strategy is to reduce the impact of emissions from the idling of heavy duty diesel trucks at distribution centers, warehouses, or other freight facilities where trucks are being loaded or unloaded. Providing incentives for electric infrastructure at these facilities would support the deployment of electric transport refrigeration units and other electric equipment at impacted sources. These facilities are located in the community providing an opportunity to reduce emissions that are directly impacting South Central Fresno residents.

Implementing Agency: SJVAPCD

Type of Action: Incentives

Implementation: 2020-2024

Description of Proposed Actions: This strategy would provide incentive funding to install electric charging infrastructure at distribution centers, warehouse, and other types of freight facilities where heavy duty diesel trucks are being loaded or unloaded using Board-approved methodology, where feasible. This measure would reduce emissions from the idling of these vehicles during this activity by providing $100,000 for the

installation of 33 plugs with an expected emission reduction of 0.17 tons of PM2.5, and 10.33 tons of NOx.

HD.4: SUPPORT PLANNING AND DEVELOPMENT OF CLEAN FUELING INFRASTRUCTURE

Overview: To provide support for planning and development of fueling infrastructure for zero and near-zero emission vehicles to support broader deployment of clean vehicles operating throughout the community.

Replacing older heavy-duty vehicles, including trucks, school and transit buses is a prevalent strategy throughout this plan. Reducing emissions from heavy-duty vehicles is an important measure to reduce the public's exposure to vehicle emissions including NOx and PM2.5. These pollutants negatively impact human health, especially for sensitive populations such as children and the elderly. These new zero and near zero-emission vehicle deployments rely on available and accessible fueling infrastructure to ensure successful deployment and use.

The District is currently developing new program for Heavy-Duty Alternative Fuel Infrastructure which will provide local businesses and agencies incentive funding to install alternative fueling infrastructure (electric, natural gas, hydrogen, etc.) to support the increased deployment of heavy-duty advanced clean technology vehicles

Implementing Agency: SJVAPCD

Type of Action: Advocacy/Incentives

Implementation: 2021

Description of Proposed Actions: The goal of this action is to work closely with businesses, public agencies and fueling providers to support and incentivize the development of clean-vehicle fueling infrastructure in the area of the community, utilizing Board-approved methodology and funding levels. In this action, the District will prioritize incentive funding to support the development and construction of new natural gas fueling infrastructure within the community. This includes increased outreach to businesses and public agencies operating vehicles within the community as well as prioritized funding for projects that serve vehicles operating in the community. Depending on the size, throughput and configuration of the fueling infrastructure, the proposed funding amount of $2,000,000 would incentivize the development of two new natural gas fueling stations at a maximum incentive of up to $1,000,000 each.

HD.6: ENHANCED ENFORCEMENT OF THE STATEWIDE ANTI-IDLING REGULATION

Overview: The goal of this strategy is to limit the potential for localized PM2.5 and toxic air quality impacts associated with the failure to comply with the state's heavy duty anti-

idling regulation. Historically, the District has partnered with CARB to conduct anti-idling enforcement throughout Valley communities.

The state's anti-idling Airborne Toxic Control Measure limits nonessential (or unnecessary) vehicle idling to specific time limits. It is applicable to all diesel-fueled commercial motor vehicles with a gross vehicular weight rating (GVWR) of greater than 10,000 pounds. The diesel exhaust from excessive idling has the potential to impose significant adverse health and environmental impacts. Therefore, efforts to ensure compliance of the anti-idling regulation, especially near sensitive receptors, is important to limiting the potential for localized impacts within the community.

Implementing Agency: SJVAPCD, CARB

Type of Action: Enforcement

Implementation: 2020

Description of Proposed Actions: The District will partner with CARB to conduct additional targeted anti-idling enforcement efforts in the South Central Fresno community at least once per quarter for the next 5 years. The District and CARB will work with the Community Steering Committee to identify heavy-duty vehicle idling "hot spots," especially those near schools, to aid in focusing the enforcement efforts.

HD.7: INCENTIVE PROGRAM FOR REPLACING OLDER DIESEL SCHOOL BUSES WITH ZERO OR NEAR ZERO EMISSION SCHOOL BUSES

Overview: To provide increased outreach and access to incentive funding for the replacement of older, high polluting school buses with new zero or near-zero-emission school buses operating within and surrounding South-Central Fresno.

Replacing older school buses is important to reduce children's exposure to diesel emissions including NOx and PM2.5 and these pollutants negatively impact human health, especially for sensitive populations such as children. New, zero-emission battery electric and near-zero emission natural gas powered school buses are significantly cleaner than older diesel buses.

Emissions from school buses are regulated by the California Air Resources Board Statewide Truck and Bus Regulation that requires transition to cleaner technology over time. Generally phased in by model year.
https://www.arb.ca.gov/msprog/onrdiesel/onrdiesel.htm

The District administers the following incentive programs targeted at reducing emissions from existing school bus fleets with the Valley:

- Electric School Bus Incentive Program –

http://valleyair.org/grants/electric-school-bus.htm. This program is operated by the District and provides incentives for the replacement of existing older, higher-polluting school buses with new, electric school buses.

- Volkswagen Mitigation Trust – http://vwbusmoney.valleyair.org/
  The VW Mitigation Trust has $130 million in funds to replace older, high-polluting transit, school, and shuttle buses with new battery-electric or fuel-cell buses. Replacing an older bus with a zero-emission bus eliminates particulate matter and other pollutants that impact children and residents riding the buses, as well as residents throughout California communities. This statewide program is being administered by the District.

Implementing Agency: SJVAPCD

Type of Action: Incentives

Implementation: 2019-2024

Description of Proposed Actions: The goal of this action is to replace up to 16 school buses, operated by Fresno Unified School District, Fowler Unified School District and/or Central Unified School District with zero-emission battery-electric school buses that operate within the community, utilizing Board-approved methodology. The proposed funding amount of $6,400,000 would cover up to 100% of the cost of replacing up to 16 diesel school buses with electric buses at $400,000 each. Estimated emissions reductions associated with this measure include 8.32 tons of PM2.5 consisting of diesel particulate matter and 20.8 tons of NOx.

HD.9: INCENTIVE PROGRAM FOR REPLACING OLDER DIESEL LOCOMOTIVES WITH NEW CLEAN-ENGINE TECHNOLOGY

Overview: To provide incentive funding for the replacement of older, high polluting locomotives with new clean-technology locomotives operating within and surrounding South-Central Fresno.

Replacing older locomotives is important to reduce the public's exposure to diesel emissions, including PM2.5 in the form of diesel particulate and NOx. These pollutants negatively impact human health, especially for sensitive populations such as children and the elderly. New, clean-technology locomotives generate significantly lower emissions than older, uncontrolled diesel locomotives.

The District offers two incentive programs for locomotive fleets interested in transitioning to newer, clean technology, including:

- Heavy-Duty Program – http://valleyair.org/grants/locomotive.htm. Locomotive replacements can be funded as an eligible project category under the District's utilizing funding provided to support AB 617. These projects are administered

according to Carl Moyer Program guidelines and are subject to additional requirements contained within the approved AB 617 Community Air Protection Guidelines. This program is operated by the District.

- Proposition 1B - http://valleyair.org/grants/locomotives-prop1b.htm
  This program incentivizes the reduction of emissions and health risks associated with freight movement along California's trade corridors via upgrading to cleaner technologies or installation of emissions capture and control systems.

- To date, The District has administered nearly $66million to fund the replacement of old, high-polluting locomotive engines with new, tier 4 and CARB verified locomotive engines.

- South Coast APCD is administering the Volkswagen Environmental Mitigation Trust Funding on behalf of the State of California to replace high-polluting locomotive engines throughout California with newer, low-polluting Tier 4, CARB verified locomotive engines. This program will be launching in the fall of 2019. http://www.aqmd.gov/vw/

Implementing Agency: SJVAPCD

Type of Action: Incentives

Implementation: 2021

Description of Proposed Actions: The goal of this action is to replace up to two (2) older, high-polluting locomotives operating within the community. The proposed funding amount of $5,200,000 would cover up to 95% of the cost of replacing up to two (2) diesel locomotives at $2,600,000 each utilizing Board-approved methodology. This measure is estimated to achieve 2.8 tons of PM2.5 diesel particulate matter, and 126 tons of NOx emissions reductions.

HD.10: INCENTIVE PROGRAM FOR REPLACING OLDER DIESEL RAILCAR MOVERS AND SWITCHER LOCOMOTIVES WITH NEW CLEAN-ENGINE TECHNOLOGY

Overview: To provide incentive funding for the replacement of older, high polluting railcar movers and/or switcher locomotives with new clean-technology railcar movers and/or switcher locomotives operating within and surrounding South-Central Fresno.

Replacing older railcar movers and/or switcher locomotives is important to reduce the public's exposure to diesel emissions including NOx and PM2.5. These pollutants negatively impact human health, especially for sensitive populations such as children and the elderly. New, clean-technology railcar movers and/or switcher locomotives are significantly cleaner than older uncontrolled diesel railcar movers and/or switcher locomotives.

The District offers two incentive programs for locomotive fleets interested in transitioning to newer, clean technology, including:

- Heavy-Duty Program – http://valleyair.org/grants/locomotive.htm. Locomotive replacements, including switcher locomotives and railcar movers can be funded as an eligible project category under the District's utilizing funding provided to support AB 617. These projects are administered according to Carl Moyer Program guidelines and are subject to additional requirements contained within the approved AB 617 Community Air Protection Guidelines. This program is operated by the District.

- Proposition 1B - http://valleyair.org/grants/locomotives-prop1b.htm
  This program incentivizes the reduction of emissions and health risks associated with freight movement along California's trade corridors via upgrading to cleaner technologies or installation of emissions capture and control systems.

- To date, the District has administered nearly $66 million to fund the replacement of old, high-polluting locomotive engines with new, Tier 4 and CARB verified locomotive engines.

Implementing Agency: SJVAPCD

Type of Action: Incentives

Implementation: 2020-2024

Description of Proposed Actions: The goal of this action is to replace up to three (3) older, high-polluting railcar movers and/or switcher locomotives operating within and surrounding the community. The proposed funding amount of $4,100,000 would cover up to 95% of the cost of replacing up to three (3) diesel railcar movers and/or switcher locomotives at $1,340,875 each, utilizing Board-approved methodology. Estimated emissions reductions associated with this measure include 1.75 tons of PM2.5 consisting of diesel particulate matter and 66.5 tons of NOx.

The following are additional suggested measures not within the Air District's jurisdiction to directly implement:

HD.11: HEAVY DUTY TRUCK REROUTING

Overview: Some Steering Committee members have suggested that heavy duty trucks be rerouted off of Jensen Avenue to other streets to reduce emissions exposure of South Central Fresno community residents.

Jurisdictional Issues: It should be noted that the District has no authority over how agencies allow land under their jurisdiction to be used. These so-called "land-use" decisions, such as truck rerouting, are historically the responsibility, under state law, of cities and counties, or, in some cases, state and federal agencies responsible for transportation corridors, state and federal parks, and other properties. AB 617 does not provide the District with new land-use regulatory authority, so land-use authority remains with cities, counties, and state and federal land-use agencies, as discussed in CARB's Blueprint (see "Who Has the Authority to Implement Actions?", page 26 of the Blueprint). However, the District has made available to the responsible agencies the various land-use strategies that have been presented by the Committee for potential inclusion into the CERP for responsible agency's input and response in the South Central Fresno Community Emissions Reduction Program.

Implementing Agency: City, County, Caltrans

Type of Action: Partnership

Timing: Unknown

Description of Proposed Actions: The District will work with the City, County, Caltrans, and all other appropriate land-use and transportation agencies to communicate this Steering Committee suggestion and receive agency feedback and response about this measure for potential inclusion in the CERP. The District has received the following response from the City:

"*City will support a detailed study of vehicular trips within the AB617 geographic footprint, to include but not limited to number and type of each vehicle, destination/origin of each vehicular trip, time of day/week analysis, vehicle miles traveled and emissions. This would then be used to assess current truck routes, evaluate alternatives and calculate the increase/decrease in VMT, GHG, and Air Quality per CEQA. The City would be willing to lead the study if funding is identified. Estimated cost: $500,000+"*

The District will work with the City of Fresno and other appropriate agencies to seek funding to support this study.

HD.12: PROMOTE THE USE OF BIODIESEL/RENEWABLE DIESEL FUELS

Overview: The reduction of emissions from diesel engines has been one of the primary elements in obtaining air quality and greenhouse gas reduction goals within California and throughout the nation. A key element of CARB's efforts in reducing greenhouse gases has been the Low Carbon Fuel Standard (LCFS), the goal of which is to reduce the carbon intensity of transportation fuels by 20% by 2030. Since the LCFS was implemented in 2011, reductions have predominantly been achieved by introducing more lower-carbon fuels to partially replace conventional fuels for transportation

applications. In 2018, biodiesel and renewable diesel met 15% of diesel fuel demand in California.[2]

Biodiesel and renewable diesel have been shown to reduce life-cycle GHG emissions by 40% - 80% as compared to traditional fossil-fuels.[3] Both alternative fuels have been shown to reduce PM2.5 emissions, as compared to petroleum diesel. According to CARB, biodiesel and renewable diesel tend to have no impact on NOx emissions when used in newer on-road engines, while in older or off-road engines biodiesel tends to increase NOx and renewable diesel tends to decrease NOx. Biodiesel can be produced from vegetable oils, used cooking oils, and/or rendered animal fats, and is often combined with ultra-low sulfur diesel to be used in fuel blends up to B20 if increased NOx emissions can be mitigated, and up to B5 otherwise. Renewable diesel can be made from the same resources as biodiesel, but uses a different production process that results in a fuel that can be used as a drop-in replacement for petroleum diesel. One Steering Committee member commented that the use of these alternative fuels can help reduce emissions in the community.

Jurisdictional Issues: It should be noted that oversight of fuel standards is the jurisdiction of the U.S. EPA and CARB. AB 617 does not provide the District with new regulatory authority over fuels programs, as discussed in CARB's Blueprint (see page 26, "Who Has the Authority to Implement Actions?"). Therefore, the District relies on CARB to research, test, and certify that such fuels achieve the intended emissions reductions.

Implementing Agency: SJVAPCD, CARB

Type of Action: Partnership/Outreach

Implementation: 2020

Description of Proposed Actions: To the extent that biodiesel and renewable diesel fuels are certified by CARB to reduce NOx/PM2.5/GHG emissions, the District will work with local suppliers to promote the use of biodiesel and renewable diesel in the community.

[2] Low Carbon Fuel Standard Data Dashboard. "Alternative Fuel Volumes and Credit Generation" https://ww3.arb.ca.gov/fuels/lcfs/dashboard/figure2_053019.xlsx..
[3] Low Carbon Fuel Standard Data Dashboard. "2018 Volume-weighted Average Carbon Intensity by Fuel Type" https://ww3.arb.ca.gov/fuels/lcfs/dashboard/dashboard.htm

OLDER/HIGH POLLUTING PASSENGER CARS

OLDER/HIGH POLLUTING PASSENGER CARS IN SOUTH CENTRAL FRESNO

Mobile source emissions account for over 85% of the overall NOx inventory in the San Joaquin Valley. With no regulatory authority over these sources, the District has relied on voluntary incentive programs to transition older, higher emitting vehicles to newer, cleaner and more fuel efficient models. With limited public transportation options available to residents driving is more prevalent in the Valley than in other areas of the state. Vehicles registered in the Valley are typically older and have higher mileage than statewide averages.

Emissions from light duty vehicles in South Central Fresno total 80.22 tons per year (TPY) of NOx, 94.75 TPY of VOC, and 7.57 TPY PM2.5. These total emissions contribute 10.8% of the NOx inventory, 25.7% of the VOC inventory, and 3.4% of the PM2.5 inventory.

Figure 4-2: The District's Drive Clean in the San Joaquin Repair and Replacement program helps Valley residents purchase new or used clean-air vehicles

COMMUNITY CONCERNS AND COMMENTS

Steering Committee comments regarding passenger vehicles included concerns about the impact of freeways, local arterial roads, and idling vehicles on community residents. Committee member suggestions to address this source category included increased outreach and incentives for low income residents, modifying program guidelines to allow increased participation, and increasing charging infrastructure in the community.

CURRENT CONTROL PROGRAMS

The District does not have regulatory authority of emissions from mobiles sources, however, due to the large amount of pollution that originates from passenger vehicles the District has implemented a suite of programs to reduce pollution from mobile sources. These programs include the following measures:

- Tune In Tune Up vehicle repair program which provides incentive funds to repair high emitting vehicles. http://valleyair.org/drivecleaninthesanjoaquin/repair/

- Vehicle replacement program which provides funding to replace older, high emitting vehicles with newer, cleaner and more fuel efficient models. https://www.valleyair.org/drivecleaninthesanjoaquin/replace/

- The vehicle rebate program provides rebates for the purchase or lease of a new clean air vehicle including battery electric, fuel cell, plug in hybrid, zero emission motorcycles, and advanced technology natural gas vehicles. https://www.valleyair.org/drivecleaninthesanjoaquin/rebate/

- Incentives are available for publically accessible charging infrastructure through the District's Charge Up! program http://valleyair.org/grants/chargeup.htm

- The District's Healthy Air Living school program promotes no idling while picking up children at school and provides no idling signs to schools to encourage drivers to turn off their engines.

- District Indirect Source Rule (9510) accounts for mobile source emissions from construction and new development projects and ensures that emissions from these activities are mitigated.

- District Employer based Trip Reduction Rule (9410) requires large employers to implement measures to encourage employees to take alternative transportation to work in order to reduce single occupancy vehicle trips.

- CARB mobile source strategy calls for increasing the deployment of plug in hybrid, battery electric, and fuel cell vehicles in order to attain federal ozone standards, reduce greenhouse gas emissions, minimize health risks, reduce petroleum usage and increase energy efficiency.

STRATEGIES DEVELOPED FOR IMPLEMENTATION IN COMMUNITY

Due to the high priority that community members placed on reducing criteria pollutant and toxic air contaminant emissions that originate from passenger vehicles operating in and around the community, District staff and the Steering Committee have developed targeted strategies for implementation in the South Central Fresno community. As detailed below, measures developed include additional incentive measures intended to increase the deployment of electric vehicles through the replacement of gas powered vehicles currently in use; providing additional charging infrastructure throughout the community; providing for electric vehicle maintenance training to increase available repair facilities and job skills in the community; and repairing high polluting passenger vehicles.

The following are proposed measures that are within the Air District's statutory jurisdiction to implement:

C.1: INCENTIVE PROGRAM TO HOST A LOCAL TUNE IN TUNE UP EVENT TO REDUCE EMISSIONS FROM OLDER, HIGH POLLUTING CARS

Overview: The goal of this strategy is to reduce emissions of high emitting passenger vehicles that may be in need of repair. Reducing emissions from passenger vehicles is important due to their contribution to the formation of ozone in the Valley. Through the District's Tune In Tune Up Program, financial incentives up to $850 are available for emissions related repairs of high emitting vehicles. Through the program weekend testing events are held to determine if vehicles are in need of emissions related repairs. Approved participants are provided vouchers which can be utilized for the necessary smog tests, diagnostic work and emissions related repairs at participating STAR certified smog shops.

Implementing Agency: SJVAPCD

Type of Action: Incentives

Implementation: 2020

Description of Proposed Actions: This strategy would provide funding for a Tune In Tune Up event in the community of South Central Fresno and funding for vehicle repairs. This measure would provide up to $850 in vehicle emissions related repairs. The overall cost of this measure is $1,000,000 which would provide funding for the event related expenses as well as 1,250 vehicle repairs. This measure is expected to achieve 11.6 tons of NOx.

C.2: INCENTIVE PROGRAM FOR THE REPLACEMENT OF PASSENGER VEHICLES WITH BATTERY ELECTRIC OR PLUG IN HYBRID VEHICLES

Overview: The goal of this strategy is to reduce emissions associated with passenger vehicles operating in the South Central Fresno community. The District's Drive Clean in the San Joaquin Replacement program provides incentives up to $9,500 to low to moderate income residents of disadvantaged communities to replace their older, high polluting vehicle with a newer, cleaner, model. Emission reductions from passenger vehicles provide benefits to area residents as well as assist in reducing ozone formation in the Valley.

Implementing Agency: SJVAPCD

Type of Action: Incentives

Implementation: 2019

Description of Proposed Actions: This strategy would provide incentive funding to South Central Fresno residents to replace their older vehicles with newer, cleaner and more fuel efficient vehicles including conventional gas powered vehicles, hybrid, plug in hybrid and battery electric vehicles, utilizing Board-approved methodologies for program eligibility and funding. Enhanced outreach would be conducted in the South Central Fresno community to ensure that residents are fully aware of available incentive options and community residents would be provided priority access through the program in order to complete projects as quickly as possible. This measure would provide $1,600,000 for the replacement of 220 vehicles. This measure is expected to achieve 1.98 tons of NOX and 0.07 tons of PM2.5.

C.5: INCENTIVE PROGRAM FOR EDUCATIONAL TRAINING FOR ELECTRIC VEHICLE MECHANICS

Overview: The goal of this strategy is to provide incentive funding to develop and advance the education of personnel on the mechanics, safe operation and maintenance of alternative fuel vehicles and infrastructure. The District currently offers an alternative fuel mechanic training incentive program that would be utilized for this measure. With a deployment of electric vehicles in the South Central Fresno community it will be necessary to have qualified, trained personnel available to provide service as needed to these vehicles.

Implementing Agency: SJVAPCD

Type of Action: Incentives

Implementation: 2019-2021

Description of Proposed Actions: This strategy would provide up to $75,000 for 5 alternative fuel mechanic training course provided by an appropriate entity. Additional outreach will be conducted to identify projects that would provide a benefit to the South Central Fresno community. There are no direct emission reductions associated with this measure, however, this measure supports the emission reductions associated with electric vehicle deployment.

RESIDENTIAL BURNING

BACKGROUND

The wood burning fireplaces and wood burning heaters source category includes emissions from wood burning fireplaces, wood burning heaters, and outdoor wood burning devices. This source category contributes 17.6 tons per year of PM2.5 towards area sources of emissions in the community of South Central Fresno, representing 7.8% of the total PM2.5 inventory. During winter, residential wood burning is one of the largest sources of particulate pollution. Given the significant localized health impacts associated with residential wood smoke, reducing emissions from residential wood burning is a high priority for South Central Fresno. Many scientific studies have found that prolonged inhalation of wood smoke contributes to adverse impacts on human health, especially among children, elderly, and people with certain medical conditions, and individuals who are sensitive to the impacts of air pollution. A number of environmental justice communities experience a disproportionately high level of directly emitted PM2.5 emissions from residential wood burning.

COMMUNITY CONCERNS AND COMMENTS

The community of South Central Fresno has provided recommendations to implement the District's recently adopted amendments to Rule 4901 (Wood Burning Fireplaces and Wood Burning Heaters) requirements as committed in the 2018 PM2.5 Plan. Additionally, implementation of enhanced financial incentives for residents to replace existing wood burning devices and pellet stoves with natural gas or electric technologies would reduce the smoke impacts associated with residential wood burning for downwind communities. The South Central Fresno community made recommendations to also have schools and community-based organizations conduct outreach and education in support of this measure.

CURRENT CONTROL PROGRAMS

The District's comprehensive strategy to reduce emissions from residential wood burning includes implementation of stringent curtailment requirements through Rule 4901, strong outreach and education to establish the necessary public support, and deployment of financial incentives to transition away from wood burning to cleaner alternatives. This approach that combines regulatory and incentive based strategies is designed to improve the public health by reducing toxic wood smoke emissions in Valley neighborhoods during the peak PM2.5 winter season (November through February). The District has continually enhanced the strategy since adopting the first regulation in 1993. Today, the District has the toughest and most effective residential wood burning strategy in the nation as it reduces emissions when and where most needed, such as during multi-day periods of stagnation and in the evening hours, and in neighborhoods where residents live and play.

STRATEGIES DEVELOPED FOR IMPLEMENTATION IN COMMUNITY

Due to the high priority that the Steering Committee and members of the public placed on reducing PM2.5 and toxic air contaminant emissions that originate from residential burning in and around the community, targeted measures have been developed to

reduce emissions from this source category. Building upon the effective implementation of the District's wood burning emission reduction strategy, the District commits to provide enhanced incentives to replace wood burning devices, increased efforts to educate public about harmful impacts of wood smoke, enhanced enforcement of wood burning curtailments, focused outreach to reduce illegal activity, and enhanced enforcement to reduce illegal burning of residential waste.

The following are proposed measures that are within the Air District's statutory jurisdiction to implement:

RB.1: INCENTIVE PROGRAM FOR THE REPLACEMENT OF EXISTING WOOD BURNING DEVICES AND PELLET STOVES WITH NATURAL GAS OR ELECTRIC TECHNOLOGIES

Overview: The goal of this strategy is to reduce the impact of PM2.5 pollution associated with residential wood burning. During the winter months, one of the largest sources of particulate pollution comes from residential wood burning. Emissions are the result of incomplete combustion and are emitted into Valley neighborhoods where residents live and play. Multiple scientific studies show that prolonged inhalation of wood smoke has adverse impacts on human health. Inhalation of wood smoke contribute to lung disease, and pulmonary arterial hypertension, which can eventually lead to heart failure. Through the District's Burn Cleaner program, incentives are currently offered to encourage Valley residents to switch to cleaner burning options. The program currently offers up to $3,000 depending on the income of the resident and the type of device they are purchasing

Implementing Agency: SJVAPCD

Type of Action: Incentives

Implementation: 2019-2024

Description of Proposed Actions: This strategy would provide enhanced financial incentives to replace existing wood burning devices and pellet stoves with natural gas or electric technologies utilizing existing Board-approved methodology. Incentives available to South Central Fresno residents would include $3,000 for natural gas devices and $4,000 for an eligible electric heating device. The goal of this measure is to replace 500 wood burning devices in South Central Fresno with natural gas or electric alternatives at an expected cost of $1,500,000. This measure is expected to achieve a total of 246 tons of PM2.5 emissions reductions.

RB.3: ENHANCED ENFORCEMENT OF WOOD-BURNING CURTAILMENTS UNDER DISTRICT RULE 4901

Overview: The goal of this strategy is to limit the potential for localized PM2.5 impacts associated with the failure to comply with mandatory episodic wood burning

curtailments under District Rule 4901. Currently, to optimize rule effectiveness and reduce the public health impact of wood smoke, the District dedicates extensive staffing resources to operate a robust Rule 4901 enforcement program covering all aspects of the rule. The District's strategy focuses on both compliance assistance and enforcement activities. On all curtailment days, the District dedicates significant staffing resources to conducting surveillance in neighborhoods and responding to complaints from members of the public to ensure compliance with the rule. The District treats fireplace surveillance and complaint response as the highest priority enforcement activity. On each curtailment day, a substantial number of the District's inspection staff are assigned to perform surveillance with a focus on areas where non-compliance with the rule has been historically high and/or where public complaints regarding burning have been common. Notwithstanding this focus, the District works to ensure that surveillance is conducted regularly in all areas subject to regulatory curtailments. In addition to the surveillance and complaint response conducted during normal business hours, the District also conducts surveillance and complaint response on weekends, holidays, and during nighttime hours.

Implementing Agency: SJVAPCD

Type of Action: Enforcement
Implementation: 2019-2024

Description of Proposed Actions: Upon implementation of this strategy, District staff will allocate additional resources toward the enforcement of District Rule 4901 episodic curtailment requirements in the South Central Fresno community. Specifically, District staff will conduct at least four (4) hours of surveillance within the South Central Fresno community on each declared curtailment day for the next five (5) winter seasons to enhance the enforcement of District Rule 4901. The District will work with the Community Steering Committee to focus surveillance efforts in areas where wood burning is more prevalent.

RB.4: REDUCE ILLEGAL BURNING THROUGH RESIDENTIAL OPEN BURNING EDUCATION

Overview: The goal of this strategy is to reduce illegal burning of residential waste through outreach and education. It is important for residents to understand both the unlawfulness of burning garbage and its negative health impacts on all. Smoke from burning trash, yard waste, or burn barrels may contain toxic air contaminants and other pollutants that are especially harmful to human health. Education is critical to effectively reducing this dangerous practice.

Implementing Agency: SJVAPCD

Type of Action: Outreach

Implementation: 2020-2024

Description of Proposed Actions: This strategy would establish a series of five (5) public workshops to educate South Central Fresno residents about the illegality and health impacts of burning waste, and to address questions and concerns interactively and accessibly within a forum setting. Workshops would take place in locations commonly available to the public such as libraries, schools, and community, health, or recreation centers. This strategy would also invest funds into geo-targeted outdoor ads in areas with frequent violations, including four (4) billboards, three (3) pieces of street furniture (such as bus shelters or kiosks), and two (2) buses routed through relevant locations. Additionally, two (2) postcard mailers would be sent to county residents in rural areas.

RB.5: ENHANCED ENFORCEMENT TO REDUCE ILLEGAL BURNING OF RESIDENTIAL WASTE

Overview: The goal of this strategy is to limit the potential for localized PM2.5 and toxic impacts associated with the illegal open burning of residential waste.

Pursuant to District rules and state law, the burning of residential waste is illegal in the San Joaquin Valley. Recognizing both the potential for localized exposure and regional air quality impacts associated with the burning of residential waste, the District promptly responds to all complaints regarding illegal burning, conducts regular area surveillance for the purpose of enforcing open burn prohibitions, and works closely with local fire agencies to encourage interdepartmental cooperation and cross-reporting of incidents.

Implementing Agency: SJVAPCD

Type of Action: Enforcement

Implementation: 2020-2024

Description of Proposed Actions: Building on the District's existing surveillance and complaint response efforts, the District will conduct additional targeted surveillance efforts in the South Central Fresno community at least once per quarter for the next five (5) years. The District will work with the Community Steering Committee to focus surveillance efforts in areas where illegal residential open burning has historically occurred.

AGRICULTURAL OPERATIONS

AGRICULTURAL OPERATIONS IN SOUTH CENTRAL FRESNO

The San Joaquin Valley's natural environment supports one of the most productive agricultural regions in the country; the Sierra Nevada provides the necessary water for growing the abundance of crops, and a temperate climate provides a long growing season. While the community of South Central Fresno is primarily an urban area, portions of the community are located at the edge of the urban-rural boundary. The southern portion of the community is currently used for agricultural purposes, but is zoned for development into an industrial area under the City of Fresno's General Plan.

Agricultural source categories include fuel combustion, industrial processes for the purpose of food and agriculture, farming processes (including dust from harvest and tilling operations, and emissions from off-road mobile sources), pesticides/fertilizers, and managed open burning. While the South Central Fresno community experiences the majority of air pollution emissions from mobile and industrial sources, agricultural sources in the surrounding area contribute a small percentage of the overall emission inventory in this community. Agricultural emissions that originate in and around the community of South Central Fresno include 12 tons per year of NOx, 72 tons per year of VOCs, and 4.81 tons per year of PM2.5. Emissions from agricultural operations represent 0.77% of the total NOx inventory, 2.77% of total VOCs, and 2.13% of the total PM2.5 emitted in the community.

COMMUNITY CONCERNS AND COMMENTS

Community members expressed concerns regarding the adverse health effects resulting from emissions generated from open burning of agricultural waste in the surrounding area, as well as concerns related to dust generated during nut harvesting that may affect community neighborhoods and roads located near orchards.

CURRENT CONTROL PROGRAMS

Current District rules regulating open burning, internal combustion engines, and dust from orchards, vineyards, and row crops are as follows:

- 4101 Visible Emissions
- 4103 Open Burning
- 4550 Conservation Management Practices
- 4702 Internal Combustion Engines

Additionally, a variety of incentive programs are available for alternatives to open burning, the replacement of agricultural tractors, trucks, pumps, and nut harvesters or sweepers, as further detailed below.

Open Burning

Through Rule 4103, the District no longer allows the burning of field crops (with the exception of a certain percentage of rice), prunings (with the exception of pome fruit prunings, and a limited amount of surface harvested pruning acreage), and orchard removals (with the exception of small acreage removals, vineyard removals, pome

fruit removals, and citrus removals). A limited amount of additional burning is allowed for disease prevention, noxious weeds, ditch banks and canals, ponding and levee banks, and diseased beehives, provided rule requirements are met and meteorological conditions are appropriate.

Rule 4103 also contains requirements for collecting, sorting, drying, and igniting agricultural materials; the timing, monitoring, and maintenance of burns; and specific requirements for field crop burning, ditch bank and levee maintenance, contraband materials, Russian thistle (tumbleweeds), and diseased materials. Additionally, the rule details a set of conditions that must be met for a burn permit to be issued.

The District uses a comprehensive Smoke Management System (SMS) to manage the Valley's remaining open burning of agricultural crops and materials. On a daily basis, the District analyzes projected local meteorology, the air quality conditions, the atmospheric holding capacity, the amount of burning already approved in a given area, and the potential impacts on downwind populations. Through the results of this daily analysis, the District uses the SMS to manage 97 Valley burn zones and allocates daily burning allowances if appropriate. This approach ensures the District limits the distribution of air pollutant emissions from open burning temporally and spatially, providing flexibility of burn days for growers while minimizing the impact on the public.

Properly managed burning allocations under the SMS ensures that air quality impacts, health impacts, and public nuisance from open burning of agricultural materials are minimized to the fullest extent feasible.

Furthermore, the District's *Alternative to Open Ag Burning Incentive Pilot Program* provided incentives for chipping or shredding agricultural material, with the materials being required to be used for soil incorporation or land application on agricultural land. From the program's launch in late 2018, the program was oversubscribed with a total of $1,644,320 offered to fund chipping and soil incorporation projects. This pilot program resulted in approximately 200 tons of NOx, 241 tons of VOC, and 337 tons of PM emission reductions.

Pesticides

The Department of Pesticide Regulation (DPR) regulates pesticides under a comprehensive program that encompasses enforcement of pesticide use in agricultural and urban environments. DPR oversees a multi-tiered enforcement infrastructure and is vested by the EPA with primary responsibility to enforce federal pesticide laws in California. DPR directs and oversees County Agricultural Commissioner enforcement of pesticide and environmental laws and regulations locally, including enforcement for the Department of Consumer Affairs' Structural Pest Control Board. DPR requires farmers to notify the department before they apply any form of pesticide. Additionally, agricultural operators are subject to strict rules that limit overspray and drift from the approved site of application, and may be subject to fines for violations. Schools near a pesticide application must be notified by DPR to allow the school to take precautions to prevent exposure.

Agricultural Tractors
Agricultural tractors are not controlled by regulation. However, the District's *Ag Tractor Replacement Program* provides incentive funds for the replacement of in-use, off-road mobile equipment that are engaged in agricultural operations as defined by the California Air Resources Board. Funds are provided on a first-come, first-served basis. Eligible tractor/equipment includes but is not limited to wheel loaders, balers, combines, graders or tractors.

Agricultural Pump Replacement Program
This program provides incentives for engine replacement (repower) of engines/motors used to power agricultural irrigation pumps. The Agricultural Pump Incentive Program provides monetary incentives for the replacement of Tier 3 internal combustion engines (IC engines) to Tier 4f IC engines and Tier 3 or Tier 4f IC engines to electric motors. Funds are provided on a first-come, first-served basis. District Rule 4702 – *Internal Combustion Engines* limits the emissions of NO_x, CO, VOC, and SO_x from IC engines.

Agricultural Trucks
Agricultural trucks are controlled by the California Air Resources Board Statewide Truck and Bus Regulation that requires transition to cleaner technology over time. This regulatory transition is generally phased in by model year.

The Funding Agricultural Replacement Measures (FARMER) Ag Truck Replacement Program provides incentive funds for the replacement of heavy-duty diesel agricultural trucks. Eligible agricultural trucks must be in current compliance with the State of California's On-Road Truck and Bus Regulation under the following compliance options:

- Agricultural Vehicle Extension
- Low-Use Exemption
- Specialty Agricultural Vehicle Extension
- Model Year Schedule and the truck must operate as an "agricultural vehicle" as defined in the truck and bus regulation.

Dust from Orchards, Vineyards, and Row Crops
The District requires that growers implement conservation management practices to reduce air pollution from agricultural operations. Growers must submit a conservation management plan to the District for approval, as required by District Rule 4550 - *Conservation Management Practices*. Within this plan, farmers detail specific measures they will be implementing to reduce dust emissions from their facility. District staff regularly conducts site inspections of Valley farms to ensure compliance with rule requirements.

The District has worked closely with representatives from the agricultural community to evaluate new harvesting equipment and practices that can effectively reduce dust from harvest activities. Based on the significant dust emission reductions that low-dust harvesting equipment can provide, the District is offering funding for the replacement of older, conventional nut harvesters or sweepers with new, low-dust technology

equipment for use in nut harvesting operations. This incentive funding can also be packaged with the Ag Tractor Replacement Program funding to upgrade the tractor used to pull harvesting equipment. This incentive program is currently available to agricultural operations throughout the Valley, including in agricultural areas that may impact community neighborhoods or arterial roads.

STRATEGIES DEVELOPED FOR IMPLEMENTATION IN COMMUNITY

The above Valley-wide control measures continue to reduce emissions from agricultural operations throughout the Valley, including in and around the community of South Central Fresno. Due to the proximity of the South Central Fresno community to areas that are currently used for agricultural operations but that are zoned for future industrial development under the City of Fresno General Plan, members of the Steering Committee expressed concerns about the impacts of emissions from removing orchards and vineyards and disposing of the resulting agricultural biomass. To address these concerns and help to reduce agricultural burning in the area, the following strategy has been developed for implementation as a part of the South Central Fresno CERP.

The following proposed measure is within the Air District's statutory jurisdiction to implement:

AG.1: INCENTIVE PROGRAM FOR DEPLOYING ON-FIELD ALTERNATIVES TO THE OPEN BURNING OF AGRICULTURAL MATERIALS

Overview: The goal of this strategy is to limit the potential for localized PM2.5 impacts associated with open agricultural burning by providing enhanced access to funding for the District's Alternative to Agricultural Open Burning Incentive Program for growers within South Central Fresno and the surrounding areas.

The San Joaquin Valley, in adherence with applicable state laws instituted under SB705 (2003 Florez), has the toughest restrictions on agricultural burning in the state. District regulations no longer allow the burning of all field crops (with the exception of rice), almost all prunings, and almost all orchard removals. The District also operates a comprehensive Smoke Management System which only allows the limited amount of burning that is still permissible to take place on days with favorable meteorology and in amounts that will not cause a significant impact on air quality.

Until 2014, the restrictions imposed by the District resulted in an 80% reduction in the open burning of agricultural waste. The exceptional drought conditions that the Valley recently experienced and the demise of the biomass power industry has resulted in an increase in the open burning of wood waste and threatens the District's ability to continue to maintain broad restrictions on open burning of agricultural waste into the future.

While modeling conducted for the District's *2018 PM2.5 Plan* indicates that reducing emissions from the open burning of agricultural materials does not significantly impact the Valley's peak urban PM2.5 locations that drive the Valley's federal attainment

mandates, the District is committed to implementing strategies to reduce localized PM2.5 community impacts.

In January of 2019, the District commenced one such strategy, a pilot incentive program to help fund the implementation of on-field practices, such as soil incorporation, that may provide alternatives to open burning of agricultural material from orchard removals. The purpose of the program was to demonstrate the feasibility of utilizing chipped agricultural material for soil incorporation or as a surface application as alternatives to burning. The cost of these practices can be prohibitive and questions remain regarding the ability to adapt these practices across all agricultural applications, but where feasible analysis shows that on-field soil incorporation of woody biomass has the potential to result in significant emission reductions when compared to open burning of agricultural material. To date, the District's program has been well subscribed with applications received totaling over $2 million in funding valley-wide.

Implementing Agency: SJVAPCD

Type of Action: Incentives

Implementation: 2020-2024

Description of Proposed Actions: This strategy would provide enhanced access to District's Alternative to Agricultural Open Burning Incentive Program for growers within South Central Fresno and the surrounding area by providing access to $375,000 in dedicated funding. This strategy would fund up to 700 acres of alternative practices.

The following are additional suggested measures not within the Air District's statutory jurisdiction to implement:

AG.2: REDUCING EXPOSURE TO PESTICIDES IN THE COMMUNITY

Overview: Specific measures were suggested by Committee members regarding reducing community exposure to pesticides, including banning untarped applications of 1,3-D, reducing the 1,3-D township cap, implementing a notification system to alert residents prior to pesticide applications, banning aerial application of pesticides, and establishing buffer zones where pesticide application is banned near sensitive receptor locations.

Jurisdictional Issue: Under state law, the District has no regulatory authority over pesticides in their pesticidal use. Some advocates have pointed out that a 1996 court case (*Harbor Fumigation Inc v. County of San Diego Air Pollution Control District*) clarified that air districts do have jurisdiction over emissions of pesticides released into the air after their pesticidal use:

> *"…although APCD cannot regulate how a pesticide is used within the Facility (and thus does not run afoul of DPR's jurisdiction over pesticide use), once the*

> *use of a pesticide is completed and its waste gas emitted into the ambient air from the Facility, then APCD's regulatory jurisdiction … begins."*

The District agrees, and has, for decades, regulated facilities that perform fumigation where the pesticide is applied in a room or fumigation chamber, and then released into the air from that chamber. The District does require air pollution control equipment or techniques to reduce pesticide emissions in such situations. Air Districts are allowed to do so by state law because the emissions of pesticides are occurring after their pesticidal use is completed. However, the District does not have jurisdiction in the case of open air application, such as on-field pesticide application, because all potential control of emissions in such situations is also a regulation of the pesticide in its pesticidal use. For instance, pesticide reformulation and limiting pesticide use (whether by amount or by location) is regulating a pesticide in its pesticidal use, and the state's position is that the District is prohibited by state law from doing so.

Implementing Agency: DPR, CARB

Type of Action: Partnership

Timing: Unknown

Description of Proposed Actions: Through discussions with the District and the Committee, DPR and CARB are committed to including in the CERP actions to address pesticides. DPR submitted a summary of strategies that will reduce exposure to pesticides in the South Central Fresno community, as follows:

> *"The Department of Pesticide Regulation (DPR) is the public agency responsible for protecting California and its residents from adverse human health and environmental effects caused by the use of pesticides. Its mission is to protect human health and the environment by regulating pesticide sales and use and by fostering reduced-risk pest management. Protecting the air we breathe is one of DPR's highest priorities, focusing not only on preventing health problems that can be caused by pesticide air toxins, but also on reducing pesticide emissions that contribute to air pollution.*
>
> *The following are some of the statewide emission reduction efforts currently being developed by DPR:*
>
> *<u>Emission Reductions:</u>*
>
> - *DPR is currently developing a regulation to reduce exposures to 1,3-D in ambient air.*
> - *DPR is currently working through the legal Pesticide Toxic Air Contaminant (TAC) process with its partner agencies including Office of Environmental Health Hazards Assessment (OEHHA), CARB, Air Districts, and CACs during the development of the regulations.*

Additional Efforts:

- *DPR routinely works with local partners to identify and promote use of alternative agricultural practices.*
- *DPR promotes the adoption and implementation of effective integrated pest management (IPM) systems and practices that reduce risks from pesticide use to human health and the environment in agricultural and non-agricultural settings. To aid in this effort, DPR makes Pest Management Alliance Grants available on a yearly basis in an effort to support the development of methods or practices to reduce pesticide associated risk. DPR is committed to promote and encourage local groups to apply for the Pest Management Alliance Grants."*

INDUSTRIAL SOURCES

INDUSTRIAL SOURCES IN SOUTH CENTRAL FRESNO

There are a variety of industrial sources located in and around the South Central Fresno Community. These sources range from smaller operations like gasoline dispensing operations (GDOs) and auto body coating operations, to medium sized operations like chrome plating operations, to larger operations like a biomass power facility, a gasoline pipeline terminal facility, and a glass manufacturing plant; which includes equipment like internal combustion (IC) engines, boilers/steam generators, and many others.

Criteria pollutant emissions from this source category include NOx, SOx, PM10/PM2.5, CO, and VOC, and toxic air contaminants (TACs) like benzene, toluene, xylene, arsenic, and dioxins. Within the SC Fresno community, 597.74 tons per year of NOx, 148.48 tons per year of VOC and 72.78 tons per year of PM2.5 are attributed to stationary sources.

COMMUNITY CONCERNS AND COMMENTS

During committee discussions regarding industrial sources, committee members identified chrome plating operations, the biomass facility, and the glass manufacturing plant as a sources to address, with suggestions ranging from providing “incentives” to replace older, higher polluting equipment, to having chrome platers switch from using hexavalent chromium to trivalent chromium, or to install advanced controls that go beyond current regulations.

CURRENT CONTROL PROGRAMS

For more than 25 years, the District has implemented several generations of emissions control regulations for stationary and area sources under its regulatory jurisdiction. These control measures represent the nation’s toughest air pollution regulations and have greatly contributed to reducing ozone and particulate matter concentrations in the Valley. Stringent and innovative rules, such as those for indirect source review, residential wood burning, glass manufacturing, and agricultural burning, have set benchmarks for California and the nation. While there has been significant progress in reducing air pollution with these regulations, which have been greatly aided by the pollution reduction efforts and financial investments of Valley businesses and residents, the District continues to adopt and modify rules to achieve ongoing emissions reductions and advance our progress toward clean air.

Gasoline Dispensing Operations (GDOs):

Gasoline dispensing operations in the San Joaquin Valley are subject to District Rule 4621 – *Gasoline Transfer Into Stationary Storage Containers, Delivery Vessels, and Bulk Plants* and Rule 4622 – *Gasoline Transfer Into Motor Vehicle Fuel Tanks.*

The purpose of Rule 4621 is to limit VOC emissions from stationary storage containers, delivery vessels, and bulk plants. This rule applies to gasoline storage containers with capacities greater than 250 gallons and has requirements to install CARB certified Phase I vapor control systems. The purpose of Rule 4622 is to limit emissions of

gasoline vapors from the transfer of gasoline into motor vehicle fuel tanks. This rule applies to any gasoline storage and dispensing operation or mobile fueler from which gasoline is transferred into motor vehicle fuel tanks. This rule also requires the installation of CARB certified Phase II vapor control systems. GDOs are subject to stringent enforcement provisions, including ongoing monitoring of equipment and annual inspections.

Auto Body Coating Operations:
Auto body coating operations in the San Joaquin Valley are subject to District Rule 4612 – *Motor Vehicle and Mobile Equipment Coating Operations* and Rule 4101 – *Visible Emissions.*

The purpose of Rule 4612 is to limit VOC emissions from coatings of motor vehicles, mobile equipment, and associated parts and components, and associated organic solvent cleaning, storage, and disposal. This rule applies to any person who supplies, sells, offers for sale, manufacturers, or distributes any automotive coating for use within the District, as well as any person who uses, applies, or solicits the use or application of any automotive coating within the District. This rule requires the sale and use of low VOC coatings and solvents, in addition to stringent requirements for the application of these coatings. Auto body coating operations are subject to stringent enforcement provisions, including ongoing recordkeeping of coatings/solvents used and annual inspections. Auto body coating operations must demonstrate continued compliance with additional visible emissions requirements as described in Rule 4101.

Chrome Plating Operations:
Chrome Plating operations in the San Joaquin Valley are subject to District Rule 7011 – *Chromium Plating and Chromic Acid Anodizing Facilities* and the Air Toxic Control Measure (ATCM) 17 CCR 93102 – *Airborne Toxic Control Measure for Chromium Plating and Chromic Acid Anodizing Facilities*.

The purpose of Rule 7011 and the ATCM is to limit chromium emissions from chromium plating and chromic acid anodizing facilities. This rule applies to any owner or operator of any facility performing hard chromium electroplating, decorative chromium electroplating, or chromic acid anodizing and any person who sells, supplies, offers for sale, uses, or manufactures for sale in California a chromium electroplating or chromic acid anodizing kit. This rule prohibits the manufacturing, sale, and use of chromium electroplating or chromic acid anodizing kits unless used at a permitted facility that is in compliance with the ATCM. For these permitted facilities, stringent requirements such as the use of add-on controls and/or chemical fume suppressants are required to minimize chromium emissions. Chrome plating operations are subject to stringent enforcement provisions, including inspection and maintenance (I&M) programs, source testing requirements, ongoing recordkeeping and annual inspections.

Biomass Power Facilities:
Biomass power facilities in the San Joaquin Valley are subject to District Rule 4352 – *Solid Fuel Fired Boilers, Steam Generators, and Process Heaters* and Rule 4101 – *Visible Emissions*.

The purpose of Rule 4352 is to limit emissions of NOx and CO from solid fuel fired boilers, steam generators and process heaters. This rule applies to any boiler, steam generator or process heater fired on solid fuel. This rule has very stringent emission limits, periodic monitoring, and source testing requirements. Biomass power facilities are subject to stringent enforcement provisions, including ongoing recordkeeping of materials burned and annual inspections. These facilities must demonstrate continued compliance with additional visible emissions requirements as described in Rule 4101.

Gasoline Pipeline Terminal Facilities:
Gasoline pipeline terminal facilities in the San Joaquin Valley are subject to District Rule 4623 – *Storage of Organic Liquids* and Rule 4624 – *Organic Liquid Loading*.

The purpose of Rule 4623 is to limit VOC emissions from the storage of organic liquids. This rule applies to any tank with a capacity of 1,100 gallons or greater in which any organic liquid is placed, held, or stored. The purpose of Rule 4624 is to limit VOC emissions from the transfer of organic liquids. This rule applies to organic liquid transfer facilities. Facilities that store or transfer organic liquids, such as gasoline pipeline terminals are subject to stringent enforcement provisions, including quarterly leak inspection requirements and annual inspections.

Glass Manufacturing Plants:
Glass manufacturing plants in the San Joaquin Valley are subject to District Rule 4354 – *Glass Melting Furnaces*.

Rule 4354 is among the most stringent rules in the nation for glass melting furnaces. The purpose of this rule is to limit NOx, SOx, VOC, CO, and PM emissions from glass melting furnaces. The NOx emission limits contained within Rule 4354 require the installation of the best available NOx technology (such as oxy-fuel firing or SCR systems). Facilities with glass melting furnaces are subject to stringent enforcement provisions, including the installation of continuous emissions monitoring equipment, periodic source testing requirements, ongoing recordkeeping of facility and annual inspections.

The purpose of Rule 4306/4320 is to limit emissions of NOx, CO, oxides of sulfur (SOx), and PM10 from boilers, steam generators, and process heaters. This rule applies to any gaseous fuel or liquid fuel fired boiler, steam generator, or process heater with a total rated heat input greater than 5 million Btu per hour. The purpose of Rule 4702 is to limit the emissions of NOx, CO, VOC, and SOx from internal combustion engines. This rule applies to any internal combustion engine rated at 25 brake horsepower or greater. Both these rules have very stringent emission limits, periodic monitoring, and source testing requirements.

STRATEGIES DEVELOPED FOR IMPLEMENTATION IN COMMUNITY

Due to the priority that community members placed on reducing PM2.5 and toxic air contaminant emissions that originate from industrial sources in and around the community, the following strategies have been developed for implementation in the South Central Fresno community.

IS.1: PROVIDE INCENTIVES, WITH REGULATORY BACKSTOP, TO PLATING OPERATIONS TO FURTHER REDUCE CHROME EMISSIONS

Overview: The goal of this strategy is to provide incentives to Chrome Plating operations to further reduce emissions of chromium, using new state funding guidelines for chrome plating facilities switching to trivalent chrome or controlling emissions beyond existing rule requirement levels, and beyond applicable BACT and BARCT requirements. District Rule 7011 already contains stringent requirements for chrome plating operations. The state identified hexavalent chromium as a Toxic Air Contaminant (TAC) in 1986, and has developed an Air Toxic Control Measure (ATCM) to reduce hexavalent chrome emissions from chrome platers. San Joaquin Valley chrome platers must comply with this ATCM and District Rule 7011, and so have already significantly reduced chrome emissions. However, hexavalent chromium is currently known to be the second most potent carcinogen identified by the state, and so the state is in the process of identifying potential updates to the chrome plating ATCM, which the District will implement upon adoption.

The California Air Resources Board has also identified chrome platers specifically as a category of stationary source that is eligible for incentive funding under AB 617, to achieve reductions in toxic emissions beyond those already required by rules and regulations. This measure takes advantage of that available funding, and seeks to achieve emission reductions even in advance of regulatory updates.

Implementing Agency: SJVAPCD

Type of Action: Incentive, Outreach, and Regulatory

Implementation: 2021

Description of Proposed Actions: The District will discuss the availability of incentives through the CARB Community Air Protection Program guidelines with all chrome plating facilities in the SC Fresno community and fund all willing partners, as feasible. As specified in the CARB funding guidance for this category, facilities willing to convert to the use of trivalent chromium instead of using hexavalent chromium may be funded for up to 90% of eligible costs. Facilities installing advanced control technologies to reduce chromium emissions beyond current rule levels may be funded for up to 80% of eligible costs with a $300,000 cap. This measure will reduce toxic chromium emissions.

This effort will achieve emission reductions well in advance of any regulatory requirements of the updated state ATCM for chrome platers that CARB is currently developing. However, the District will begin implementing the revised ATCM immediately upon adoption by the state, so that chrome platers that have not taken advantage of the availability of funding will be required to implement the reductions required by the regulation.

IS.4: ENHANCED STATIONARY SOURCE INSPECTION FREQUENCY

Overview: The goal of this strategy is to limit the potential for localized air quality impacts at permitted facilities associated with the failure to comply with emission standards established by District permit, rule, or regulation.

The District conducts inspections and investigations of both permitted sources to determine compliance with a multitude of health-protective local, state, and federal air quality regulations targeting both criteria and toxic pollutants. These include (1) District rules and permit requirements; (2) statewide Airborne Toxic Control Measures; (3) statewide greenhouse gas regulations; and (4) federal New Source Performance Standards, National Emission Standards for Hazardous Air Pollutants, and Maximum Available Control Technology standards. The District closely monitors such sources and strictly enforces applicable requirements. Compliance evaluations are unannounced whenever possible and involve both a physical inspection of the facility and a review of operating and monitoring records. When a violation of a District permit, rule, or regulation is identified, the District takes an appropriate level of enforcement action.

During the review of the enforcement history for the South Central Fresno community and 7-mile buffer area, the District determined that 44 enforcement actions were issued to facilities (not including gas stations) for violations resulting in excess emissions. These violations occurred at 24 permitted facilities in the area. The District has also issued 18 enforcement actions to gas stations for violations resulting in excess emissions. These violations occurred at 10 gas stations in the area. The District believes that more frequent inspections for these 34 facilities would be prudent to limit the potential for air quality impacts associated with failure to comply with emission standards established by District permit, rule, or regulation.

Implementing Agency: SJVAPCD

Type of Action: Enforcement

Implementation: 2020

Description of Proposed Actions: The District will increase the frequency of inspection at each facility within the South Central Fresno community that has had an emission violation over the past three (3) years. These facilities will be inspected at least twice

per calendar year for the next five (5) years or until the facility has four (4) consecutive inspections without an emission violation, whichever occurs first.

IS.5: PILOT TRAINING PROGRAM FOR CONDUCTING SELF-INSPECTIONS AT GAS STATIONS

Overview: The goal of this strategy is to limit the potential for air quality impacts associated with vapor recovery defects at gasoline dispensing stations in the South Central Fresno community.

Gasoline dispensing stations are sources of volatile organic compound (VOC) and toxic emissions such as benzene. Accordingly, District rules require state-certified vapor recovery systems be installed, operated, and maintained in order to achieve at least 95% control of gasoline vapors. District staff inspects gasoline vapor recovery systems on a routine basis to detect equipment defects, such as torn hoses and damaged nozzles, and missing or non-certified parts, to ensure compliance with applicable state and local requirements. Furthermore, District staff routinely witnesses third-party source testing of gasoline vapor recovery systems to verify compliance with applicable leak standards and backpressure requirements. In addition, frequent and thorough self-inspections of vapor recovery systems by the facility operator aids in the identification and timely repair of vapor recovery system defects in the interim between District inspections and reduces the potential for localized impacts from excess emissions associated with equipment defects.

Implementing Agency: SJVAPCD

Type of Action: Compliance Assistance

Implementation: 2020

Description of Proposed Actions: The District will develop a new pilot training program to instruct gas station operators in conducting thorough self-inspections of the vapor recovery systems to aid in the identification and timely repair of vapor recovery system defects. Once developed, the District will provide hands-on training to each of the 52 gas stations in the South Central Fresno community. This training will cover important inspection points such as nozzles, hoses, breakaways, vacuum motors (as applicable), and components associated with storage tanks, and vapor recovery system pressure/vacuum vents. By receiving this training, operators will be better equipped to identify and expeditiously repair any system defects resulting in excess VOC and toxic emissions.

IS.6: EXPLORE POTENTIAL INCENTIVES TO INSTALL ADVANCED CONTROL TECHNOLOGY TO ACHIEVE EMISSION REDUCTIONS BEYOND REGULATORY REQUIREMENTS (BACT AND BARCT)

Overview: The goal of this strategy is to reduce NOx and PM2.5 emissions in the community from stationary source operations through the installation of advanced controls. During the rule development process the District conducts when amending existing rules or adopting new rules; there are times where advanced control technologies are identified that could potentially achieve additional emissions reductions, but are found to be not cost-effective at the time of rule adoption. While the District's current regulations are some of the most stringent regulations in the nation and have achieved significant emissions reductions, NOx emissions in the Valley must be reduced by an additional 90% in order to attain the latest federal ozone and PM2.5 standards that now encroach on natural background levels, and direct PM2.5 emissions reductions must also be achieved. Therefore, reductions that go beyond these stringent requirements are needed, and the California Air Resources Board is addressing that need by designing an incentive program that can be used to generate additional reductions at stationary sources of pollution. This measure is to work with the Steering Committee to identify stationary sources of concern, and discuss using CARB's guidance and associated funding to find opportunities to reduce emissions.

Implementing Agency: SJVAPCD, CARB

Type of Action: Incentive, Outreach

Implementation: 2020-2024

Description of Proposed Actions: This strategy would explore potential incentives for stationary sources within the South Central Fresno community to install advanced control technology, beyond existing requirements, including applicable BACT and BARCT requirements that would not otherwise be economically feasible to install. The state is currently developing funding guidance for such projects. The District will work with interested parties, including the Steering Committee, to identify types of facilities and controls not otherwise identified in the CERP and will work with partners to implement these advanced controls. The District will also identify available grant funding to assist implementation (including incentives made available by CARB for such purposes), and will work with the Committee to determine the number and types of projects to be funded, and will quantify emissions reductions as reduction opportunities are finalized.

IS.7: REGULATORY ACTIONS: EVALUATION OF BARCT REQUIREMENTS FOR RULES THAT APPLY TO CAP AND TRADE FACILITIES

Overview: The goal of this strategy is to evaluate the District's existing regulations to determine if they meet state requirements for Best Available Retrofit Control Technologies (BARCT), for all rules subject to the state's greenhouse gas Cap and Trade program, on the expedited schedule approved by the Board in December 2018.

This evaluation process, as further detailed later in this chapter in the section titled, "Additional Regulatory Measures to Reduce Emissions in the Community," seeks to achieve reductions in the community of VOC, NOx and PM2.5 emissions from stationary source operations through the installation of advanced controls that meet the state's BARCT requirements.

Implementing Agency: SJVAPCD

Type of Action: Regulatory

Implementation: 2020-2024

Description of Proposed Actions: The District will examine the following rules to determine if they meet state BARCT requirements, following the "BARCT Determination Schedule" detailed below. All rules that are found to require modification to achieve BARCT requirements will be modified following the schedule labeled "BARCT Rulemaking Schedule" detailed below, as adopted by the District's Governing Board in December 2018:

Rule	Title	BARCT Determination Status	BARCT Determination Schedule	BARCT Rulemaking Schedule (if necessary)
4454	Refinery Process Unit Turnaround	Scheduled	2019	2020
4641	Cutback, Slow Cure, And Emulsified Asphalt, Paving And Maintenance Operations	Scheduled	2019	2020
4104	Reduction of Animal Matter	Scheduled	2019	2020
4409	Components at Light Crude Oil Production Facilities, Natural Gas Production Facilities, and Natural Gas Processing Facilities	Scheduled	2019	2020
4455	Components at Petroleum Refineries, Gas Liquids Processing Facilities, and Chemical Plants	Scheduled	2019	2020
4702	Internal Combustion Engines (VOC only)	Scheduled (in conjunction with PM2.5 Plan commitment)	2020	2020
4623	Storage of Organic Liquids	Scheduled	2020	2021

4694	Wine Fermentation and Storage Tanks	Scheduled	2020	2021
4624	Transfer of Organic Liquid	Scheduled	2020	2021
4603	Surface Coating of Metal Parts and Products, Plastic Parts and Products, and Pleasure Crafts	Scheduled	2020	2021
4601	Architectural Coatings	Scheduled	2020	2021
4401	Steam-Enhanced Crude Oil Production Wells	Scheduled	2021	2022
4566	Organic Material Composting Operations	Scheduled	2021	2022
4625	Wastewater Separators	Scheduled	2021	2022
4621	Gasoline Transfer Into Stationary Storage Containers, Delivery Vessels, and Bulk Plant	Scheduled	2021	2022
4402	Crude Oil Production Sumps	Scheduled	2021	2022

Further information on the District's expedited BARCT schedule and rule analyses can be found in the staff report presented to the District Governing Board in December, 2018:
http://www.valleyair.org/Board_meetings/GB/agenda_minutes/Agenda/2018/December/final/13.pdf

IS.8: REGULATORY ACTIONS: EVALUATION OF RULES TO DETERMINE WHETHER ADDITIONAL REDUCTIONS ARE POSSIBLE FOR SOURCES OF NOx and PM2.5

Overview: In addition to the BARCT implementation schedule above, the District will be analyzing and amending eight District rules to pursue additional emission reduction opportunities beyond BARCT. These rule amendments will be reviewed on the schedule included in the District's 2018 PM2.5 Plan recently adopted by CARB into the State Implementation Plan.

Emissions reductions achieved through the implementation of more stringent limits potentially required through these rule amendments will further contribute to reduced exposure to air pollution in the community. Community Steering Committee members, members of the AB 617-selected community, and the general public are encouraged to be involved in the upcoming rulemaking process for these rules.

Implementing Agency: SJVAPCD

Type of Action: Regulatory

Implementation: 2019-2021

Description of Proposed Actions: The District will be analyzing and amending eight District rules to pursue additional emission reduction opportunities beyond BARCT following the "Rulemaking Schedule" detailed below:

Rule	Title	BARCT Status	Rulemaking Schedule
4901	Wood Burning Fireplaces and Wood Burning Heaters	No units subject to AB 617 BARCT analysis. Rule amended in June, 2019.	2019 (Completed)
4311	Flares	Rule meets or exceeds BARCT	2020
4306 and 4320	Boilers, Steam Generators, and Process Heaters - Phase 3 and Advanced Emission Reduction Options for Boilers, Steam Generators, and Process Heaters Greater than 5.0 MMBtu/hr	Rule meets or exceeds BARCT	2020
4702	Internal Combustion Engines	Rule meets or exceeds BARCT for NOx, updated AB 617 BARCT determination scheduled for VOCs	2020
4692	Commercial Charbroiling	No units subject to AB 617 BARCT analysis	2020
4352	Solid Fuel-Fired Boilers, Steam Generators and Process Heaters	No units subject to AB 617 BARCT analysis	2021
4354	Glass Melting Furnaces	Rule meets or exceeds BARCT	2021

IS.9: REGULATORY ACTIONS: EXPEDITED FACILITY RISK ASSESSMENT AND RISK REDUCTION UNDER DISTRICT IMPLEMENTATION OF THE AIR TOXICS HOT SPOTS INFORMATION AND ASSESSMENT ACT (AB 2588)

Overview: This strategy will expedite the review of stationary sources of pollution in the community that are currently being reassessed under the Air Toxics "Hot Spots" Information and Assessment Act (AB 2588), which requires facilities that emit toxic air contaminants to report the types and quantities of toxic substances their facilities routinely release into the air. While all facilities under permit with the District are already undergoing this review process, the District will expedite its review of facilities within the AB 617 Community. The goals of the District Air Toxics "Hot Spots" program are:

- to identify Valley facilities that release toxic air contaminants as a result of their day to day operations,
- to collect and quantify emission data from equipment located at permitted facilities,
- to identify facilities causing localized health impacts on nearby residents,

- to determine facility-wide health risks resulting from the emission of toxic air contaminants,
- to notify nearby residents and businesses of significant risk facilities in their vicinity, and
- to require that significant risk facilities reduce their risks to a level that no longer constitutes a significant risk

The District's implementation of AB 2588, California's Air Toxics "Hot Spots" Information and Assessment Act, has resulted in major reductions in emissions of air toxics from existing sources in the San Joaquin Valley. Under this right-to-know law, the District has worked with Valley facilities to quantify emissions of air toxics, determine the health risk caused by those emissions, report emissions and any significant risks through written public reports and neighborhood public meetings, and take steps to reduce such risks.

More information about this effort can be found later in this chapter, in the section called, "Additional Regulatory Measures to Reduce Emissions in the Community."

Implementing Agency: SJVAPCD

Type of Action: Regulatory

Implementation: 2019-2021

Description of Proposed Actions: The District has put into effect a plan to expedite the AB 2588 reassessments for facilities located within the AB617 community of South Central Fresno.

Please refer to Appendix E for further details about the District's Health Risk Assessment Process, and a table identifying the AB 2588 reassessment status of each facility within the community as of September 1, 2019. The District intends to complete this reassessment of facilities within the community by 2021.

EMISSIONS EXPOSURE AND LAND USE

LAND USE IN THE COMMUNITY

Land use is the characterization of land based on what can be built on it and what the land can be used for. It is important to note that local air districts do not have authority over land use. Land use decisions are directly under the authority of Land use Agencies. The design of development projects in a community significantly influences how people travel. Land use agencies (e.g. City and County government agencies) have jurisdiction over land use, and as such develop land use plans and make decisions about how they grow and expand. Land use agencies typically have principal responsibility for approving development projects within their jurisdictions for a variety of land use types such as residential (single or multi-family, etc.), commercial (fast food, shopping center, retail, etc.), and industrial (warehouse distribution centers, glass manufacturing, etc.). Through the land use approval process, these agencies are responsible for implementing land use strategies that promotes increased walkability, commute alternatives and cleaner transit fleets resulting in air quality benefits within a community.

Land use strategies may result in reduction of number of trips by designing development to be more suitable for walking, bicycling, and transit. These land use strategies are typically outlined as measures and goals within a City or County general plan, which is the primary “long range” planning document used to locate future development and provides the framework within which decisions on how to grow, provide public services and facilities, and protect and enhance the environment are made. For information about the City of Fresno General Plan, please refer to Chapter 3, Understanding the Community. Land use agencies’ decisions are critical in contributing to the improvement in air quality within a community and should be geared towards promoting strategies aimed at reducing VMT by increasing community walkability, implementing commute alternatives and cleaner transit fleets.

The District takes an advisory role working with cities and counties and engages them to use their land use and transportation planning authority to help achieve air quality goals by incorporating as many air quality policies and measures as possible into their general plans, community plans, and specific plans, and to ensure that development occurs in ways that minimize air quality impacts.

COMMUNITY CONCERNS AND COMMENTS

A primary concern expressed by Steering Committee members during meeting discussions was that planned industrial development, specifically distribution centers planned for under the City of Fresno South Industrial Priority Area Specific Plan, will result in increased exposure to emissions for residents that live near heavy duty trucking corridors and major thoroughfares in the community. To address community member concerns, measures included in this section will focus both on strategies to reduce conflicting land uses in the community, as well as transportation strategies that reduce exposure to mobile source emissions resulting from land use decisions.

For example, a suggestion was to ascertain new truck routes in order to avoid traveling near schools or through the community. Another example is to support the development of charging infrastructure and installing new centralized fueling stations (electric, CNG, clean diesel) for heavy-duty trucks within the industrial areas. Other suggestions included providing low income housing to reduce the need to travel far for work within the community, by providing funds to include sidewalks and bike lanes, co-funding ride-sharing, increasing multi-modal transportation in the community, and strategizing land use planning to minimize or reduce vehicle miles traveled.

As the majority of these suggestions relate to land use issues for which the District does not have land use authority, the District's approach is to provide support to develop fueling infrastructure for zero and near-zero-emission vehicles, provide incentives for alternative modes of transportation, and support the land use planning process through the California Environmental Quality Act (CEQA). The District is supportive of measures and policies the land use agency can implement toward making the communities more transit-, bicycle-, and pedestrian-friendly, avoid land use conflicts that lead to toxics and nuisance problems, and minimizing the need to and/or mitigate air quality impacts of individual development proposals. In addition, the District has long-standing experience working with the City of Fresno and is already working with the City through providing suggestions and identifying opportunities for minimizing or reducing air quality impacts from proposed projects through the CEQA commenting process. The District plans to further develop its partnership with the City of Fresno and help City's Planning staff better understand air quality impacts of project proposals and identifying potential measures resulting in air quality benefits in the San Joaquin Valley.

CURRENT CONTROL PROGRAMS

The District has implemented the following rules and programs to reduce emissions from mobile sources and to encourage implementation of measures promoting alternative mode of transportation and increasing walkability within the community.

- District Rule 9410 "Employer Based Trip Reduction" requires large employers to implement measures to encourage employees to take alternative transportation to work through the establishment of an Employer Trip Reduction Implementation Plan (eTRIP). An eTRIP is a set of measures that encourages employees to use alternative transportation and ridesharing for their morning and evening commutes. Each measure contributes to a workplace where it is easier for employees to choose to use ridesharing or alternative transportation. Through this rule, single-occupancy vehicle trips are reduced, thus reducing emissions of oxides of nitrogen (NOx), volatile organic compounds (VOC) and particulate matter (PM).

- District Rule 9510 "Indirect Source Review" (ISR) accounts for mobile source emissions from construction and new development projects and ensures that emissions from these activities are mitigated through on site activities or through payment of mitigation fees. The ISR rule reduces NOx and PM10 emissions from mobile and area sources associated with construction and operation of new

development projects in the Valley. The ISR rule applies to developers of new residential, commercial and industrial projects and to transportation and transit projects whose emissions will exceed certain thresholds contained in the rule. The ISR rule encourages clean air designs to be incorporated into the development project, or, if insufficient emissions reductions can be achieved through clean air project design features, by paying a fee that will be used to fund off-site emissions reduction projects.

- The District provides incentives up to $50,000 per project for electric vehicle charging infrastructure through the Charge Up Program. http://valleyair.org/grants/chargeup.htm.

- The District is developing new program for Heavy-Duty Alternative Fuel Infrastructure which will provide local businesses and agencies incentive funding to install alternative fueling infrastructure (electric, natural gas, hydrogen, etc.) to support the increased deployment of heavy-duty advanced clean technology vehicles.

- The District serves as a Commenting Agency under CEQA in providing technical expertise in characterizing project related impacts on air quality when reviewing projects of various land uses (i.e., residential, commercial, and industrial). CEQA is a state statute that requires state and local agencies to identify the significant environmental impacts of their discretionary decisions and to require the avoidance or mitigation of those impacts, if feasible. Typically, the Lead Agency, such as the local city or county, will submit to the District a request for air quality related comments for a specific project. The District then assesses the project's potential impact on air quality and prepares a letter (commenting letter) that identifies the project, its impact on air quality, recommended feasible mitigation measures to be incorporated, and District rules and regulations that may apply. The commenting letter is then provided to the Lead Agency.

STRATEGIES DEVELOPED FOR IMPLEMENTATION IN THE COMMUNITY

Several strategies have been identified under this Land Use and Transportation section that span from advocating issues, providing incentives, collaborating with the local land use agency, i.e. City and County, to providing input through the land use process. Land use and transportation strategies developed to reduce emissions due to conflicting land uses are further detailed below.

The following are proposed measures that are within the Air District's statutory jurisdiction to implement:

LU.1: SUPPORT PROJECTS THAT REDUCE VEHICLE MILES TRAVELED

Overview: The purpose of this strategy is to reduce vehicle miles traveled (VMT) in the community through measures that promote active transport and increase the walkability of community neighborhoods.

Mobile source emissions make up over 85% of the Valley's NOx emissions, the primary driver in the formation of ozone and particulate matter pollution, and therefore reductions in mobile source emissions have become an ever-increasingly critical part of the Valley's attainment strategy of federal air quality standards.

It is important to note that mobile source "tailpipe" emissions are within the responsibility and jurisdiction of the California Air Resources Board, and local air districts do not have the authority to adopt and implement regulations requiring ultra-low tailpipe emissions standards on mobile sources. The State and the federal government, unlike the District, have the authority to directly regulate tailpipe emissions from mobile sources. New state and federal regulations coupled with a robust incentive-based emission reduction strategy are necessary to reduce emission reductions and community residents' exposure to air pollutants. The California Air Resources Board has adopted tough regulations for heavy-duty trucks, off-road equipment, and other mobile sources.

In the meantime, the District has been innovative in creating rules to reduce air quality impacts from these sources. In particular, the District has adopted regulations such as the Indirect Source Review and Employer based Trip Reduction rules to reduce emissions from mobile sources within the District's limited jurisdiction over these sources.

The District Rule 9510 "Indirect Source Review" (ISR) is the only rule of its kind in the State of California and throughout the nation, which applies to new development projects. The Districts rule is recognized as a benchmark, or best available control, for regulating indirect source emissions with the purpose of reducing the growth in emissions from mobile and area sources associated with construction and operation of new development project in the Valley. The District encourages emissions to be reduced through project design elements resulting in air quality benefits.

The District Rule 9410 "Employer Based Trip Reduction" requires larger employers to establish trip reduction programs. These programs are designed to encourage employees to reduce single-occupancy vehicle trips, thus reducing emissions associated with work commutes.

Land use decisions are critical in contributing to the improvement in air quality within a community and should be geared towards promoting strategies aimed at reducing VMT by increasing community walkability, implementing commute alternatives and cleaner transit fleets. Examples of such measures are listed below:

- Bicycle infrastructure
- Infrastructure to support alternative modes of transportation (electrical vehicles, near-zero emissions vehicles, etc.)
- Satellite offices/telecommuting centers to reduce the length of employee commute trips or eliminate such trip

- Implement measures promoting the use of fuels that are less polluting than gasoline or diesel, for example:
  - Replacing diesel fleet with alternative fuel engine technology and infrastructure
  - Retrofitting existing equipment to reduce emissions using methods such as particulate filters, oxidation catalysts, or other approved technologies
  - Repowering/Retrofitting heavy-duty diesel fleet with cleaner diesel engine technology and/or diesel particulate filter after-treatment technology
  - Replacing diesel fleet vehicles with cleaner fueled low emission vehicles (i.e. school buses, buses, on- and off- road heavy duty vehicles, lighter duty trucks and passenger vehicles).

Implementing Agency: SJVAPCD

Type of Action: Partnership

Implementation: 2019-2024

Description of Proposed Actions: Provide District support for projects that reduce VMT, including advocacy for competitive project proposals and potential match funding support to eligible projects, as appropriate, through existing District programs (i.e. bicycle path infrastructure, electric vehicle charging infrastructure, vanpooling and ridesharing). Under this strategy, the District is proposing to partner with City of Fresno to identify opportunities, such as District CEQA commenting process, District's guidelines for general plans, District's published Air Quality Mitigation Strategies, committee/public participation in city planning and General Plan development efforts, etc., to expand understanding of air quality impacts of proposals and potential air quality benefits of alternatives.

LU.2: PROVIDE ASSISTANCE DURING THE CALIFORNIA ENVIRONMENTAL QUALITY ACT PROCESS

Overview: The purpose of this strategy is to provide assistance during the California Environmental Quality Act (CEQA) process with guidance to land use agencies, project proponents, and the public on how the project may impact air quality in the San Joaquin Valley, and information on how air pollution impacts can be reduced.

CEQA is a state statute that requires public agencies such as state and local agencies to identify the significant potential environmental impacts of a proposed project and to avoid or mitigate such impacts, if feasible. A public agency must comply with CEQA when it undertakes an activity defined by CEQA as a "project". A project is an activity undertaken by a public agency or a private activity which must receive some discretionary approval (meaning that the agency has the authority to deny the requested permit or approval) from a government agency which may cause either a direct physical change in the environment or a reasonably foreseeable indirect change in the environment.

Land use decisions are critical to improving air quality within the San Joaquin Valley Air Basin because land use patterns greatly influence transportation needs while motor vehicle emissions are the largest source of air pollution in the San Joaquin Valley. It is important to note that local air districts do not have authority over land use. Land use decisions are directly under the authority of Land use Agencies. The design of development projects in a community significantly influences how people travel. Land use agencies (e.g. City and County government agencies) have jurisdiction over land use, and as such develop land use plans and make decisions about how they grow and expand. Even though the District does not have land use authority, however, as a public agency the District takes an active role in the intergovernmental review process under CEQA. Providing District assistance during the CEQA process allows land use agencies and project proponents to enhance project design by identifying feasible mitigation measures in the early stages of the planning process for a better overall project with minimized impact on air quality.

In carrying out its duties under CEQA, the District may act as a Lead Agency, a Responsible Agency, or a Trustee/"Commenting" Agency. The role the District under CEQA is dependent upon the extent of the District's discretionary approval power over the project. The District is typically not the Lead Agency for proposed new projects because project approval is generally required by other public agencies with broader authority, such as land use agencies. A Lead Agency is the public agency with the broadest authority for approving or carrying out the project and therefore has the principal responsibility for carrying out or approving a project subject to CEQA. Lead Agencies are responsible for complying with CEQA by ensuring that all potential environmental impacts of proposed projects are adequately assessed, and environmental damage is avoided or minimized where feasible.

The District is more often a Responsible Agency or a "Trustee Agency" (more commonly known as a "Commenting Agency"). A Responsible Agency is a public agency, other than the Lead Agency, that has responsibility for carrying out or approving a project subject to CEQA. While a Lead Agency must consider all of the potential impacts of a project, a Responsible Agency may only consider those aspects that are within the agency's area of expertise or which are required to be carried out or approved by the agency. A "Commenting Agency", is an agency that has "jurisdiction by law" over a particular natural resource but does not have discretionary approval power over the project. In this role, the District is advising Land use Agencies and provides technical expertise in characterizing project related impacts on air quality when reviewing projects of various land uses (i.e., residential, commercial, and industrial). In addition to reviewing a project's impact on air quality, the District may review and comment on other sections of the environmental document that relate to air quality impacts, for example traffic and health risks. As such, when serving as a Commenting Agency, the District may provide the Lead Agency with comments on the adequacy of the air quality analysis, identify District rules, which apply to the project, and recommend potential mitigation measures for the Lead Agency's consideration.

The air quality considerations that warrant particular attention during early consultation between Lead Agencies and project proponents include consistency with applicable District rules and permit requirements, and incorporation of all feasible measures to reduce a project's impact on air quality. Addressing issues in relation to land use and project design while a proposed project is still in the planning stages provides project proponents opportunities to incorporate project design features to minimize the impact on air quality.

Implementing Agency: SJVAPCD, City, County

Type of Action: Land use, Partnership

Implementation: 2019

Description of Proposed Actions: The District will work with the City and County on active CEQA coordination with the land use agencies and project proponents for proposed projects within the South Fresno Community. This strategy will result in enhancing project designs in the early stages of the planning process for a better overall project with minimized impact on air quality and early identification of feasible mitigation measures.

City of Fresno has committed to include the Air District in the City's pre-application process, which may include written comments and/or attendance at Development Review Committee (DRC) meetings for projects that will result in construction within the AB 617 area. Under this partnership, this process will offer an opportunity to the District to discuss the proposed project with the applicant(s) including (if project description has sufficient detail) potential impacts on air quality, on-site clean-air project design elements, and feasible mitigation measures in advance of final decision making and prior to formal application acceptance.

LU.3: PROVIDE EDUCATION AND OUTREACH ON AVAILABLE TOOLS FOR PUBLIC INFORMATION REGARDING LAND USE PROJECTS

Overview: The purpose of this strategy is to increase awareness about publically available tools and documents through the City of Fresno's website, and to train community members on how to access and use these tools. FAASTER, for example, is a tool developed by the City of Fresno to provide valuable information about public works project and planning decisions throughout the city including within the South Central Fresno community, and can be found here: https://lmsaca.fresno.gov/CitizenAccess/.

For land use, FAASTER can provide any public member information on entitlement applications regarding project status, overview and location. Any interested person can search by applicant, project name, parcel number or address to see what is happening in a certain location, and receive notifications as the project review process develops.

Implementing Agency: SJVAPCD, City of Fresno

Type of Action: Land use, Partnership

Implementation: 2019

Description of Proposed Actions: The District will work with the City to hold a public workshop in the South Central Fresno community to inform the public of the available tools, including FAASTER, and train community members on how to access and use these tools.

The District will continue to look for other opportunities for measures to include in the final CERP to work with the City of Fresno to address community concerns about providing additional transparency to permitting and CEQA processes, including ensuring required air quality mitigation occurs.

LU.4: COLLABORATING TO ENHANCE COMMUNITY PARTICIPATION IN LAND USE PROCESSES

Overview: While the District and the City of Fresno have committed to extensive inter-agency cooperation and action in this South Central Fresno Community Emission Reduction Program, additional opportunities may present themselves in future discussions involving the Community Steering Committee, the public, the City, the County, and the District, especially as implementation of the CERP progresses.

This measure is the District's commitment to continue to assist in facilitating discussions between the community and land-use agencies in the area to identify additional opportunities to address community concerns regarding land-use and air quality.

Implementing Entities: District, City of Fresno, Fresno County

Type of Action: Partnership

Implementation: 2019

Description of Proposed Actions: The District will assist in facilitating further discussions with the community and land use agencies (City/County) to identify additional opportunities to address community concerns and questions regarding land-use and air quality. Some areas of future discussion may include, but are not limited to:

- Ensuring more comprehensive opportunities for public input on land-use decisions
- Providing additional public access and education regarding permitting and CEQA processes
- Better communicating and understanding air quality impacts and potential mitigation
- Work together to identify and seek additional air quality improvement funding

SOLAR DEPLOYMENT IN THE COMMUNITY

BACKGROUND

The State of California has aggressively pursued renewable energy. It is the policy of the state that renewable energy resources and zero-carbon resources supply 100% of retail sales of electricity to California end-use customers by December 31, 2045. The State has also directed state agencies to undertake various studies to identify and assess:

- Barriers to, and opportunities for, solar photovoltaic energy generation.
- Barriers to, and opportunities for, access to other renewable energy by low-income customers.
- Barriers to contracting opportunities for local small businesses in disadvantaged communities.

As an outcome of the state's aggressive renewable and zero-carbon electricity requirements and the state's desire to make renewable power more accessible to low-income and disadvantaged communities a number of programs have been developed to make solar photovoltaic systems more accessible in South Central Fresno.

COMMUNITY CONCERNS AND COMMENTS

The South Central Fresno Steering Committee has identified residential solar photovoltaic installation as a strategy to reduce emissions and reduce the cost of energy in the community.

STRATEGIES DEVELOPED FOR IMPLEMENTATION IN COMMUNITY

Based on community interest in residential solar PV systems, the District will be partnering with other entities with solar funding programs to assist the community in accessing those programs. As further detailed below, these programs include the following:

- DAC-Single Family Solar Homes (DAC-SASH) program
- Solar on Multifamily Affordable Housing (SOMAH) program
- DAC-Green Tariff (DAC-GT) program
- Community Solar Green Tariff (CSGT) program

The following is a suggested measure not within the Air District's jurisdiction to directly implement:

SD.1: INCENTIVE PROGRAM FOR INSTALLING SOLAR IN THE COMMUNITY

Overview: The goal of this strategy is to increase the amount of solar photovoltaic (PV) systems installed in the community by connecting community members with programs that provide financial incentives for the installation of solar photovoltaic (PV) systems. A variety of programs are available to provide incentives for the installation of PV systems or for preferred rates for green energy in the community.

Jurisdictional Issues: It should be noted that oversight of energy usage, including implementation of community energy efficiency programs, is the jurisdiction of the California Public Utilities Commission, the public utilities, cities, and counties. AB 617 does not provide the District with new regulatory authority over energy programs, as discussed in CARB's Blueprint (see "Who Has the Authority to Implement Actions?", page 26 of the Blueprint). However, the District will make available to the responsible agencies the below strategy, as suggested by the Committee for potential inclusion into the CERP, for input and response in the South Central Fresno Community Emissions Reduction Program.

Implementing Entities: California Public Utilities Commission, Pacific Gas and Electric Company, GRID Alternatives, SOMAH Nonprofit Administrative Partnership (SNAP)

Type of Action: Partnership

Implementation: 2019-2024

Description of Proposed Actions: The District will help to coordinate meetings with entities that offer incentives for solar photovoltaic (PV) installation and other green energy programs that have the potential to reduce utility rates in the community. The following is a summary of programs that can benefit the community:

DAC-Single Family Solar Homes (DAC-SASH) program provides assistance in the form of up-front financial incentives for the installation of rooftop solar generating systems for income-qualified owners of single family homes in disadvantaged communities. The program is administered by GRID Alternatives and has an annual budget of $10 million from 2019 through 2030.

Solar on Multifamily Affordable Housing (SOMAH) program provides financial incentives for installing solar photovoltaic (PV) energy systems on multifamily affordable housing in disadvantaged communities (DAC). The program has $100 million annually and has a goal of installing 300 megawatts of generating capacity by 2030. The program is administered by the SOMAH Nonprofit Administrative Partnership (SNAP).

DAC-Green Tariff (DAC-GT) program procures 100 percent renewable energy on behalf of customers while providing them a 20 percent discount on their otherwise applicable utility rate. The 20 percent discount can be applied as a discount to CARE rates. The DAC-GT program will begin in 2020 and will be run through the utility company (Pacific Gas and Electric).

Community Solar Green Tariff (CSGT) is similar to the DAC-GT program in that it procures 100 percent renewable energy on behalf of the customers while providing a 20 percent rate reductions. However, under this program the projects providing the solar energy must be sited within a top 25 percent DAC and the subscribers must reside within a top 25 percent DAC and live within 5 miles of

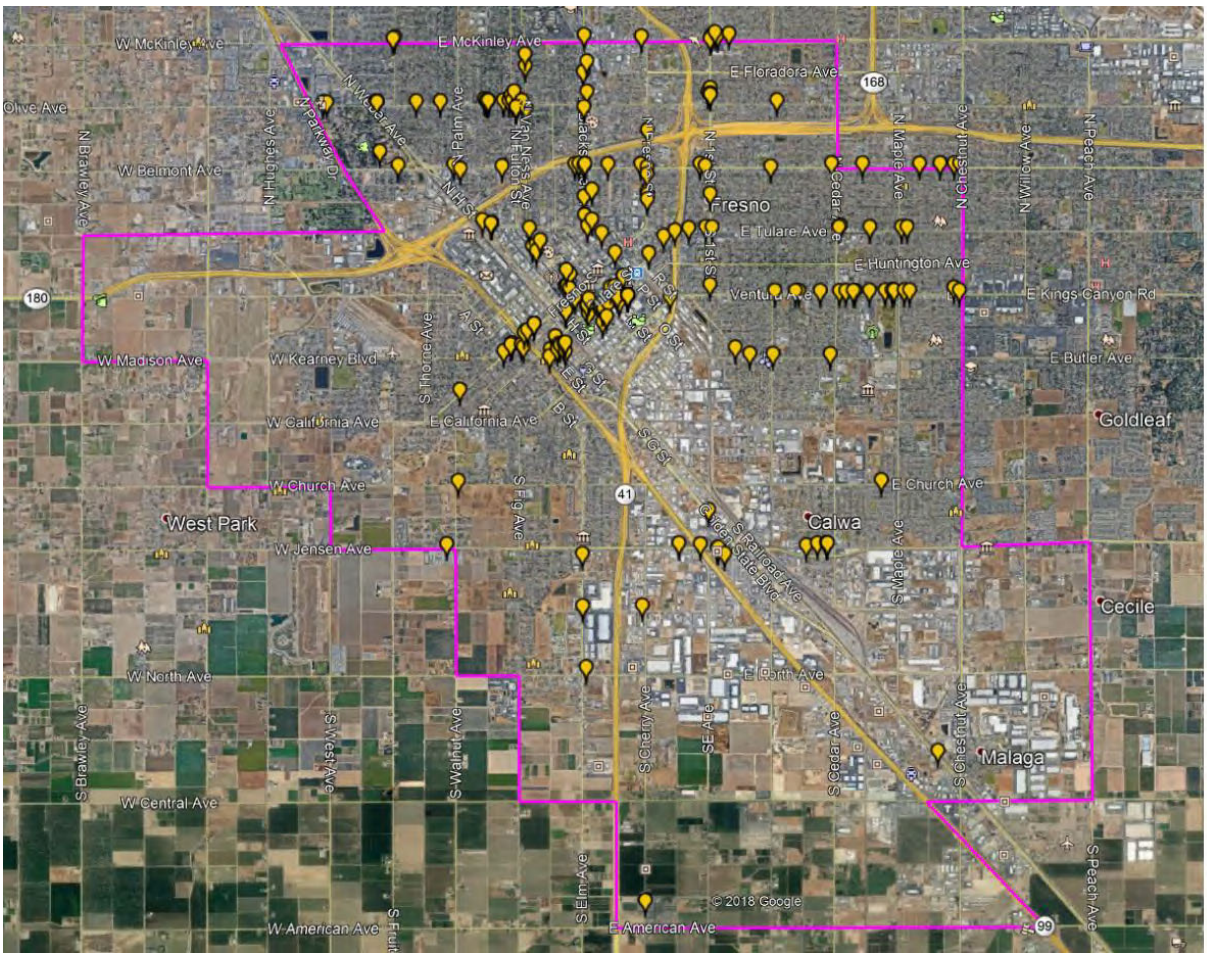
the solar project. The program is approved to serve up to 41 megawatts of power and serve 6,800 customers. In order to enroll in the program communities must contact their utility (Pacific Gas and Electric).

COMMERCIAL COOKING

COMMERCIAL COOKING OPERATIONS IN FRESNO

Commercial cooking represents emissions from the various methods of cooking at restaurants. This includes charbroiling, deep-fat frying, and other cooking such as clamshell or flat griddles. The emissions are from the cooking process exclusively, such as from fat drippings hitting hot radiant surfaces in a charbroiler, and excludes emissions from the heat sources. The locations of restaurants in the South Central Fresno community are shown in the figure below.

Figure 4-3: Commercial Cooking Operations in South Central Fresno Community



In the Valley, the primary pollutant of concern from commercial cooking is PM2.5, but there are also emissions of VOCs and toxics. In this category, 76% of the PM2.5 comes from charbroiling, which is divided between chain-driven charbroilers and underfired charbroilers. Between these two categories, underfired charbroiling represents 89% of PM2.5 emitted.

Commercial cooking emissions that originate in the community of Fresno include 11 tons per year of VOCs, and 70 tons per year of PM2.5. The commercial cooking category represents 31% of the total PM2.5 emitted in the community, 6% of the formaldehyde, and 2% of the cadmium.

COMMUNITY CONCERNS AND COMMENTS

Although few members indicated this as a priority category, commenters from the Community Steering Committee were concerned that incentives would be insufficient for this category and called for a strong regulatory approach. In combination with the regulatory requirements, further discussed below, that will be developed through a public process as a part of the 2018 PM2.5 Plan implementation, the District included a targeted incentive and outreach program for implementation in the community due to the large percentage of emissions that commercial cooking represent in the community, and the high risk of local exposure to carcinogenic air toxics (including heterocyclic amines and polycyclic aromatic hydrocarbons) from charbroiling operations.

CURRENT CONTROL PROGRAMS

In 2002, the District adopted Rule 4692 (Commercial Charbroiling) requiring emission controls on the most used chain-driven charbroilers in the valley, reducing emissions from those devices 84%. In 2009, the District amended the rule requiring controls on additional chain-driven charbroilers further reducing those emissions by 25%. These stringent controls have reduced the impact of chain-driven charbroilers to only 11% of commercial charbroiling emissions.

The remaining 89% of commercial charbroiling emissions are from underfired charbroilers. The dilution of emissions from these types of charbroilers resulting from the hood and ventilation systems make the types of controls that work for chain-driven units inappropriate for underfired units. To identify potential technologies that could work, and demonstrate them in actual Valley restaurants the District has developed the Restaurant Charbroiler Technology Partnership. Information learned from this program, as well as information from other installations of control equipment throughout the state and country was considered in the District's *2018 Plan for the 1997, 2006, and 2012 PM2.5 Standards*. That analysis led to a commitment to amend Rule 4692 to achieve additional emission reductions from commercial underfired charbroilers. In addition to the regulatory commitment, the District committed to expanding its incentive program fund the installation of controls for commercial underfired charbroilers within urban boundaries in hot-spot areas of Fresno, Kern, and Madera counties, with a future year regulatory requirements to encourage participation by Valley businesses.

STRATEGY DEVELOPED FOR IMPLEMENTATION IN COMMUNITY

A combination of incentive funding, with enhanced outreach, combined with a future regulatory requirement will seek to install emissions control equipment to reduce PM2.5 emissions from restaurants using underfired charbroilers.

The following is a proposed measure that is within the Air District's statutory jurisdiction to implement:

CC.1: INCENTIVE PROGRAM FOR INSTALLING ADVANCED EMISSIONS CONTROL EQUIPMENT ON UNDERFIRED CHARBROILERS

Overview: The goal of this strategy is reduce PM2.5 emissions from underfired charbroilers. The District has been very successful in reducing emissions from commercial charbroiling by requiring controls on chain-driven charbroilers. Unfortunately, the same types of controls won't work for underfired units, and other more expensive technologies must be employed to achieve similar results. These new technologies have not been widely achieved in practice, and many remaining questions regarding their technological feasibility must still be addressed. The District's Restaurant Charbroiler Technology Partnership program has had some success installing equipment to reduce PM2.5 emissions from underfired charbroilers, and helped identify some technologies that are very promising to address this source category.

Implementing Agency: SJVAPCD

Type of Action: Incentives (with regulatory backstop)

Implementation: 2020-2024

Description of Proposed Actions: This strategy would provide $150,000 in incentive funding per restaurant for the installation of control equipment to reduce particulate emission from underfired charbroilers, and to provide enhanced outreach and education to local restaurants regarding health impacts and availability of funding for installation of controls. Proposed funding amount of $1,200,000 would cover up to 100% of the cost of installing emissions control equipment. Emission reductions will be calculated at a later time.

DUST IN THE COMMUNITY

BACKGROUND

In the South Central Fresno community, there are 546 miles of roads, including 60 freeway miles, 207 arterial roads, and 279 local roads. Source of emissions from roads include deposits of vehicle exhausts and industrial exhausts, particles from tire and brake wear, dust from paved roads or potholes, and dust from construction, open areas, and other earthmoving activities.

Paved road dust emissions in the community total 34.16 tons per year, or 21% of the total PM2.5 emissions in the community. Construction, demolition and other earthmoving activities emit 12 tons per year of PM2.5, or 7.5% of the total PM2.5 inventory in the community. Unpaved road dust and dust from open areas also have minor PM2.5 emissions in the area, totaling approximately 1% of the community PM2.5 emissions inventory.

COMMUNITY CONCERNS AND COMMENTS

The Community Steering Committee expressed an interest in evaluating air quality impacts and feasibility of increasing frequency of street sweeping along freeways and streets. Community members also wanted to identify opportunities to reduce dust from paved and unpaved roads in the community through road paving improvements.

CURRENT CONTROL PROGRAMS

Regulation VIII (Fugitive PM10 Prohibition) / Dust Control Plan (DCP): The District's Regulation VIII series (Fugitive PM10 Prohibitions) was adopted in November 2001, and subsequently amended in 2004. This rule series contains a comprehensive suite of rules designed to reduce fugitive PM10 emissions from a range of sources including:

- Specified outdoor fugitive dust sources.
- Construction or demolition related disturbances of soil, including land clearing, grubbing, scraping, excavation, extraction, land leveling, grading, cut and fill operations, travel on the site, travel access roads to and from the site, and demolition activities.
- Outside storage and handling of any unpackaged material, which emits or has the potential to emit dust when stored or handled.
- Prevention and cleanup of mud and dirt whenever it is deposited (carryout and trackout) onto public paved roads
- Open areas 0.5 acres or more within urban areas, or 3.0 acres or more within rural areas that contain at least 1,000 square feet of disturbed surface area.
- Any paved, unpaved, or modified public or private road, street highway, freeway, alley way, access drive, access easement, or driveway.
- Unpaved vehicle/equipment areas, including parking, fueling, service, shipping, receiving, and transfer areas.
- "Off-field" agricultural sources including, but not limited to, unpaved roads, unpaved vehicle/equipment traffic areas, and bulk materials.

The Regulation VIII rules are implemented via the District's Dust Control Plan (DCP) program: https://www.valleyair.org/busind/comply/PM10/compliance_PM10.htm

STRATEGIES DEVELOPED FOR IMPLEMENTATION IN COMMUNITY

Due to the high priority that the Steering Committee placed on reducing dust in the community, specific measures have been developed to target emissions reductions from fugitive dust sources. The District is proposing increased enforcement of Regulation VIII rules to reduce fugitive dust from construction and earthmoving activities within the community. Additionally, the District will partner with other entities to identify opportunities to increase street sweeping efforts in the community and to increase road paving improvements in the community.

The following proposed measure is within the Air District's statutory jurisdiction to implement:

FD.1: ENHANCED ENFORCEMENT OF DISTRICT REGULATION VIII FUGITIVE DUST REQUIREMENTS

Overview: The goal of this strategy is to limit the potential for localized air quality impacts associated with fugitive dust from construction/earthmoving activities and open areas subject to District Regulation VIII.

District rules limit fugitive dust emissions from construction, demolition, and earthmoving; bulk material storage; open areas; and unpaved roads and vehicle/equipment traffic areas. Furthermore, District rules restrict carryout and trackout onto paved public roadways.

In order to facilitate enforcement of fugitive dust prohibitions, a Construction Notification or Dust Control Plan is required for all construction activities in the District involving one or more acre of disturbed surface area. District staff reviews each Construction Notification and Dust Control Plan prior to the start of construction, to ensure that operators have planned to utilize required work practices to mitigate fugitive dust emissions. Furthermore, District staff regularly surveys and inspects such sites, responds to all complaints regarding fugitive dust, and provides training classes for those wishing to submit Dust Control Plans.

In reviewing the compliance history for the South Central Fresno community, it was determined that the District had received 34 complaints regarding fugitive dust related issues, with the majority pertaining to construction/earthmoving activities and open areas. With a number of large projects in the area, the District felt it prudent to add an enforcement strategy to the CERP to ensure continued compliance with fugitive dust regulation in the South Central Fresno community.

Implementing Agency: SJVAPCD

Type of Action: Enforcement

Implementation: 2020

Description of Proposed Actions: Building on the District's existing surveillance and complaint response efforts, the District will conduct at least one targeted enforcement effort within the South Central Fresno community during both the 2nd and 3rd quarters for the next five (5) years.

The following suggested measures are not within the Air District's jurisdiction to directly implement:

FD.2: STREET SWEEPING

Overview: The goal of this strategy is to identify opportunities to reduce dust from paved and unpaved roads in the community through increased frequency of street sweeping.

The District currently regulates fugitive dust emissions from a range of sources with a series of rules known as Regulation VIII. Rule 8061 (Paved and Unpaved Roads) establishes standards for the construction of new and modified paved roads in accordance with published guidelines by the American Association of State Highway and Transportation Officials for road construction and applies to any paved, unpaved, or modified public or private road, street highway, freeway, alley way, access drive, access easement, or driveway. Rule 8061 also establishes thresholds that when exceeded require that roads are treated to reduce visible dust emissions. In addition, Rule 8061 has requirements for PM10 efficient street sweepers to be used at least once per month on streets with paved curbs which have been determined to have the greatest actual or potential for dirt or silt loadings.

In the City of Fresno, the street sweeping schedule is:

- Residential areas are swept once every month.
- Arterial streets are swept once per week and at night.
- Major streets are swept once per week during the evenings and weekends.
- Downtown is swept three times per week at nights and weekends.

Some areas within the community of South Central Fresno are not within Fresno city limits. These areas are maintained by the County of Fresno.

Jurisdictional Issues: It should be noted that the District has no authority over how agencies allow land under their jurisdiction to be used. These so-called "land-use" decisions, such as whether and how often to require street sweeping, are historically the responsibility, under state law, of cities and counties, or, in some cases, state and federal agencies responsible for transportation corridors, state and federal parks, and other properties. AB 617 does not provide the District with new land-use regulatory authority, so land-use authority remains with cities, counties, and state and federal land-use agencies, as discussed in CARB's Blueprint (see "Who Has the Authority to

Implement Actions?", page 26 of the Blueprint). However, the District has made available to the responsible agencies the various land-use strategies that have been presented by the Committee for potential inclusion into the CERP for responsible agency's input and response in the South Central Fresno Community Emissions Reduction Program.

Implementing Agency: Cities and Counties

Type of Action: Partnership

Implementation: 2020

Description of Proposed Actions: The District, through partnerships with other entities (including City of Fresno, Fresno County, and Fresno Council of Governments), will work to identify opportunities to identify street sweeping efforts in the community.

FD.3: ROAD PAVING IMPROVEMENTS

Overview: The goal of this strategy is to identify opportunities to reduce dust from paved and unpaved roads in the community through road paving improvements. The District currently regulates fugitive dust emissions from a range of sources with a series of rules known as Regulation VIII. Rule 8061 (Paved and Unpaved Roads) establishes standards for the construction of new and modified paved roads in accordance with published guidelines by the American Association of State Highway and Transportation Officials for road construction and applies to any paved, unpaved, or modified public or private road, street highway, freeway, alley way, access drive, access easement, or driveway. Rule 8061 also establishes thresholds that when exceeded require that roads are treated to reduce visible dust emissions.

Implementing Agency: Cities and Counties

Type of Action: Partnership

Implementation: Immediately upon identifying opportunities for agency coordination

Description of Proposed Actions: The District will partner with the City of Fresno and Fresno County to notify them as grant funding opportunities for road paving, road resurfacing, and sidewalk improvements become available. The District will provide support to the City and County in grant applications through letters of support and technical support, as requested.

LAWN AND GARDEN EQUIPMENT

LAWN AND GARDEN EQUIPMENT IN SOUTH CENTRAL FRESNO

Small off-road engines (SORE) which are typically utilized in gas powered lawn and garden equipment emit oil-based particulates, PM2.5, NOx, and a mixture of hydrocarbons, which combine with other gases to form ozone, carbon monoxide and other toxic air contaminants. This equipment can also cause a significant amount of fugitive dust and can increase fugitive emissions including PM, toxic air contaminants, and ultrafine particles resulting in negative health impacts for the user.

According to a 2003 study by the California Air Resources Board, there are over 11.4 million pieces of residential lawn and garden equipment operating throughout the state. In the South Central Fresno community the emissions from this sector total 12.03 tons per year (TPY) of NOx, 77.53 TPY of VOC and 1.58 TPY of PM2.5. These total emissions contribute 0.66% of the NOx inventory, 2.9% of the VOC inventory, and 0.69% of the PM2.5 inventory.

Figure 4-4: Electric yard equipment helps to reduce emissions near homes and places of business

COMMUNITY CONCERNS AND COMMENTS

Community Steering Committee comments regarding Lawn and Garden equipment included better outreach to inform community members of available incentives and increased incentives for the equipment as well as providing free electric lawn mowers for low income residents.

Additional comments included banning leaf blowers in commercial and residential applications as well as requiring all gas powered equipment to be registered and inspected. The District does not have the authority to regulate the use of leaf blowers or other lawn and garden equipment operating throughout the Valley.

CURRENT CONTROL PROGRAMS

CARB has a SORE program, which includes lawn and garden equipment. In 2020, CARB will consider new standards for small engines to help California meet its goal of reducing smog-forming pollutant emissions from mobile sources by 80 percent in 2031. https://ww2.arb.ca.gov/our-work/programs/small-off-road-engines-sore

In addition, the District offers incentives to help reduce emissions from gas-powered lawn and garden equipment. The Clean Green Yard Machines (CGYM) program provides funding for the following options:

- The residential CGYM provides rebates for the replacement of an old gas-powered mower with a new electric mower and for the purchase of eligible new electric lawn and garden electric equipment without replacements. To date, this program has replaced over 6,700 lawn mowers with over $1.5 million in funding. http://www.valleyair.org/grants/cgym.htm

- The Commercial CGYM launched in May 2019 and provides funding for the replacement of eligible old gas-powered lawn and garden equipment with battery-powered options for public agencies, private entities, and businesses. http://valleyair.org/grants/cgym-commercial.htm

STRATEGIES DEVELOPED FOR IMPLEMENTATION IN COMMUNITY

In order to achieve additional emission reductions from the Lawn and Garden category the District will provide enhanced outreach and access to South Central Fresno residents or businesses who would like to participate in our available incentive programs. For the residential program, the District proposes to cover the full cost of an electric lawn mower purchase when replacing an existing gas powered mower.

LG.1: INCENTIVE PROGRAM FOR THE REPLACEMENT OF RESIDENTIAL LAWN AND GARDEN EQUIPMENT

Overview: The goal of this strategy is to reduce NOx and PM2.5 emissions from residential lawn and garden equipment by replacing existing gas powered units with battery powered zero emission models. Utilizing electric lawn care equipment can provide residents with immediate economic, environmental, and health benefits. The District's Clean Green Yard Machines program provides incentive funding for the replacement of existing gas powered lawn mower with a new electric model. These incentives range from $100-250 depending on the cost of the new mower. In addition, the District offers incentives up to $50 for the purchase of a new electric lawn mower, edger, trimmer, chainsaw or polesaw without requiring an old piece of equipment to be turned in.

Implementing Agency: SJVAPCD

Type of Action: Incentives

Implementation: 2019-2024

Description of Proposed Actions: This strategy will provide South Central Fresno residents with increased incentives for the replacement of residential lawn care equipment utilizing existing District Board-approved criteria, with an increased incentive amount for residents within the community. This measure will increase outreach and

access to incentive funding while providing rebates up to 100% of the equipment cost of a new electric lawn mower when replacing an existing gas powered model. Residents who do not have an existing piece of equipment to retire would be eligible for incentives up to $50 for the purchase of a new piece of eligible equipment. The goal is to replace 570 gas powered units at an expected cost of $200,000. Estimated emissions reductions associated with this measure include 0.13 tons of PM2.5 and 0.2 tons of NOx.

LG.2: INCENTIVE PROGRAM FOR THE REPLACEMENT OF COMMERCIAL LAWN AND GARDEN EQUIPMENT

Overview: The goal of this strategy is to reduce NOx and PM2.5 emissions from commercial landscaping operations by replacing existing gas powered equipment with battery powered zero emission models. Advancing clean technology in the area of commercial lawn care can provide meaningful health benefits to San Joaquin Valley residents who are directly impacted and exposed on a daily basis to air pollution generated from lawn care equipment. Emissions from commercial lawn care providers occurs in the South Central Fresno community, directly impacted equipment operators and community residents. The District currently offers a commercial lawn and garden equipment replacement program and provides incentives for the replacement of gas powered equipment with battery operated zero emission technology. These incentives range from $200-$15,000 depending on the equipment type and cost of the new units. In addition, the program provides incentive funds for additional batteries and chargers to ensure that the equipment is capable of operating for a full day of work.

Implementing Agency: SJVAPCD

Type of Action: Incentives

Implementation: 2019-2024

Description of Proposed Actions: This strategy will provide commercial lawn care providers operating in South Central Fresno with enhanced outreach and access to available incentives offered by the District, utilizing Board-approved criteria. The goal of this measure is to replace 60 pieces of commercial grade gas powered lawn and garden equipment at an expected cost of $75,000. Emission reductions associated with this measure will be calculated at a later time.

PUBLIC FLEETS

PUBLIC FLEETS IN SOUTH CENTRAL FRESNO

Public agencies, including the City Fresno and Fresno County as well as transit organizations operate a variety of public fleet vehicles within South Central Fresno. These include a wide variety of light-duty vehicles used for municipal purposes including police vehicles, municipal work vehicles, city and county staff vehicles, etc. These vehicles are typically fueled by conventional gasoline or diesel engines. Emissions from this source category include oxides of nitrogen (NOx) and combustion PM from the internal combustion engines. Mobile sources account for more than 85% of the NOx inventory throughout the Valley.

Figure 4-5: Examples of public fleet vehicles

COMMUNITY CONCERNS AND COMMENTS

Community comments regarding this source category centered on monitoring vehicles for PM2.5 and VOC emissions, continuing to support existing programs, and random SMOG testing.

CURRENT CONTROL PROGRAMS

State and Federal requirements control emissions from passenger vehicles. The Valley Air District does not have jurisdiction over these sources. However, due to the large amount of air pollution that originates from passenger vehicles in the Valley, the District has implemented a suite of programs to reduce pollution from public fleets:

- The District operates the Public Benefit Grants Program. The purpose of this program is to fund the purchase of new electric, plug-in hybrid, or alternative fuel vehicles for public agencies to promote clean air alternative-fuel technologies and the use of low-or zero-emission vehicles in public fleets. This program is currently open and accepting applications on a first-come-first-served basis.
- Employer Based Trip Reduction (District Rule 9410) requires large employers to implement measures to encourage employees to take alternative transportation to work through the establishment of an Employer Trip Reduction Implementation Plan (eTRIP).
    - An eTRIP is a set of measures that encourages employees to use alternative transportation and ridesharing for their morning and evening commutes.

- Each measure contributes to a workplace where it is easier for employees to choose to use ridesharing or alternative transportation.
- Through this rule, single-occupancy vehicle trips are reduced, thus reducing emissions of oxides of nitrogen (NOx), volatile organic compounds (VOC) and particulate matter (PM).

STRATEGIES DEVELOPED FOR IMPLEMENTATION IN COMMUNITY

Due to community members' interest in reducing emissions of criteria pollutants and toxic air contaminants that originate from mobile sources operating in and around the community, the following strategy was developed to reduce emissions associated with the operation of public fleet vehicles.

PF.1: INCENTIVE PROGRAM FOR REPLACING OLDER PUBLIC FLEET VEHICLES WITH NEW, CLEAN-VEHICLE TECHOLOGY

Overview: To provide increased outreach and access to incentive funding for the replacement of older, higher polluting public fleet vehicles operating within and surrounding South-Central Fresno with new clean vehicle technology.

Replacing older public fleet vehicles is important to reduce the public's exposure to vehicle emissions including NOx and PM2.5. These pollutants negatively impact human health, especially for sensitive populations such as children. These are new clean vehicle technologies, including plug-in hybrid, battery electric and natural gas that are significantly cleaner than conventionally-powered gasoline and diesel vehicles.

State and Federal requirements control emissions from passenger vehicles. The Valley Air District does not have jurisdiction over these sources. However, due to the large amount of air pollution that originates from passenger vehicles in the Valley, including public fleet vehicles, the District has implemented a suite of programs to reduce pollution from public fleets:

- The Public Benefit Grants Program - http://valleyair.org/grants/publicbenefit.htm. This program is operated by the District. The purpose of this program is to fund the purchase of new electric, plug-in hybrid, or alternative fuel vehicles for public agencies to promote clean air alternative-fuel technologies and the use of low-or zero-emission vehicles in public fleets. This program is currently open and accepting applications on a first-come-first-served basis.

- Employer Based Trip Reduction (District Rule 9410) requires large employers to implement measures to encourage employees to take alternative transportation to work through the establishment of an Employer Trip Reduction Implementation Plan (eTRIP).
    - An eTRIP is a set of measures that encourages employees to use alternative transportation and ridesharing for their morning and evening commutes.

- Each measure contributes to a workplace where it is easier for employees to choose to use ridesharing or alternative transportation.

- Through this rule, single-occupancy vehicle trips are reduced, thus reducing emissions of oxides of nitrogen (NOx), volatile organic compounds (VOC) and particulate matter (PM).

Implementing Agency: SJVAPCD

Type of Action: Incentives

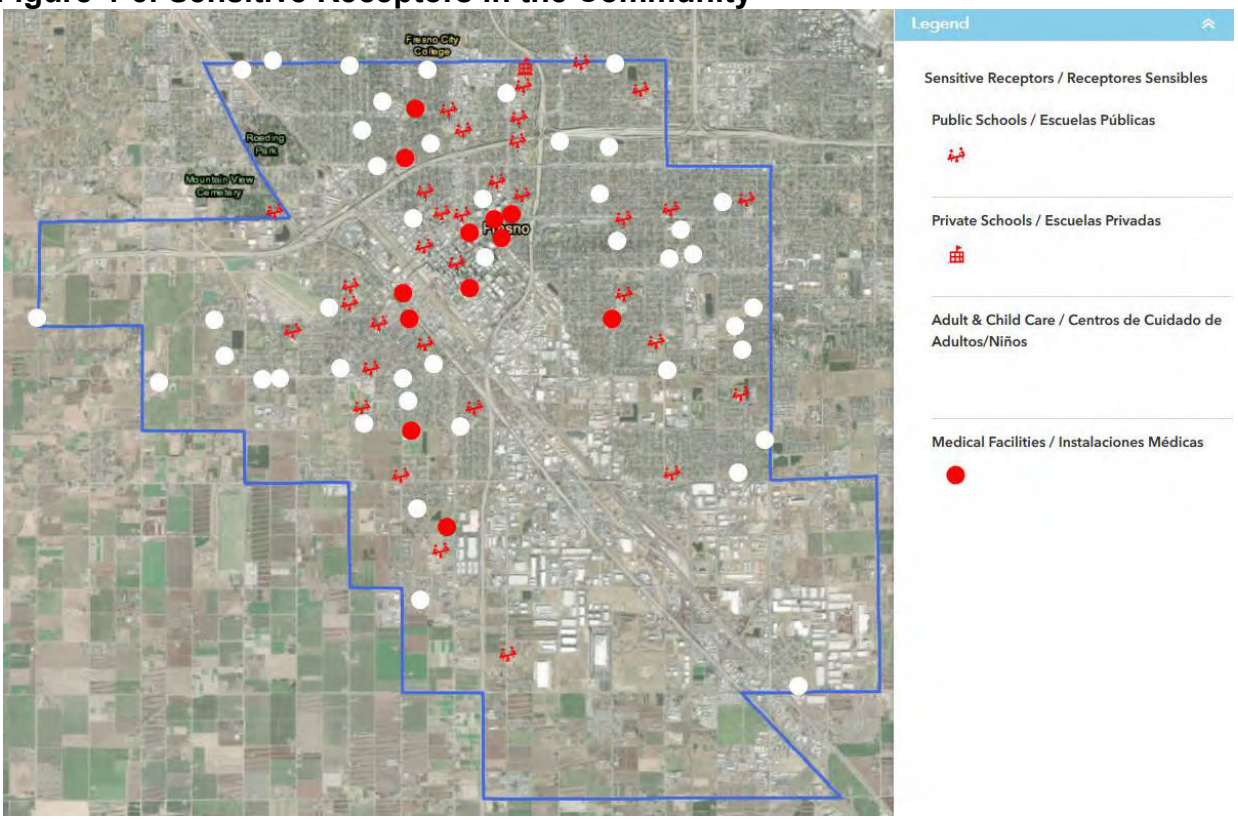
Implementation: 2019-2021

Description of Proposed Actions: The goal of this action is to work closely with public agencies, including City of Fresno and Fresno County, to replace vehicles through the District's Public Benefit Grants Program. This includes increased outreach to public agencies operating vehicles within the community as well as prioritized funding for projects in the community. Depending on the types and cost of vehicles replaced, the proposed funding amount of $8,000,000 would cover the replacement of up to 400 vehicles at an incentive of $20,000 each.

EXPOSURE REDUCTION STRATEGIES FOR SENSITIVE RECEPTORS

Proximity to emission sources can pose health risks for community members, particularly for sensitive groups such as children, the elderly, and those with cardiovascular diseases. Sensitive receptors located in South Central Fresno include schools, daycare facilities, and medical facilities, as shown in the map below. The CARB Blueprint contains suggestions of several measures that can be implemented to reduce exposure to emissions at areas where these sensitive receptors may be particularly vulnerable to exposure, referred as proximity-based goals.

Figure 4-6: Sensitive Receptors in the Community



In discussions about possible exposure reduction measures to implement in the AB 617-selected community, the South Central Fresno Steering Committee placed a high priority on measures that would protect the health of children, including installing advanced filtration systems at schools. Other measures prioritized by the Steering Committee included reducing idling near sensitive receptors, and increasing community member knowledge about actions individuals can take to protect their health.

The Steering Committee also suggested planting trees, installing vegetative barriers at industrial sites and along major roadways, and rerouting trucks off of main through fares. The District has engaged with local government agencies, CARB, and appropriate state agencies that have the authority to implement these strategies.

Reducing exposure for sensitive receptors will be accomplished through the implementation of the following measures related to schools, indoor air quality, urban greening, and vegetative barriers.

EXPOSURE REDUCTION STRATEGIES FOR SCHOOLS

SCHOOLS IN THE SOUTH CENTRAL FRESNO COMMUNITY

Of the eight public school districts that serve children within the South Central Fresno community boundary, Fresno Unified serves approximately 63% of the 54 active schools in the region. The second- and third-largest districts are the Fresno County Office of Education and Central Unified School District, which serve 13% and 7% of schools respectively. Enlisting the participation and support of the largest districts in the effort to reduce children's exposure is key to ensuring that benefits are as widespread as possible. Targeting schools located in areas near emissions sources, like Malaga, protects the most vulnerable populations. Each school's demographics must also be considered: approximately 65% of schools in all districts throughout the boundary serve elementary-aged children. All children, but especially young children, are considered sensitive receptors with respect to air pollution. It is important to prioritize their protection from unhealthy air during their developing years.

COMMUNITY CONCERNS AND COMMENTS

A primary concern expressed by Steering Committee members is to ensure cleaner air both indoors and outdoors for children at school while fully engaging local school districts and parents in clean-air efforts. Although the District lacks the legal authority to appropriate local school districts' LCAP funding as suggested, it can provide its own incentives to this end. Committee members expressed a desire to prioritize schools in neighborhoods with the highest risk of exposure to pollutants, such as Malaga and Southwest Fresno, and to enlist the cooperation and support of Fresno Unified School District in particular.

CURRENT CONTROL PROGRAMS

The Healthy Air Living (HAL) Schools program empowers participating schools to make informed decisions about outdoor activities based on real-time air quality conditions. School staff sign up for automated notifications when air quality becomes harmful using the Real-time Air Advisory Network (RAAN) tool, and receive health-protective recommendations for the modification or cancellation of outdoor activities accordingly through the Real-time Outdoor Activity Risk (ROAR) guidelines. The program includes access to resources like anti-idling signs, air quality widgets for school websites, bilingual informational materials, and bilingual educational speakers for students, parents, and staff.

STRATEGIES DEVELOPED FOR IMPLEMENTATION IN COMMUNITY

Strategies developed to reduce the exposure of children within the community require a twofold approach: increasing enrollment of schools in the HAL School program protects children from exposure to unhealthy outdoor air through the widespread adoption of RAAN and ROAR; further, establishing a new pilot program that offers incentive funds to install advanced air filtration systems in community schools reduces exposure to potentially unhealthy indoor air.

SC.1 INCENTIVE PROGRAM TO INSTALL ADVANCED AIR FILTRATION SYSTEMS IN COMMUNITY SCHOOLS

Overview: The goal of this strategy is to reduce the impact of air pollution on children at schools and daycare facilities. Air filtration reduces the concentration of particulate contaminants from indoor air and is an important component of a school's Heating Ventilation and Air Conditioning (HVAC) system. Reducing airborne particles (such as PM 2.5) is important because particulate matter negatively impacts human health, especially that of sensitive populations such as children. Older HVAC systems and basic air filtration used in some schools only remove a small fraction of particles in the air that are smaller than 0.3 microns (µm). More efficient HVAC air filters and standalone air cleaners are important for creating healthier air in school classrooms.

Implementing Agency: SJVAPCD

Type of Action: Incentives

Implementation: 2019-2024

Description of Proposed Actions: This strategy would provide up to $1,500,000 in incentive funding for schools and daycares in South Central Fresno to install advanced air filtration systems, utilizing existing Community Air Protection Program guidelines. Proposed funding amounts would provide up to 55 local schools with funding to install HVAC filters with a MERV rating of 14 or greater. Schools with older HVAC systems may receive up to 100% of the cost of approved standalone air cleaner units with HEPA rated filters and a Clean Air Delivery Rate (CADR) appropriate for the classroom size. Schools that receive high-efficiency HVAC filters may also receive up to 100% of the cost of one (1) set of replacement HVAC filters, and schools that receive standalone air ventilation units may also receive up to 100% of the cost of one (1) set of replacement HEPA filters per unit.

SC.2: REDUCE CHILDREN'S EXPOSURE THROUGH INCREASED ENROLLMENT IN THE HEALTHY AIR LIVING SCHOOLS PROGRAM

Overview: The goal of this strategy is to reduce children's exposure to unhealthy air by increasing the enrollment of schools in the Healthy Air Living (HAL) Schools program. Children are considered sensitive receptors with respect to air pollution because their lungs are developing, they breathe disproportionately more air than adults, and they tend to spend more time exercising outdoors. The Healthy Air Living Schools program asks participating schools to actively monitor local air quality using the Real-time Air Advisory Network (RAAN) and to modify outdoor activities accordingly. This strategy enrolls more schools in the program, effectively reducing the short- and long-term exposure of an increased number of children to harmful air.

Implementing Agency: SJVAPCD

Type of Action: Outreach

Implementation: 2019-2024

Description of Proposed Actions: This strategy would seek to enroll all five (5) school districts within the South Central Fresno boundary in the Healthy Air Living Schools program. Participating schools and districts would assign one or more designees to receive automated RAAN notifications when local air conditions become harmful, and would modify, relocate, or cancel outdoor activities such as recess, physical education, practices, and sporting events in accordance with the health-protective Real-time Outdoor Activity Risk (ROAR) guidelines. SJVAPCD representatives would meet with teams of key staff (such as administrators, coaches, nurses, science teachers) from ten (10) schools within the boundary to ensure understanding of and adherence to the program. SJVAPCD representatives would also attend five (5) school community events such as health fairs or parent nights to educate the community about air quality and the HAL Schools program. Related air quality educational materials would be distributed to each district's Family Services department, community liaison office, or similar for circulation to the public.

INDOOR AIR QUALITY

Weatherization measures, such as installing weather-stripping and caulking around windows and doors, can reduce the amount of outdoor air infiltrating into a home and decrease energy costs associated with heating and cooling. However, weatherization has the possibility to have negative impacts on indoor air quality if not accompanied by additional energy upgrades for appliances. Tightening building openings may also have the unintended consequence of allowing contaminants that would otherwise be leaked out of under-weatherized homes to build up to unhealthy levels, including carbon monoxide (CO) from combustion gases and VOCs from consumer products. To address these concerns, a 2010 study was conducted on 514 homes to evaluate the indoor air quality impacts of weatherization performed through the U.S. Department of Energy's (DOE) Weatherization Assistance Program (WAP). Results from the study conclude that, when coupled with other energy efficient upgrades, exposure to CO was reduced[4].

Recent programs promoting and incentivizing weatherization have recognized the need to couple residential energy efficiency upgrades with new, efficient appliances. These programs allow the District to work with local partners to bring these residential-level incentives to the community that mitigate exposure to air pollution.

COMMUNITY CONCERNS AND COMMENTS

Community commenters have noted that these weatherization programs already exist. While the District acknowledges that this funding is not new, the District is committed to establish a new focus on improving indoor air quality by partnering with local agencies.

CURRENT CONTROL PROGRAMS

The District does not fund or regulate weatherization or energy efficiency of homes.

STRATEGIES DEVELOPED FOR IMPLEMENTATION IN COMMUNITY

Based on the priority placed on reducing exposure to air pollution for sensitive receptors, the following indoor air quality improvement strategies were developed for implementation as a part of the South Central Fresno CERP.

The following is a suggested measure not within the Air District's jurisdiction to directly implement:

IAQ.1: INCENTIVE PROGRAM FOR WEATHERIZATION AND ENERGY EFFICIENCY

Overview: The goal of this strategy is to reduce the impact of and exposure to air pollution on residents within their homes. Weatherization of a home, which can include actions to improve seals around doors and windows, to increase insulation, and to improve air filtration, can reduce penetration of outside pollutants into the home and decrease the overall energy demand for residents. Coupled with solar, the decreased

[4] https://www.epa.gov/indoor-air-quality-iaq/protocols-home-energy-upgrades

energy demands can mean a lot to the community of South Central Fresno, including lower energy bills for low-income households and decreased emissions from natural gas. Without proper weatherization, older homes waste energy, making heating/cooling units work harder to keep your home at a constant temperature, resulting in increased utility costs and emissions.

Implementing Agency: Fresno County Economic Opportunities Commission (Fresno EOC) in partnership with the California Community Services Department (CSD) and the District

Type of Action: Incentives

Implementation: 2019

Description of Proposed Actions: This strategy would provide increased outreach and access to incentive funding for low-income residents in South Central Fresno to receive weatherization services. The California Community Services Department (CSD) empowers and funds local organization partners to provide weatherization and energy service assistance to low-income communities. Fresno EOC, the local partner serving the community of South Central Fresno, provides energy assistance through CSD's programs to many low-income households in Fresno County each year. The District will work with Fresno EOC to help increase awareness and access for low-income community members to state funding for weatherization programs, including exploring the opportunity for funding air filters for residential use.

Fresno EOC has committed to host a meeting in the South Central Fresno community where residents can learn about available funding for weatherization services and fill out the appropriate forms and applications. Proposed funding amounts could cover up to 100% of the cost of the following weatherization actions:

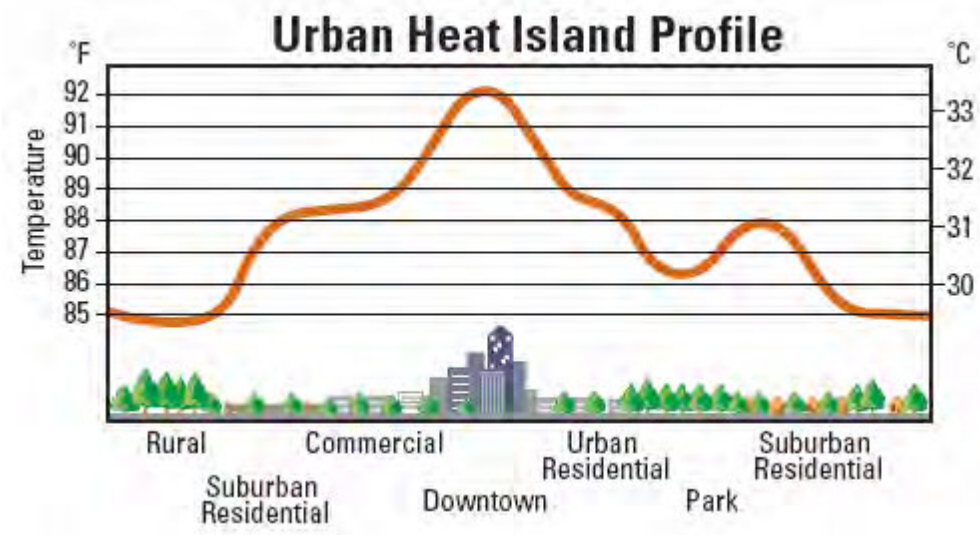
- Test, repair, or replace refrigerator, water heater, heating/cooling systems, and gas cooking appliances.
- Insulation of walls, ceilings, floors, and attics.
- Weather-stripping, caulking all doors and windows.
- Water heater blankets.
- Carbon monoxide detectors.
- Set-back thermostat.
- Duct testing of heating/cooling systems.

URBAN GREENING

URBAN GREENING SOURCES IN SOUTH CENTRAL FRESNO

Urban greening is one way to help improve air quality and public health in addition to enhancing the overall beautification of the community with drought resistant low maintenance greenery. Trees and vegetation help reduce the impacts of heat islands by increasing the amount of shade and cooling the air by evapotranspiration (McPherson, 1994). Careful placement and choice of vegetation will maximize its cooling benefits. Shade provided by trees and other vegetation prevents sunlight from reaching heat-absorbing surfaces such as sidewalks and parking lots, cooling the area by 1 to 9 degrees Fahrenheit. Air quality also benefits from a decrease in energy usage. The less energy used, the fewer power plants running and emitting ozone precursors.[5] The total net savings when considering energy, ozone, and PM reduced from vegetation were valued at $210/tree.

Figure 4-7: The Urban Heat Island Effect illustrated *(Source: EPA, 1992)*



COMMUNITY CONCERNS AND COMMENTS

The steering committees expressed an interest in opportunities for increased urban greening and forestry in the community of South Central Fresno as a strategy to reduce exposure from emissions that occur along local transportation corridors.

CURRENT PROGRAMS

The District Fast Track Action Plan identified Heat Island Mitigation as measure to be implemented with the goal to increase urban forest canopy shading and increase the albedo of structures and pavement. This guidance includes a model resolution and policy statement for use by businesses, government, and organizations who desire to commit to heat island mitigation strategies.

[5] http://www.epa.gov/heatisland/resources/pdf/BasicsCompendium.pdf

Due to the benefits of urban greening, there are several programs available to support urban greening in communities. Below are the ongoing efforts to promote Urban Greening by other agencies, as well as programs committed to be implemented in future State and/or Valley-wide programs.

- **California Natural Resources Agency Urban Greening Grant Program:** Consistent with AB 32, the Urban Greening Program will fund projects that reduce greenhouse gases**.** This program includes urban heat island mitigation projects and energy conservation efforts related to shade tree projects.
- **Cal Fire:** Through the California Climate Investments (CCI) Urban& Community Forestry Grant Program, CALFIRE works to optimize the benefits of trees and related vegetation through multiple-objective projects as specified in the California Urban Forestry Act of 1978.
- **Active Transportation Program (ATP): California Department of Transportation (CALTRANS):** Urban forestry, such as trees and other vegetation, are significant components of several eligible projects under the ATP, including parks, trails, and safe-routes-to-schools.
- **California ReLeaf Grants:** California ReLeaf seeks and provides pass-through grants to ReLeaf Network Members and other community groups interested in planting and caring for trees in California and offers grant programs through the Social Equity Grant Program and California Arbor Week Grant.
- **California Urban Forests Council (CAUFC):** As a coalition, CAUFC is dedicated to the expansion and perpetuation of sustainable urban and community forests to enhance the quality of life for all Californians.
- **Tree Fresno:** Tree Fresno has received multiple grants from CalFire to support urban tree planting efforts at Valley parks and campuses.

Non-profit organizations such as One Tree Planted, River Partners, the San Joaquin River Conservancy, the Tree Foundation of Kern, Tree Lodi, and others provide the public the ability to donate to support tree planting and also advocate for the allocation of state and federal funding towards tree planting or replanting in forest, river, and/or urban areas in California.

STRATEGIES DEVELOPED FOR IMPLEMENTATION IN COMMUNITY

Due to the community's interest in increased urban greening, the District will be working with other agency partners to bring increased funding for urban greening to the AB 617 selected communities, as further described in the following measure.

The following is a suggested measure not within the Air District's jurisdiction to directly implement:

UG.1 INCREASED URBAN GREENING AND FORESTRY TO IMPROVE AIR QUALITY

Overview: The goal of this strategy is to improve air quality in the community of South Central Fresno through urban greening and forestry programs. This measure is supported by scientific studies that have shown urban trees and forestry can help with the removal of air pollutants and reduced emissions of volatile organic compounds (VOC's). The effects of urban trees on fine particulate matter (PM2.5) was modeled for ten U.S. cities, with total annual PM2.5 removal varying from 5.2 tons in Syracuse to 71.1 tons in Atlanta. Overall air quality improvements attributed to urban trees ranged between 0.05% in San Francisco to 0.24% in Atlanta (Nowak, Hirabayashi, Bodine, Hoehn, 2013). Based on a study to assess the effects of urban trees on air quality have found that urban vegetation can attribute to temperature reduction, removal of air pollutants, reduce emission of VOCs, and building energy conservation (United States Department of Agriculture Forest Service, 2002).

The District has long been supportive of the public benefits provided from planting of trees and vegetation. The District's Fast Track Action Plan, adopted by the Governing Board to reduce ozone pollution in the Valley, identified strategic use of tree and vegetation planting as a potential measure to reduce ozone. There has also been significant efforts at the federal, state, and local levels to promote and increase urban greening and forestry through funding opportunities, programs, and projects.

Jurisdiction Issues: It should be noted that the District has no authority over how agencies allow land under their jurisdiction to be used. These so-called "land-use" decisions, such as whether to allow or require accelerated urban greening efforts, are historically the responsibility, under state law, of cities and counties, or, in some cases, state and federal agencies responsible for transportation corridors, state and federal parks, and other properties. AB 617 does not provide the District with new land-use regulatory authority, so land-use authority remains with cities, counties, and state and federal land-use agencies, as discussed in CARB's Blueprint (see "Who Has the Authority to Implement Actions?", page 26 of the Blueprint). However, the District has made available to the responsible agencies the various land-use strategies that have been presented by the Committee for potential inclusion into the CERP for responsible agency's input and response in the South Central Fresno Community Emissions Reduction Program.

Implementing Agency: City and County, SJVAPCD

Type of Action: Partnership, Incentives

Implementation: 2019-2024

Description of Proposed Actions: The goal of this measure is to identify and support efforts to increased urban greening and forestry to improve air quality and overall quality of life for residents in the community of South Central Fresno. This measure would involve efforts to partner, collaborate, and engage with other agencies to fulfil the need for increased urban greening and forestry in the community. The District has begun outreach efforts with Tree Fresno and Releaf California to identify available funding sources to support urban greening projects. The District will consider a funding match to support urban greening projects, contingent on state funding allocations to support new urban greening projects within the AB 617-selected community boundary.

VEGETATIVE BARRIERS IN SOUTH CENTRAL FRESNO

BACKGROUND

Vegetative barriers, also known as windbreaks, are composed of one or more rows of trees or shrubs that may be planted in specific areas of concern in order to improve air quality in the immediate area by intercepting airborne particles, dust, chemicals, and odors. Pollutants directly emitted from cars, trucks, and other motor vehicles are found in higher concentrations near major roads. In addition, stationary sources such as industrial facilities, factories, and agricultural operations can also contribute air pollutants to their surrounding areas. While various emission control techniques and programs exist to reduce these pollutants from mobile and stationary sources, vegetative barriers have been shown to be an additional measure to potentially reduce a population's exposure to air pollution through the interception of airborne particles and the uptake of gaseous pollutants. Examples of vegetative barriers include trees, bushes, shrubs, or a mix of these. Generally, a higher and thicker vegetative barrier with full coverage will result in greater reductions in downwind pollutant concentrations. In addition to air quality benefits, vegetative barriers can improve aesthetics, increase property values, reduce heat, control surface water runoff, and reduce noise pollution.[6]

Characteristics of a vegetative barrier that should be considered include the porosity/density of the vegetative barrier, the characteristics of the vegetation during different seasons , leaf surface characteristics, vegetation air emissions (e.g. biogenic VOCs), and the resistance of the vegetative barrier to air pollution. Other considerations include: soil characteristics, availability of water, control of water runoff, maintenance of the vegetative barrier, use of native and non-invasive species, and roadway safety. Vegetative barriers may also be used with solid barriers to increase mitigation.[6] Research is ongoing as to the effectiveness of vegetative barriers in reducing exposure to pollutants, but a recent study has found that vegetative barrier installations may reduce downwind exposure to carbon monoxide and fine particulate matter by at least 23%.[7]

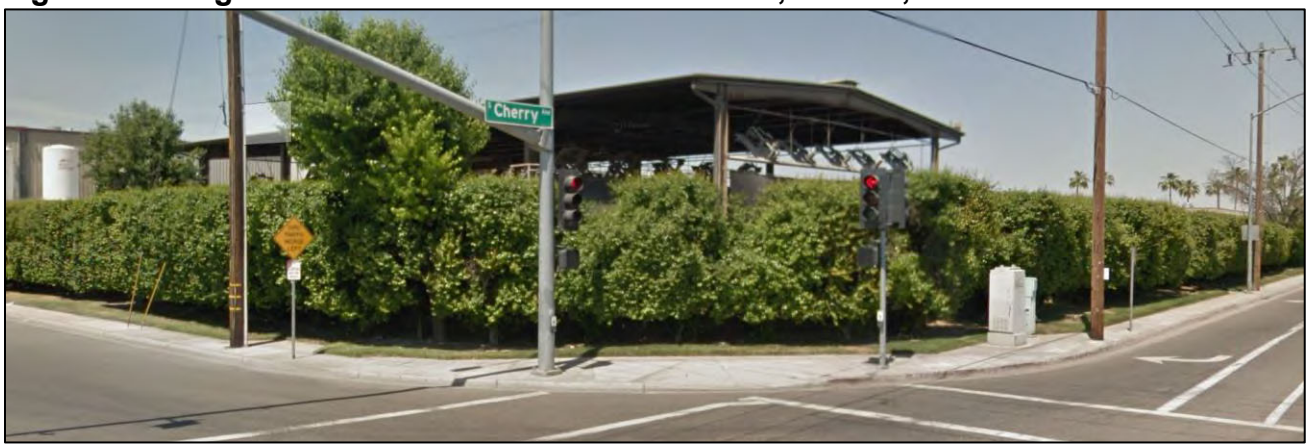
The US EPA has produced a fact sheet with further information on vegetative barriers, available here: https://19january2017snapshot.epa.gov/sites/production/files/2016-08/documents/recommendations_for_constructing_roadside_vegetation_barriers_to_improve_near-road_air_quality.pdf

[6] Baldauf, R. (2016). Recommendations for Constructing Roadside Vegetation Barriers to Improve Near-Road Air Quality. *National Risk Management Laboratory Office of Research and Development, Air Pollution Prevention and Control Division: Washington, DC, USA*.

[7] Lin, M. Y., Hagler, G., Baldauf, R., Isakov, V., Lin, H. Y., & Khlystov, A. (2016). The effects of vegetation barriers on near-road ultrafine particle number and carbon monoxide concentrations. *Science of the Total Environment*, *553*, 372-379.

Figure 4-8: Vegetative Barrier w/ Solid Barrier on Highway 198, Visalia, CA*

Figure 4-9: Vegetative Barrier around Foster Farms, Fresno, CA*



**Latest Google Map Information*

COMMUNITY CONCERNS AND COMMENTS

The South Central Fresno Steering Committee has identified Vegetative Barriers as a priority for air pollutant mitigation. The committee has expressed the need to enforce existing mitigation plans associated with specific industries. In addition, there is interest in conducting tree planting and "living fence" events.

CURRENT PROGRAMS

The Valley Air District, the City of Fresno, Fresno County, The California Department of Transportation (Caltrans), and other local partners have promoted the use of vegetative barriers for reducing exposure to air pollutants, mitigating the urban heat island effect, and improving aesthetics. The District's Fast Track Action Plan includes the strategic use of tree and vegetation planting as a potential measure to improve air quality. Additionally, the Fresno TREES project aims to assess the efficacy of vegetative barriers to reduce near-road pollution exposure, increase vegetative planting in these near-road environments, and help sequester carbon through tree planting.[8]

[8] https://ww2.arb.ca.gov/sites/default/files/2018-06/fresno_trees_sep.pdf

STRATEGIES DEVELOPED FOR IMPLEMENTATION IN COMMUNITY

Based on community interest in vegetative barriers, the following measure was developed for implementation as a part of the South Central Fresno CERP.

The following is a suggested measure not within the Air District's jurisdiction to directly implement:

VB.1: INCENTIVE PROGRAM FOR THE INSTALLATION OF VEGETATIVE BARRIERS AROUND/NEAR SOURCES OF CONCERN

Overview: The purpose of this strategy is to provide incentives for the installation of vegetative barriers around/near sources of concern to reduce particulate matter, odor, and other emissions, as feasible. Based on community interest in vegetative barriers, the District will be partnering with other agencies to funnel available grant funding to the community to support the installation of vegetative barriers at/near industrial facilities and along major transportation and goods movement corridors. The District will also work with the National Resources Conservation Service (NRCS) to evaluate the feasibility of installing vegetative barriers near agricultural farms and identify potential additional funding sources.

Jurisdiction Issues: It should be noted that the District has no authority over how agencies allow land under their jurisdiction to be used. These so-called "land-use" decisions, such as whether to allow or require vegetative barriers in specific locations, are historically the responsibility, under state law, of cities and counties, or, in some cases, state and federal agencies responsible for transportation corridors, state and federal parks, and other properties. AB 617 does not provide the District with new land-use regulatory authority, so land-use authority remains with cities, counties, and state and federal land-use agencies, as discussed in CARB's Blueprint (see "Who Has the Authority to Implement Actions?", page 26 of the Blueprint). However, the District has made available to the responsible agencies the various land-use strategies that have been presented by the Committee for potential inclusion into the CERP for responsible agency's input and response in the South Central Fresno Community Emissions Reduction Program.

Implementing Agency: SJVAPCD, CDOT, NRCS, other local partners

Type of Action: Partnership, Incentives

Implementation: 2020-2024

Description of Proposed Actions: The District will work closely with the community, City, California Department of Transportation, Natural Resource Conservation Service and others to investigate and identify areas suitable for installation of vegetative barriers. Type and location of projects will be developed with the input of Steering Committee, and funded as funding sources are identified. The District will consider a funding match of up to $1,000,000 to leverage available state funding allocations for the deployment of vegetative barrier installations within the AB 617-selected community boundary.

REDUCING AUTOMOBILE IDLING NEAR SENSITIVE RECEPTORS

MOBILE EMISSIONS IN SOUTH CENTRAL FRESNO

Even if a vehicle does not move, it still emits pollution if the engine is left on. Idling engines emit volatile organic compounds (VOCs) when running, which react with heat from sunlight to form the gaseous pollutant ozone. They may also emit particulate matter (PM), oxides of nitrogen (NOx) and air toxics like benzene, formaldehyde, and acetaldehyde, all of which can be especially harmful to the health of sensitive populations. Children and seniors are considered sensitive receptors with respect to air pollution and are more likely to suffer adverse health impacts from nearby vehicles idling than healthy adults. Targeting anti-idling outreach to areas commonly serving these sensitive individuals is an important way of reducing exposure.

In South Central Fresno, mobile emissions from on-road vehicles (including light, medium, and heavy duty vehicles) are the most significant source of NOx and air toxics annually. In 2017 alone, vehicles produced 1,103.56 tons of NOx (about 59% of total NOx). Idling contributes to this figure, but is a largely preventable practice.

COMMUNITY CONCERNS AND COMMENTS

In addition to the idling of heavy duty trucks addressed by Strategy HD.6, Steering Committee members expressed concerns about the impacts of emissions from idling automobiles in and around the community. A suggestion from Steering Committee members is that children should be educated about the negative impacts of vehicle idling on health and air quality so that they may encourage their parents to turn their engines off. The Committee also suggested that posted anti-idling signage should be enforced with fines that benefit clean-air efforts in schools. Unfortunately, the District does not have regulatory authority over mobile pollution sources and cannot issue fines for idling.

CURRENT CONTROL PROGRAMS

Although the ability to regulate vehicles lies with State and Federal authorities, the District has implemented many measures to reduce vehicle emissions. These include grant programs providing incentive funds to the public for the purchase of cleaner vehicles (Drive Clean in the San Joaquin), requiring construction and development projects to mitigate emissions produced during the course of construction (Indirect Source Rule), and requiring large employers to encourage their employees to choose alternative transportation to work through the establishment of an Employer Trip Reduction Implementation Plan (eTRIP). However, the preventable problem of idling is best addressed by the Healthy Air Living Schools program. Participating schools receive sets of free bilingual anti-idling signs to post near parent drop-off and pick-up areas, along with educational materials, presentations, and speakers able to address the impacts of idling.

STRATEGIES DEVELOPED FOR IMPLEMENTATION IN COMMUNITY

Due to the interest of community members in reducing emissions of criteria pollutants and toxic air contaminants originating from idling vehicles, the following strategy was developed for inclusion in the CERP. This idle-reduction outreach strategy expands on previous programs by offering anti-idling signage and informational materials to a wider variety of locations that serve sensitive populations in addition to expanding distribution to schools.

IR.1: AUTOMOBILE IDLE-REDUCTION OUTREACH TO REDUCE THE EXPOSURE OF SENSITVE RECEPTORS TO VEHICLE EMISSIONS

Overview: The goal of this strategy is to reduce the exposure of sensitive individuals to vehicle emissions at locations serving children, seniors, and those with medical conditions. Engines left idling may emit air toxics like benzene, formaldehyde, and acetaldehyde, which can be especially harmful to the health of sensitive populations. Elevated levels of air toxics and other pollutants can be prevented by encouraging drivers to turn off their engines when parked. It is important to target anti-idling messaging to areas commonly serving sensitive individuals to reduce health impacts on the most vulnerable populations.

Implementing Agency: SJVAPCD

Type of Action: Outreach and Exposure Reduction

Implementation: 2019-2024

Description of Proposed Actions: This strategy would provide and distribute thirty (30) sets of bilingual English and Spanish idle-reduction street signs to be installed in locations that commonly serve sensitive groups throughout the community boundary. Sites may include the parking lots of schools, child care facilities, libraries, senior centers, parks, nursing homes, medical centers, and pediatric offices. When possible, educational materials or infographics would be provided to each location to explain the importance of reducing idling and its impacts on health and air quality. SJVAPCD representatives would also develop and deliver five (5) presentations about the impacts of vehicle exhaust and related District resources such as incentive funding for cleaner vehicles and school programs that deliver free idle-reduction signs to schools throughout the Valley. Note that idling of heavy duty trucks is proposed to be reduced by Strategy HD.6.

COMMUNITY OUTREACH STRATEGIES

The District's Outreach and Communications team conducts air quality outreach throughout all eight counties of the San Joaquin Valley. The District coordinates events, delivers presentations, responds to the media 24/7, manages social networks, pilots outreach campaigns like the Healthy Air Living (HAL) Schools and Check Before You Burn (CBYB) programs, and connects with the public in multiple languages across any medium. In addition to offering media interviews, taking public calls, partnering with local institutions, and accepting speaking engagements, the District conducts paid advertising and informational campaigns regularly to spread air quality awareness across television, radio, billboards, social media, digital networks, and other venues. Through the development of innovative tools like RAAN and the Valley Air App, over 8,000 registered users receive automated notifications when the air quality at any location they choose to follow becomes unhealthy, allowing them to make informed decisions about their outdoor activities to limit their own exposure.

COMMUNITY CONCERNS AND COMMENTS

The Committee recommended that the District develop a bilingual app to allow community members to see information from air monitoring equipment deployed as part of the CERP. Real-time air quality data from CERP-specific monitors is available online through the community web page at: http://community.valleyair.org/selected-communities/south-central-fresno/air-monitoring/. Additionally, the recently-redesigned Valley Air App allows users to check the air quality at any location using the Real-time Air Advisory Network (RAAN).

STRATEGIES DEVELOPED FOR IMPLEMENTATION IN COMMUNITY

The Community Air Quality Outreach Strategy goes beyond current outreach efforts to provide community-specific information about local conditions and measures the public can take to protect themselves during episodes of poor air quality through new social media campaigns and workshops hosted in partnership with local civic and community organizations.

The *Sharing Clean Air Efforts and How Communities Can Get Involved* Strategy further increases awareness of community air quality improvement programs and available incentives by hosting workshops and symposiums with community partners.

O.1: OUTREACH TO INCREASE COMMUNITY AWARENESS AND KNOWLEDGE OF AIR QUALITY

Overview: The goal of this strategy is to provide additional information to the community about real-time air quality conditions and measures the public can take to protect themselves during episodes of poor air quality. An understanding of what conditions constitute poor air quality, the relative seriousness of a given episode, and any potential health impacts is necessary for the public to make informed decisions about how and when to limit their exposure. It is critical for the public to have widespread knowledge of

tools available to inform them of real-time conditions, assist with the interpretation of such conditions, and to describe what actions may be taken to protect themselves.

Implementing Agency: SJVAPCD

Type of Action: Outreach

Implementation: 2019-2024

Description of Proposed Actions: This strategy would increase community awareness of available tools to keep informed of real-time changes in air quality through social media campaigns and a series of partner workshops. Social media campaigns would be launched on three platforms: Facebook, Twitter, and Instagram. A partnership with local civic and community organizations would be established to host workshops at locations commonly available to the public such as libraries, schools, and community, health, or recreation centers. Both the social media outreach and live workshops would promote real-time tools such as myRAAN, the Valley Air App, the Real-time Outdoor Activity Risk (ROAR) Guidelines, the wildfire page of the District's website, as well as information about general air quality education, wildfire smoke impacts, health effects, and similar topics. This strategy would aim to increase myRAAN registrations, Valley Air App downloads, and social media followers among members of the community.

The District will also work with the City of Fresno to explore ways to forward air quality-related issues reported through the City's "FresGo" citizen reporting app directly to the District. With many South Central Fresno residents already familiar with "FresGo," this strategy, combined with increased outreach about how to use the District's Valley Air App for reporting these issues, will increase community access to District resources.

Annual Goals for these actions in SC Fresno include:

- Attend/host 4 community meetings to share information
- 1 community targeted social media campaign
- Circulation of infographics to at least 4 community spaces

O.2: OUTREACH TO SHARE CLEAN AIR EFFORTS AND HOW COMMUNITIES CAN GET INVOLVED

Overview: The goal of this strategy is to increase public awareness of air quality improvement programs currently available through the SJVAPCD. Increased education may lead to more widespread understanding of the air quality challenges faced by both the community and the San Joaquin Valley at large, and greater adoption of the District's resources, incentive funding, and community engagement. Education is important to empower the public to protect themselves from exposure when possible, to make greater use of District resources and programs, and to encourage community members to adopt practices in their daily lives that help further reduce emissions.

Implementing Agency: SJVAPCD

Type of Action: Outreach

Implementation: 2019-2024

Description of Proposed Actions: This strategy would increase awareness of available programs by establishing a series of outreach events within South Central Fresno. These workshops would be hosted in locations commonly available to the public such as libraries, schools, and community, health, or recreation centers. Topics may rotate to include a wide range of District programs such as Clean Green Yard Machines, Burn Cleaner, Drive Clean in the San Joaquin, Healthy Air Living Schools, and similar topics. This strategy would also create an annual youth symposium to educate and encourage high school students to share air quality information with their peers, helping to sustain community awareness through future generations.

Annual Goals for these actions in SC Fresno include:

- Attend/host 4 community meetings to share information
- 1 community targeted social media campaign

O.3: JOINT ADVOCACY FOR CONTINUED/ADDITIONAL FUNDING TO SUPPORT AIR QUALITY IMPROVEMENT MEASURES

Overview: Continued state funding is key to continued progress addressing community level air pollution and completing the work necessary to engage with the community, monitor emissions, and implement community emission reduction strategies. Over the past three years, the state has provided significant funding for incentive programs to reduce emissions and for completing the work necessary to develop community based emission reduction plans. This funding has largely been from the Greenhouse Gas Reduction Fund that is funded by the Cap and Trade Program. In each of the last two state budgets, the state has allocated $245 million for emission reduction incentives, $50 million for local air district implementation of AB 617, and $10 million for technical assistance grants for community based organizations.

Going forward, there is concern that this funding might be reduced as the Greenhouse Gas Reduction Fund faces additional competition from other non-air quality related state programs. There is no other known funding source to replace this funding if it is lost. To ensure that the goals of the AB 617 legislation are met, CARB, the District, and local communities and other interested parties, must work together to advocate for continued/additional state funding to support the implementation of health protective local measures that reduce community exposure to criteria pollutants and toxic air contaminants.

Implementing Agencies: CARB, SJVAPCD, Local Community Groups

Type of Action: Outreach and Advocacy

Implementation: Ongoing

Description of Proposed Actions: CARB and the Air District will work with Steering Committee and other interested parties to advocate for additional and continuing funding from the state to implement AB 617 and to fund emission reduction efforts in disadvantaged communities.

ADDITIONAL INFORMATION ABOUT REGULATORY MEASURES TO REDUCE EMISSIONS IN THE COMMUNITY

Due to the nonattainment status of the Valley Air Basin for the criteria pollutants of fine particulate matter and ozone, the District requires that permitted facilities implement the most stringent control measures feasible for implementation to control criteria pollutants and associated precursor emissions. Beyond the regulations and stringent permitting requirements that are already implemented Valley-wide, the following sections detail enhanced regulatory strategies that will be implemented in the AB 617-selected community.

BARCT EXPEDITED SCHEDULE

In addition to community monitoring and emission reduction program requirements, AB 617 requires that air districts located in non-attainment areas perform a Best Available Retrofit Control Technology (BARCT) analysis for all categories of units at facilities subject to the state Cap-and-Trade program. In accordance with AB 617 requirements, the District adopted an expedited schedule for performing further determination of BARCT requirements in December, 2018.

The District utilized an extensive evaluation process to make an initial determination of whether the rules that apply to Cap-and-Trade facilities meet all state BARCT requirements, as mandated by AB 617. While District rules are expected to meet BARCT due to the District's ongoing extensive regulatory evaluations, the proposed BARCT implementation schedule includes commitments to establish updated BARCT determinations for District rules as required under AB 617. The proposed schedule was prepared through a public process, which included two public workshops. In addition to the BARCT implementation schedule, the District will be proceeding with amending a number of District rules included as commitments in the new *2018 PM2.5 Plan*, as discussed earlier in the CERP, that are also subject to the AB 617 BARCT implementation requirement.

In conjunction with District rules applicable to stationary source equipment, under the District's New Source Review permitting regulation, new facilities or facilities modifying equipment that emit air pollutants greater than 2 pounds per day (lb/day), are subject to stringent emissions control requirements. For each piece of equipment that has the potential to emit over the 2 lb/day threshold, the District requires the use of the best available air pollution control technology (BACT) used to control emissions from similar types of equipment. As part of this BACT analysis, the District determines if cleaner technologies that are not generally used for the equipment being analyzed could be used to further reduce emissions from the proposed equipment. This very stringent requirement ensures that the most effective air pollution control technique is utilized, resulting in the least amount of air pollution possible.

In addition to these stringent requirements on new sources of air pollution, rules adopted in the San Joaquin Valley are regularly analyzed for compliance with the state's BARCT requirements.

Best Available Retrofit Control Technology (BARCT)

Existing stationary sources in non-attainment areas such as the San Joaquin Valley have been subject to BARCT requirements since the 1980s, although some nonattainment areas with market-based criteria pollutant reduction programs were not required to apply BARCT to facilities complying with those market-based programs. Although AB 617 does not specifically define BARCT, California Health and Safety Code (CH&SC) Section 40406 defines BARCT as follows:

> *Best Available Retrofit Control Technology (BARCT) is an air emission limit that applies to existing sources and is the maximum degree of reduction achievable, taking into account environmental, energy and economic impacts by each class or category of source.*

Unlike other regions in the state, the District has not relied on market-based systems such as South Coast AQMD's RECLAIM program to achieve regional emissions reductions needed for attainment. Such market-based systems allow sources of pollution to avoid installing BARCT-level controls if regional emissions are reduced at an established rate. This potential path to avoiding installing the best air pollution controls in other air districts was a significant portion of the genesis of this BARCT requirement of AB 617.

In contrast, businesses in the San Joaquin Valley have always had to comply with BARCT in accordance to the implementation schedules established in District rules. When developing attainment plans or amending prohibitory rules, the District evaluates all applicable sources of emissions for potential strategies to reduce emissions. These evaluations include an exhaustive search of air quality regulations throughout the nation, review of existing emission control technologies, and analysis of advanced emission control technologies that may soon be available, to identify potential technologically and economically feasible emission reduction measures. Through these processes, the District demonstrates on an ongoing basis that District rules meet state and federal emission control requirements, including BARCT and Most Stringent Measures, which exceeds BARCT requirements. Therefore, given the District's ongoing and extensive work to identify and apply most stringent measures necessary to attain the ever-tightening federal health-based standards under the Clean Air Act, it is anticipated that most if not all District rules satisfy BARCT requirements.

The District recognizes that emission control technologies are continually evolving, and therefore robust and ongoing analysis is necessary to demonstrate that the District's rules continue to meet BARCT and other requirements on an ongoing basis. Furthermore, in the context of the 2016 Ozone attainment plan, the recently adopted PM2.5 attainment plan, and upcoming plans, future rule development actions will be required and, in this process, rules that have recently been determined to meet BARCT during this AB 617 analysis may be subject to further analysis to ensure they continue to meet BARCT requirements. Additionally, in those instances where the District is

made aware of new technology, further case specific and rule specific BARCT determinations may be conducted.

Affected Rules Included in the District's Expedited BARCT Implementation Schedule
As captured in Section 40920.6 of the Health and Safety Code, AB 617 identifies specific requirements for the District to meet when establishing the expedited BARCT implementation schedule. AB 617 requires the schedule to apply to each industrial source that, as of January 1, 2017, was subject to a specified market-based compliance mechanism and give highest priority to those permitted units that have not modified emissions-related permit conditions for the greatest period of time.

Based on information provided by CARB, as of January 1, 2017, 109 facilities within the District were identified as being subject to the state Cap-and-Trade program, a market-based compliance mechanism adopted by the state board pursuant to subdivision (c) of Section 38562, and therefore AB 617 BARCT requirements. Evaluating the 109 affected facilities, the District identified that approximately 4,500 active permit units are within the scope of this BARCT analysis. From the 4,500 active permit units, the District determined that 32 District rules that apply to specific source categories of equipment were subject to the BARCT analysis required under AB 617.

District staff performed analysis of 32 affected rules and determined that:

- 5 rules were superseded by a more stringent rule known to meet BARCT or by a rule subject to further BARCT analysis,
- 5 rules were determined to meet Most Stringent Measures (MSM) for NOx, the only relevant pollutant for these affected rules and therefore meet BARCT, and
- 6 rules were specifically determined to meet BARCT through an extensive rule and source category evaluation that compared our rule requirements with federal and state air quality regulations and with regulations of other air districts in California.
- While the remaining 16 rules likely already meet BARCT due to the District's ongoing extensive regulatory evaluations and enhancements, the proposed BARCT implementation schedule includes commitments to establish updated BARCT determinations for these rules.

Prioritization Criteria for Expedited BARCT Analysis Schedule
Section 40920.6(c)(3) of the Health and Safety Code requires Districts to give highest priority to conduct the BARCT analysis to those rules affecting permitted units that have not modified emissions-related permit conditions for the greatest period of time. To assist in further prioritization, the District also considered local public health, clean air benefits to the surrounding community, and regional air quality and attainment benefits by prioritizing units that emit NOx and are located within communities selected for action under AB 617. In addition, while cost-effectiveness of controls can't be fully analyzed until each rule is addressed during the development of a BARCT rule, the District also prioritized rules with the greatest number of potentially affected units, which, when coupled to the law's requirement of prioritizing based on the length of time since the

units were last modified, provides some consideration of the most likely controls to be cost-effective.

Public Process

As a part of the public process associated with establishing this schedule, the District conducted a public scoping meeting on June 14, 2018, to solicit input from stakeholders regarding the District's proposed methodology to address the AB 617 requirement to adopt an expedited BARCT analysis schedule by the end of 2018.

In addition, the District held a public workshop on November 1, 2018, to solicit input from the stakeholders regarding the Districts proposed expedited BARCT Rule implementation schedule. No comments were received from stakeholders after this workshop.

Expedited BARCT Implementation Schedule

Through this public process and in accordance with AB 617 requirements, the District has adopted the following expedited BARCT implementation schedule:

Table 4-1: Expedited BARCT Implementation Schedule

Rule	Title	BARCT Determination Status	BARCT Determination Schedule	BARCT Rulemaking Schedule (if necessary)
4454	Refinery Process Unit Turnaround	Scheduled	2019	2020
4641	Cutback, Slow Cure, And Emulsified Asphalt, Paving And Maintenance Operations	Scheduled	2019	2020
4104	Reduction of Animal Matter	Scheduled	2019	2020
4409	Components at Light Crude Oil Production Facilities, Natural Gas Production Facilities, and Natural Gas Processing Facilities	Scheduled	2019	2020
4455	Components at Petroleum Refineries, Gas Liquids Processing Facilities, and Chemical Plants	Scheduled	2019	2020
4702	Internal Combustion Engines (VOC only)	Scheduled (in conjunction with PM2.5 Plan commitment)	2020	2020
4623	Storage of Organic Liquids	Scheduled	2020	2021
4694	Wine Fermentation and Storage Tanks	Scheduled	2020	2021
4624	Transfer of Organic Liquid	Scheduled	2020	2021
4603	Surface Coating of Metal Parts and Products, Plastic Parts and Products, and Pleasure Crafts	Scheduled	2020	2021
4601	Architectural Coatings	Scheduled	2020	2021

4401	Steam-Enhanced Crude Oil Production Wells	Scheduled	2021	2022
4566	Organic Material Composting Operations	Scheduled	2021	2022
4625	Wastewater Separators	Scheduled	2021	2022
4621	Gasoline Transfer Into Stationary Storage Containers, Delivery Vessels, and Bulk Plant	Scheduled	2021	2022
4402	Crude Oil Production Sumps	Scheduled	2021	2022
4351	Boilers, Steam Generators, and Process Heaters - Phase 1	Rule superseded by more stringent rules, District Rules 4305, 4306, and 4320	---	---
4405	Oxides of Nitrogen Emissions from Existing Steam Generators Used in Thermally Enhanced Oil Recovery - Central and Western Kern County Fields	Rule superseded by more stringent rules, District Rules 4305, 4306, and 4320	---	---
4406	Sulfur Compounds from Oil-Field Steam Generators - Kern County	Rule superseded by more stringent rules, District Rules 4305, 4306, and 4320	---	---
4305	Boilers, Steam Generators, and Process Heaters - Phase 2	Rule superseded by District Rules 4306 and 4320, more stringent rules	---	---
4701	Internal Combustion Engines - Phase 1	Rule superseded by District Rule 4702, a more stringent rule	---	---
4309	Dryers, Dehydrators, and Ovens	Rule determined to meet BARCT	---	---
4703	Stationary Gas Turbines	Rule determined to meet BARCT	---	---
4306	Boilers, Steam Generators, and Process Heaters - Phase 3	Rule determined to meet BARCT	---	---
4307	Boilers, Steam Generators, and Process Heaters - 2.0 MMBtu/hr to 5.0 MMBtu/hr	Rule determined to meet BARCT	---	---

4320	Advanced Emission Reduction Options for Boilers, Steam Generators, and Process Heaters Greater Than 5.0 MMBtu/hr	Rule determined to meet BARCT	---	---
4311	Flares	Rule determined to meet BARCT	---	---
4354	Glass Melting Furnaces	Rule determined to meet BARCT	---	---
4408	Glycol Dehydration Systems	Rule determined to meet BARCT	---	---
4453	Refinery Vacuum Producing Devices or Systems	Rule determined to meet BARCT	---	---
4612	Motor Vehicle and Mobile Equipment Coating Operations	Rule determined to meet BARCT	---	---
4622	Gasoline Transfer into Motor Vehicle Fuel Tanks	Rule determined to meet BARCT	---	---

UPCOMING 2018 PM2.5 PLAN RULE AMENDMENT EFFORTS

In addition to the BARCT implementation schedule above, the District will be proceeding with amending eight District rules to pursue additional emission reduction opportunities beyond BARCT, included as commitments in the new *2018 PM2.5 Plan* recently adopted by CARB into the State Implementation Plan:

Emissions reductions achieved through the implementation of more stringent limits potentially required through these rule amendments will further contribute to reduced exposure to air pollution in the community. Community Steering Committee members, members of the AB 617-selected community, and the general public are encouraged to be involved in the upcoming rulemaking process for these rules.

Table 4-2: Scheduled District Rule Amendments to Reduce PM2.5

Rule	Title	BARCT Status	PM2.5 Plan Rulemaking Schedule
4901	Wood Burning Fireplaces and Wood Burning Heaters	No units subject to AB 617 BARCT analysis. Rule amended in June, 2019.	2019 (Completed)
4311	Flares	Rule meets or exceeds BARCT	2020
4306 and 4320	Boilers, Steam Generators, and Process Heaters - Phase 3 and Advanced Emission Reduction Options for Boilers, Steam Generators, and Process Heaters Greater than 5.0 MMBtu/hr	Rule meets or exceeds BARCT	2020

Rule	Title	BARCT Status	PM2.5 Plan Rulemaking Schedule
4702	Internal Combustion Engines	Rule meets or exceeds BARCT for NOx, updated AB 617 BARCT determination scheduled for VOCs	2020
4692	Commercial Charbroiling	No units subject to AB 617 BARCT analysis	2020
4352	Solid Fuel-Fired Boilers, Steam Generators and Process Heaters	No units subject to AB 617 BARCT analysis	2021
4354	Glass Melting Furnaces	Rule meets or exceeds BARCT	2021

Further information on the District's expedited BARCT schedule and rule analyses can be found in the staff report presented to the District Governing Board in December, 2018:
http://www.valleyair.org/Board_meetings/GB/agenda_minutes/Agenda/2018/December/final/13.pdf

PERMITTING: BACT AND T-BACT DETERMINATIONS

CARB is developing a Technology Clearinghouse of best available control technologies (BACT) and best available control technologies for toxic air contaminants (T-BACT) determinations for air districts throughout California. The District will use this Technology Clearinghouse as an additional resource for BACT Determinations, and will reference this information when developing BACT and T-BACT technology determinations for any new or modified source permitting processes in the community. More information about the District's stringent new and modified source review process is available in Chapter 3.

FACILITY RISK REDUCTION AUDITS UNDER AB 2588 (AIR TOXICS HOT SPOTS INFORMATION AND ASSESSMENT ACT)

Risk Reduction Audit Plan Facilities within the District

Based on the current facility status, as of September 9, 2019, there are no District permitted facilities subject to a Risk Reduction Audit Plan.

Background

The Air Toxics "Hot Spots" Information and Assessment Act (AB 2588) was enacted in September 1987. Under this act, stationary sources are required to report the types and quantities of certain toxic substances their facilities routinely release into the air. The goals of the Air Toxics "Hot Spots" Act are:

- to identify Valley facilities that release toxic air contaminants as a result of their day to day operations,
- to collect and quantify emission data from equipment located at permitted facilities,

- to identify facilities causing localized health impacts on nearby residents,
- to determine facility-wide health risks resulting from the emission of toxic air contaminants,
- to notify nearby residents and businesses of significant risk facilities in their vicinity, and
- to require that significant risk facilities reduce their risks below the level of significance in accordance with the provisions of the "Emissions Inventory Criteria and Guidelines Report" adopted by the Air Resources Board.

District's Implementation of AB 2588

The District's implementation of AB 2588, California's *Air Toxics "Hot Spots" Information and Assessment Act*, has resulted in major reductions in emissions of air toxics from existing sources in the San Joaquin Valley. Under this right-to-know law, the District has worked with Valley facilities to quantify emissions of air toxics, determine the health risk caused by those emissions, report emissions and any significant risks through written public reports and neighborhood public meetings, and take steps to reduce such risks. As a result of this effort, and the resulting emissions reductions, no Valley facility currently poses a significant risk under this program.

The District's integrated air toxics program fulfills the state AB 2588 Hot Spots mandates, aimed at quantifying and assessing localized health risk, notifying affected residents, and reducing risk from facilities with high risk caused by air toxic emissions. In addition, the District's integrated air toxics program incorporates Airborne Toxic Control Measure (ATCM) regulations promulgated by the Air Resources Board, requiring prescribed control measures for various source categories that cause significant risks at a regional level. Furthermore, the District's integrated program fulfills federal mandates under Title III of the federal Clean Air Act, requiring Maximum Available Control Technology (MACT) for sources of air toxics.

In addition to the state and federal mandates, the District's integrated air toxics program also implements the more stringent local permitting and California Environmental Quality Act (CEQA) requirements, specifically to ensure installation of Best Available Control Technology (BACT) for air toxics and that new permits or modifications to existing facilities will not result in a significant increase in health risk to the public.

The District has spent the last two decades implementing a wide variety of methods to reduce toxic air contaminant emissions in the San Joaquin Valley. Based on the latest California Toxics Inventory, only 14% of all air toxics in the San Joaquin Valley are now emitted from stationary sources of pollution under the direct control and regulation of the District, while 52% comes from mobile sources such as cars and trucks, and the remaining 34% is emitted from area-wide sources like road dust, paints, solvents, and other consumer products. Mobile and area-wide sources of emissions are generally under the regulatory authority of the State of California and the federal government.

The District's integrated approach to addressing and reducing risks from toxic air contaminants has taken three main paths:

- Reducing air toxic emissions from existing stationary sources of emissions;
- Preventing the creation of new or modified stationary sources of significant risk; and
- Finding creative and cooperative methods of reducing risk from emissions sources that the District does not typically regulate.

In 2015, the District began implementing the state Office of Environmental Health Hazard Assessment's (OEHHA's) revised Guidance on Preparation of Health Risk Assessments that was adopted by OEHHA in early March 2015. Following OEHHA revised guidelines, the District began a health risk reassessment of all facilities located in the San Joaquin Valley. The health risk reassessment follows the phased processing schedule outlined in AB 2588, which was originally implemented in the late 80's and early 90's. AB 2588 subjected three major categories (or phases) of facilities to the regulation based upon their level of annual emissions.

Reassessment of facilities subject to the AB2588 Hot Spots regulation is a multi-year process with that has started in 2016, following the phases identified below:

- Phase I Facilities (≥ 25 tons emissions per year)
- Phase II Facilities (10 ≤ tons emissions per year < 25)
- Phase III Facilities (< 10 tons emissions per year)
- Phase IV Facilities (Industry-wide and agricultural facilities)

Prioritizing Facility Health Risks

Based on the emissions inventory, the District is prioritizing each facility's health risk using complex computerized database and modeling programs. A "prioritization" is a conservative health risk assessment screening analysis, resulting in a facility prioritization score used to determine if a more refined health risk assessment is necessary. As part of this process, very conservative assumptions are utilized, with many safety factors built in to determine the worst-case health risk to possible receptors. The purpose of those safety factors is to ensure that the most sensitive receptors (children, elderly, pregnant women and people with weakened immune systems) are protected. Facilities ranked as high priority are required to perform health risk assessments. The District prioritizes and ranks the health risk posed by the facility as "low", "intermediate", or "high" priority, based on the following:

- Low Priority: Prioritization Score ≤ 1
  Facility Exempt from further AB 2588 requirements

- Intermediate Priority: 1 < Prioritization Score ≤ 10
  Facility required to provide Update Summary every four years

- High Priority: Prioritization Score > 10
  Facility required to perform a refined Health Risk

Assessment

Health Risk Assessment Process

When a facility's prioritization score exceeds 10, the facility is classified as "High Priority" and a Health Risk Assessment (HRA) is required for the facility, and such facility is required to submit an HRA for District approval. The District and State Office of Environmental Health Hazard Assessment (OEHHA) are required by the Air Toxics "Hot Spots" Act to review each HRA. Risk calculation involves a great deal of uncertainty. The uncertainty arises from lack of data in many areas necessitating the use of assumptions. As part of this process, again, very conservative assumptions are utilized, with many safety factors built in to determine the worst-case risk to possible receptors. The purpose of those safety factors is to ensure that the most sensitive receptors (children, elderly, pregnant women and people with weakened immune systems) are protected. The assumptions used are designed to be health protective in order to avoid underestimating the risk to the public. Therefore, while the actual risk may be much less than the calculated risk, it is very unlikely to be higher than calculated.

Upon approval of facility HRA, the District determines the facility's health risk status, which is classified as a low risk, intermediate risk, high risk, or risk reduction required, based on the following HRA scores:

- Low Risk: HRA cancer risk $\leq$ 1 in a million, and
  HRA total hazard index of < 0.1
  (Facility Exempt from further AB 2588 requirements)

- Intermediate Risk: 1 $\leq$ HRA cancer risk < 10 in a million, or
  0.1 $\leq$ HRA total hazard index $\leq$ 1.0
  (Facility required to provide update summary on a quadrennial basis)

- High Risk: HRA cancer risk $\geq$ 10 in a million, or
  HRA total hazard index of > 1.0
  (Public Notice)

- Risk Reduction Required: HRA cancer risk $\geq$ 100 in a million cancer, or
  HRA total hazard index of > 5.0
  (Public Notice and Risk Reduction Audit Plan)

Facilities that pose health risks above District action levels are required to submit plans to reduce their risk. The Risk Reduction Audit Plan (RRAP) trigger level for cancer risk is 100 cases per million exposed persons, based on the maximum exposure beyond facility boundaries at a residence or business. The action level (Risk Reduction Audit Plan) for non-cancer risk is a hazard index of 5 at any point beyond the facility boundary where a person could reasonably experience exposure to such a risk.

The District's review of completeness of the facility's RRAP includes a substantive analysis of the emission reduction measures included in the plan, and the ability of those measures to achieve emission reduction goals as quickly as feasible. If the District determines that the RRAP does not meet those requirements, the District shall remand the audit and plan to the facility specifying the deficiencies identified by the District. A facility operator shall submit a RRAP addressing the deficiencies identified by the District within 90 days of receipt of a deficiency notice. An updated prioritization and/or health risk assessment shall be determined based on the approved RRAP.

AB 617 Community Facility Lists with Associated AB 2588 Designations
Assembly Bill 617 requires the California Air Resources Board (CARB) and air districts to develop and implement emissions reporting for disadvantaged communities. With the establishment of the selected community boundaries, the District has put into effect a plan to expedite and streamline the AB 2588 reassessments for facilities located within the selected community of South Central Fresno.

Community-Based AB 2588 Reassessments
Based on previous AB 2588 analyses and on the on-going District's integrated air toxics program, no Valley facilities have been determined to pose significant risk. Therefore, no existing facility(s) have or have been required to prepare a Risk Reduction Audit Plan. However, as mentioned above, the District is currently in the process of reassessing Valley facilities under AB 2588, which includes those in South Central Fresno.

Please refer to Appendix E for further details about the District's Health Risk Assessment Process, and a table identifying the AB 2588 reassessment status of each facility within the community as of September 9, 2019.

ENFORCEMENT STRATEGIES

To support strategies developed in partnership with community members, District staff have developed several enforcement strategies that will enhance the District's robust existing enforcement program in the AB 617-selected community. Information about new enforcement measures that apply to a specific source category of concern to the community have been included in the strategy discussion for that source of concern. These enforcement measures include increased stationary source inspection frequency, increased surveillance to reduce residential burning, free training programs for gasoline dispensing facility operators, and increased enforcement of District rules that control fugitive dust. Further details about all enforcement measures that will apply to South Central Fresno are provided in the CERP Enforcement Plan.

STATEWIDE STRATEGIES

This section provided by the California Air Resources Board

Overview of California Air Resources Board's Statewide Actions

Community-scale air pollution exposure is caused by many factors, including the cumulative impacts from multiple pollution sources. Effective solutions require multiple strategies at both the statewide and local level to deliver new emissions reductions directly within these communities.

The California Air Resources Board (CARB) has adopted a number of comprehensive air quality and climate plans over the last several years that lay out new emissions reduction strategies. These plans include the State Strategy for the State Implementation Plan,[9] the California Sustainable Freight Action Plan,[10] California's 2017 Climate Change Scoping Plan,[11] and the Short-Lived Climate Pollutants Reduction Strategy,[12] along with a suite of incentive programs. The Community Air Protection Blueprint[13] further identified additional actions to reduce the air pollution burden in heavily impacted communities throughout the State. Together, these plans provide a foundation for the new actions identified as part of this community emissions reduction program.

This section illustrates CARB's statewide role in the community emissions reduction program, by broadly describing the regulatory, enforcement, and incentive-based actions CARB has taken to reduce emissions statewide. It also highlights specific foundational CARB actions that address areas of concern identified by the South Central Fresno community.

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[9] California Air Resources Board, *Revised Proposed 2016 State Strategy for the State Implementation Plan*, March 7, 2017, available at: www.arb.ca.gov/planning/sip/sip.htm.

[10] California Department of Transportation, *California Sustainable Freight Action Plan*, July 2016, available at: http://www.dot.ca.gov/hq/tpp/offices/ogm/cs_freight_action_plan/theplan.html.

[11] California Air Resources Board, *California's 2017 Climate Change Scoping Plan*, November 2017, available at: www.arb.ca.gov/cc/scopingplan/scopingplan.htm.

[12] California Air Resources Board, *Short-Lived Climate Pollutant Reduction Strategy*, March 2017, available at: www.arb.ca.gov/cc/shortlived/shortlived.htm.

[13] California Air Resources Board, *Final Community Air Protection Blueprint for Selecting Communities, Preparing Community Emissions Reduction Programs, Identifying Statewide Strategies, and Conducting Community Air Monitoring*, October, 2018, available at: https://ww2.arb.ca.gov/our-work/programs/Community-Air-Protection-Program.

REGULATORY PROGRAMS

Federal, State, and local air quality agencies all work together to reduce emissions. At the federal level, the U.S. Environmental Protection Agency (U.S. EPA) has primary authority to control emissions from certain mobile sources, including sources that are all or partly under federal jurisdiction (e.g., some farm and construction equipment, aircraft, marine vessels, locomotives), which it shares in some cases with air districts and CARB. The U.S. EPA also establishes ambient air quality standards for some air pollutants.

At the State level, CARB is responsible for controlling emissions from mobile sources and consumer products (except where federal law preempts CARB's authority), controlling toxic emissions from mobile and stationary sources, controlling greenhouse gases from mobile and stationary sources, developing fuel specifications, and coordinating State-level air quality planning strategies with other agencies.

Regionally, air districts are primarily responsible for controlling emissions from stationary and indirect sources (with the exception of consumer products in most cases) through rules and permitting programs within their regions.

CARB regulatory programs are designed to reduce emissions to protect public health, achieve air quality standards, reduce greenhouse gas emissions, and reduce exposure to toxic air contaminants. CARB establishes regulatory requirements for cleaner technologies (both zero and near-zero emissions) and their deployment into the fleet, for cleaner fuels, and to ensure in-use performance. CARB's regulatory programs are broad – impacting stationary sources, mobile sources, and multiple points within product supply chains from manufacturers to distributors, retailers, and end-users. CARB's regulations affect cars, trucks, ships, off-road equipment, consumer products, fuels, and stationary sources.

One important and relevant regulatory authority of CARB's is to adopt measures to reduce emissions of toxic air contaminants from mobile and non-mobile sources, known as Airborne Toxic Control Measures (ATCM).[14] These regulatory measures include process requirements, emissions limits, or technology requirements. Additionally, CARB implements the Statewide Air Toxics "Hot Spots" Program[15] to address the health risk from toxic air contaminants at individual facilities across the State. The Air Toxics "Hot Spots" Program includes several components to collect emissions data, identify facilities having localized impacts, ascertain health risks, notify nearby residents of significant risks, and reduce those significant risks to acceptable levels.

Under the Air Toxics "Hot Spots" Program, air districts are required to set a threshold for facilities that pose a significant health risk and prioritize facilities for health risk

[14] California Health and Safety Code § 39650 et seq.

[15] Assembly Bill 2588, Air Toxics "Hot Spots" Information and Assessment Act, Connelly, Statutes of 1987, California Health and Safety Code § 44300 et seq.

assessments. Air districts also establish a risk value above which facilities must conduct a risk reduction audit and emissions reduction plan. Facilities must develop these health risk assessments, risk reduction audits, and emission reduction plans. CARB provides technical guidance to support smaller businesses conducting health risk assessments and developing emissions reduction plans.

Additionally, CARB has pursued enforceable agreements with industry that result in voluntary but enforceable adoption of the cleanest technologies or practices and provide assurance that emissions reductions will be realized. CARB's agreement with the Union Pacific Railroad Company and BNSF Railway Company to accelerate introduction of cleaner locomotives in the South Coast Air Basin is an example of an enforceable agreement.

For more information on CARB's Air Toxics "Hot Spots" Program, visit: https://www.arb.ca.gov/ab2588/ab2588.htm. For more detailed information on CARB's statewide emissions reduction strategies, see Appendix C of the Community Air Protection Blueprint at: https://ww2.arb.ca.gov/our-work/programs/community-air-protection-program.

ENFORCEMENT PROGRAMS

To achieve the reductions associated with rules and regulations, regulated entities must comply with requirements and technology must function as expected. CARB's goal, set out in more detail in statute and in its Enforcement Policy, is to achieve comprehensive compliance with every regulation the CARB Governing Board has adopted, and the Enforcement Program finds violations, investigates cases, and resolves cases through either the administrative settlement process, or litigation. CARB's enforcement efforts encompass a broad spectrum of programs, including certification requirements for vehicles, engines, aftermarket parts, consumer products, and fuels; in-use fleet requirements focused on diesel mobile sources; and greenhouse gas standards for stationary sources.

CARB settlement of enforcement cases can also fund Supplemental Environmental Projects, which are not otherwise required by law or regulation but benefit air quality by reducing emissions, reducing exposure to air pollution, or preventing future air quality violations. [16] Examples of Supplemental Environmental Projects include installation of air filtration systems in schools, increasing services to children with asthma, and school bus and diesel emissions reduction projects.

One critical and relevant enforcement program is CARB's continued effort to streamline the Truck and Bus Regulation enforcement process.[17] This work is closely linked to

[16] California Air Resources Board, Supplemental Environmental Project (SEP) Policy (Oct. 4, 2017) available at https://ww2.arb.ca.gov/resources/fact-sheets/supplemental-environmental-projects

[17] For more information on the Truck and Bus Regulation, visit:

http://www.arb.ca.gov/msprog/onrdiesel/onrdiesel.htm.

implementation of Senate Bill 1,[18] which ties truck registration in California to compliance with the Truck and Bus Regulation. Once fully implemented, CARB's Enforcement Program will identify potential violators through Department of Motor Vehicles' registrations, notify potential violators, give violators an opportunity to prove compliance, and finally place registration holds on all trucks that do not comply with the regulation. This process is expected to significantly improve the compliance rate with the Truck and Bus Regulation and improve air quality along trucking corridors in California.

For more detailed information on CARB's Enforcement Programs, visit: https://www.arb.ca.gov/enf/enf.htm.

INCENTIVE PROGRAMS

CARB operates incentive programs that reduce the costs of developing, purchasing, or operating cleaner technologies. The programs help ensure cleaner cars, trucks, equipment, and facilities are operating in our neighborhoods by driving the development of new, cleaner technologies, and by accelerating their sale and adoption. Specifically, they accelerate the introduction of advanced technology vehicles and equipment, accelerate the turnover of older and higher emitting vehicles and equipment, and increase access to clean vehicles and transportation in disadvantaged communities and lower-income households.

Examples of CARB incentive programs include the Carl Moyer Memorial Air Quality Standards Attainment Program[19] (the Community Air Protection Incentives[20] are implemented by the air district through this program), Proposition 1B: Goods Movement Emission Reduction Program,[21] Funding Agricultural Replacement Measures for Emission Reductions Program,[22] and Low Carbon Transportation Investments and Air Quality Improvement Program (which includes the Hybrid and Zero-Emission Truck and

[18] California Vehicle Code § 4000.15(a).

[19] For more information on the Carl Moyer Memorial Air Quality Standards Attainment Program, visit: https://www.arb.ca.gov/msprog/moyer/moyer.htm.

[20] For more information on the Community Air Protection Incentives, visit: https://www.arb.ca.gov/msprog/cap/capfunds.htm

[21] For more information on the Proposition 1B: Goods Movement Emission Reduction Program, visit: https://www.arb.ca.gov/bonds/gmbond/gmbond.htm.

[22] For more information on the Funding Agricultural Replacement Measures for Emission Reductions Program, visit: https://ww2.arb.ca.gov/our-work/programs/farmer-program.

Bus Voucher Incentive Project).[23] While CARB is responsible for program oversight, some of these programs are implemented as a partnership with local air districts.

For more information on air pollution incentives, grants, and credit programs, visit: https://www.arb.ca.gov/ba/fininfo.htm.

CARB Actions Related to the South Central Fresno Community

This section highlights CARB actions that specifically relate to the South Central Fresno community. This list should not be interpreted as comprehensive or exhaustive, but rather illustrative of some of the major statewide strategies driving emissions reductions in conjunction with those local level strategies identified in this community emissions reduction program. The full list of CARB foundational strategies can be found in Appendix D and Appendix F of the Community Air Protection Blueprint.[24]

Real Emissions Assessment Logging System – As part of an on-board diagnostic regulation, a new emissions tracking program for excess smog-related and greenhouse gas emissions (Real Emissions Assessment Logging) will provide CARB with the ability to monitor emissions performance of all vehicles, including medium- and heavy-duty vehicles, allowing regulators to recognize and correct problems faster. For more information on the regulation and the emissions tracking program, visit: https://ww2.arb.ca.gov/news/carb-gets-real-further-cut-pollution-diesel-and-gas-vehicles.

Heavy-Duty On-Road and Off-Road Engine In-Use Testing – CARB is working through a public process to consider implementation of Heavy-Duty On-Road and Off-Road Engine In-Use Testing to use real world screening of heavy-duty trucks and off-road engines operating in selected communities to target heavy-duty in-use compliance testing. Engines emitting above expected levels may be brought into CARB's in-use compliance program. Non-compliant engines may be recalled and emission mitigation projects could include the deployment of zero emission technology in selected environmental justice communities. For more information, see Appendix F, page F-8, of the Community Air Protection Blueprint.

Reducing Emissions from Oil and Gas Systems – The Short-Lived Climate Pollutant Reduction Strategy establishes a goal of reducing fugitive methane emissions from oil and gas by 40 percent below current levels in 2025 and a minimum 45 percent in 2030,

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[23] For more information on the Low Carbon Transportation Investments and Air Quality Improvement Program, visit: https://ww2.arb.ca.gov/our-work/programs/low-carbon-transportation-investments-and-air-quality-improvement-program.

[24] California Air Resources Board, *Final Community Air Protection Blueprint for Selecting Communities, Preparing Community Emissions Reduction Programs, Identifying Statewide Strategies, and Conducting Community Air Monitoring*, October, 2018, available at: https://ww2.arb.ca.gov/our-work/programs/Community-Air-Protection-Program.

and from all other sources by 40 percent in 2030. In addition to California's comprehensive and stringent emerging framework to reduce methane emissions from oil and gas systems, in 2017 CARB adopted and is now implementing, with the help of the local air districts, a regulation that will reduce fugitive methane emissions by about 44 percent by 2021 from the oil and gas production, processing, and storage sector. This regulation is also estimated to reduce volatile organic compounds emissions from oil and gas operations statewide by over 3,600 tons per year, and to reduce toxic air contaminant emissions (such as benzene, toluene, ethyl-benzene, and xylenes) by over 100 tons per year statewide from oil and gas operations. For more information on the Short-Lived Climate Pollutant Reduction Strategy, visit: https://www.arb.ca.gov/cc/shortlived/shortlived.htm. For more information on the Oil and Gas Methane Regulation, visit: https://ww2.arb.ca.gov/resources/fact-sheets/oil-and-gas-methane-regulation.

Freight Handbook – CARB is developing a handbook that identifies best practices for the siting, design, construction, and operation of freight facilities to minimize community exposure to air pollution. The handbook is intended to serve as a tool for local governments and community advocates to use in local land use planning and permitting decisions. The handbook will contain recommendations that local governments and freight facility developers, builders, and operators should integrate zero emission operations and technologies, and incorporate supporting infrastructure into project design. When implemented, the recommendations should lead to improved regulatory review processes, increased operational efficiencies, and reduced costs to business. For more information on the handbook, visit: https://www.arb.ca.gov/gmp/sfti/sfti.htm.

Transport Refrigeration Unit Regulations – Transport refrigeration units congregate at distribution centers and other facilities, resulting in the potential for health risks to those that live and work nearby. CARB is working through a public process to consider new requirements to transition the transport refrigeration units fleet to zero emission operations by requiring both zero emission technology and supporting infrastructure. For more information on this new regulation, visit: https://ww2.arb.ca.gov/our-work/programs/transport-refrigeration-unit/new-transport-refrigeration-unit-regulation.

Drayage Truck Regulation Amendments – CARB's Truck and Bus Regulation requires diesel trucks and buses that operate in California to be upgraded to reduce emissions. CARB's Drayage Truck Regulation currently requires all drayage trucks to meet or exceed 2007 federal engine standards. Additionally, over the next several years, CARB will be working through a public process to consider amendments to the Drayage Truck Regulation that may transition the drayage fleet to zero emission operations. For more information on the regulation, visit: https://arb.ca.gov/msprog/onroad/porttruck/porttruck.htm.

Advanced Clean Trucks Regulation – CARB is working through a public process to develop and consider proposals for new approaches and strategies that may transition to zero emission technology those truck fleets that operate in urban centers, have stop and go driving cycles, and are centrally maintained and fueled. *District note: CARB*

reports that by 2024, this measure is estimated to reduce 0.01 tons per year of PM2.5, 0.2 tons per year of NOx, and 0.001 tons per year of diesel PM. By 2029, this measure is estimated to reduce 0.1 tons per year of PM2.5, 4.2 tons per year of NOx, and 0.02 tons per year of diesel PM emissions in the community.

For more information on the proposed regulation, visit: https://ww2.arb.ca.gov/our-work/programs/advanced-clean-truck.

Heavy-Duty Vehicle Inspection and Maintenance – When emissions control systems are not operating correctly, in-use emissions can increase. CARB's current inspection programs include the roadside Heavy-Duty Vehicle Inspection Program and the fleet Periodic Smoke Inspection Program. These regulations require heavy-duty vehicles operating in California to be inspected for excessive smoke and tampering.

In July 2018, CARB approved amendments to the Heavy-Duty Vehicle Inspection Program and the Periodic Smoke Inspection Program to reduce the smoke opacity limits to levels more appropriate for today's modern engine technology. CARB is now exploring the development of a more comprehensive heavy-duty inspection and maintenance program which would help ensure all vehicle emissions control systems are adequately maintained throughout the vehicles' operating lives. *District note: CARB reports that by 2024, this measure is estimated to reduce 0.9 tons per year of PM2.5 (diesel PM) and 59 tons per year of NOx. By 2029, this measure is estimated to reduce 1.0 ton per year of PM2.5 (diesel PM) and 72.6 tons per year of NOx emissions in the community.*

For more information on existing heavy-duty maintenance programs, visit: https://www.arb.ca.gov/enf/hdvip/hdvip.htm. For more information on the development of a comprehensive heavy-duty inspection and maintenance program, visit: https://ww2.arb.ca.gov/our-work/programs/heavy-duty-inspection-and-maintenance-program.

Advanced Clean Cars 2 – CARB would consider expanded California-specific standards for new light-duty vehicles, impacting 2026 and later model year vehicles, to increase the number of new zero emission and plug-in hybrid electric vehicles sold in California and increase the stringency of fleet-wide emission standards for greenhouse gases and criteria pollutants. *District note: CARB reports that by 2029, this measure is estimated to reduce 0.02 tons per year of PM2.5 and 1.08 tons per year of NOx emissions in the community.*

For more information on the Advanced Clean Car Program, visit: https://ww2.arb.ca.gov/our-work/programs/advanced-clean-cars-program.

Small Off-Road Engines – In 2020, CARB will consider new standards for small off-road engines (SORE), which are spark-ignition engines rated at or below 19 kilowatts and used primarily for lawn, garden, and other outdoor power equipment. *District note: CARB reports that by 2024, this measure is estimated to reduce 1.4 tons per year of*

NOx. By 2029, this measure is estimated to reduce 3.2 tons per year of NOx emissions in the community.

For more information on Small Off-Road Engines, visit: https://ww2.arb.ca.gov/our-work/programs/small-off-road-engines-sore.

Commercial Cooking Suggested Control Measure – This strategy consists of a two-phase process to evaluate California's current emission reduction requirements for commercial cooking operations that prepare food for human consumption, and if necessary, make improvements to achieve additional reductions in particulate matter 10 microns or less in diameter (PM10), particulate matter 2.5 microns or less in diameter (PM2.5) and volatile organic compound emissions that contribute to ozone formation. For more information on this measure, see Appendix F, pages F-8 and F-9, of the Community Air Protection Blueprint.

Evaluation and Potential Development of Regulation to Reduce Idling for All Rail Yard Sources – This strategy will require operators to limit idling of all combustion powered vehicles and mobile equipment operating at rail yards and other locations, as well as reducing emissions from stationary locomotive operations (e.g., maintenance, testing). The scope will include both freight and passenger rail activities, in and around intermodal, classification, and maintenance rail yards, at seaports, at warehouses, on sidings, at passenger rail stations, and at maintenance and service locations. Locomotives with zero emission capability could be exempt, if operators show that zero emission operation is maximized. For more information on this potential regulation, see Appendix F, page F-5, of the Community Air Protection Blueprint.

Evaluation and Potential Development of Regulation to Reduce Emissions for Locomotives not Preempted Under the Clean Air Act – This strategy will require the retrofit, repower, remanufacture, or replacement of freight and passenger locomotives not preempted under the Clean Air Act, beginning in 2025. Locomotives in operation beyond their useful life are typically operated by Class 3 freight railroads, industrial facilities, and passenger railroads, as well as a smaller number run by Class I railroads that can readily transfer those units to other states. Although the activity levels on these locomotives are lower than interstate line-haul and passenger locomotives, locomotives past their useful lives are the oldest and highest emitting (per unit of work performed) in the State. Prioritizing the earliest implementation in communities with high cumulative exposure burdens will be considered as part of this strategy.

As an alternative, CARB could also consider a voluntary agreement with the major railroads to secure greater community health benefits by reducing emissions from interstate locomotives (the dominant source of emissions and community health risk at rail yards), if that agreement was developed in a transparent public process and included clear enforcement provisions. For more information on this potential strategy, see Appendix F, pages F-5 and F-6, of the Community Air Protection Blueprint.

Conduct Periodic Supplemental Environmental Projects Outreach – Supplemental Environmental Projects allows penalties collected from settlements to be used for projects that provide air quality benefits within communities throughout the State.

This strategy commits CARB to conducting outreach to impacted communities so CARB staff can identify where funds from Supplemental Environmental Projects can best be applied, and working to match Supplemental Environmental Projects with available settlements that have a common nexus. CARB staff will conduct periodic meetings throughout the State. CARB staff will utilize the ideas received from community members to determine what needs can be met through Supplemental Environmental Projects, and work to put those projects in place. For more information on these measures, see Appendix F, page F-24, of the Community Air Protection Blueprint.

Cargo Handling Equipment Amendment – This strategy will amend the existing Cargo Handling Equipment regulation. This regulation applies to mobile equipment such as yard trucks, rubber-tired gantry cranes, container handlers, and forklifts that operate at ports or intermodal rail yards. The strategy will propose an implementation schedule for new equipment and infrastructure requirements, with a focus on the transition to zero emission operation, and may include provisions for efficiency improvements. For more information on the Cargo Handling Equipment Amendment visit: https://ww2.arb.ca.gov/our-work/programs/cargo-handling-equipment.

Chrome Plating Control Measure Amendments – This strategy will amend the current regulation on chrome plating to further reduce toxic air contaminants at chrome plating facilities. In December 2006, CARB approved the proposed amendments to the Hexavalent Chromium Airborne Toxic Control Measure for Chrome Plating and Chromic Acid Anodizing Operations (Chrome Plating ATCM). The Chrome Plating ATCM requires the use of control technologies and operational practices that reduce hexavalent chromium emissions to their lowest levels. Facilities are subject to hexavalent chromium emission limits based on throughput and distance to sensitive receptors. Certain facilities are required to install add-on air pollution control devices and other facilities can meet the emissions limit through the use of chemical fume suppressants.

CARB staff will amend the existing chrome plating regulation to incorporate provisions to align with the federal chrome plating regulation and consider additional measures to further reduce emissions from chrome plating operations. The amendments will include the prohibition of perfluorooctane sulfonate containing fume suppressants (as required by federal regulation), changes to the surface tension requirements, and other actions to reduce uncontrolled emissions. CARB staff will also evaluate less toxic alternatives to hexavalent chromium and options to phase out perfluorinated chemicals used in fume suppressants. For more information on these measures, see Appendix F, pages F-6 and F-7, of the Community Air Protection Blueprint.

Composite Wood Products Control Measure Amendments – This strategy will amend the CARB Composite Wood Products Airborne Toxic Control Measure (ATCM),

approved in 2007. The Composite Wood Products ATCM established formaldehyde emission standards for three types of composite wood products (hardwood plywood, particleboard, and medium density fiberboard) and requires that all consumer goods that contain such materials (e.g., flooring, cabinets, furniture) destined for sale in California must comply with the Composite Wood Products ATCM.

CARB staff will amend the existing Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products, to obtain additional formaldehyde emission reductions, clarify requirements and applicability, improve enforceability, and align with the U.S. Environmental Protection Agency formaldehyde regulation, where appropriate. (Note: CARB cannot enforce the U.S. Environmental Protection Agency formaldehyde in composite wood regulation, because it was adopted under the Toxic Substances Control Act). For more information on the Composite Wood Products ATCM visit: https://ww2.arb.ca.gov/our-work/programs/composite-wood-products-program.

Catalytic Converter Theft Reduction – This strategy consists of a regulation and/or compliance assistance to deter thefts of vehicle catalytic convertors in communities selected for the Community Air Protection Program.

This strategy will include a regulation and/or compliance assistance to reduce theft of vehicle catalytic converters in communities selected through the community identification and selection process. A regulation will require manufacturers to stamp catalytic converters with a vehicle identification number. Compliance assistance would offer free vehicle identification number stamping on converters in communities selected through the community assessment process. This strategy will make it easier for the recycler to identify stolen catalytic converters. For more information on this strategy, see Appendix F, pages F-7 and F-8, of the Community Air Protection Blueprint.

Heavy Duty On-Road and Off-Road Engine In-Use Testing – This strategy will involve real world screening of heavy-duty trucks and off-road engines operating in selected communities to target heavy-duty in-use compliance testing. Engines that are found to be emitting above expected levels will be brought into CARB's in-use compliance program. Engines found to be in noncompliance will be recalled and emission mitigation projects could include, deployment of zero emission technology in selected environmental justice communities. For more information on this strategy, see Appendix F, page F-8, of the Community Air Protection Blueprint.

EMISSION REDUCTION TARGETS

The CARB Community Air Protection Blueprint contains guidance for calculating emission reduction targets in the community. To estimate the emissions reductions expected for each proposed measure, the District first established specific, numerical goals for the deployment or implementation of technology and control techniques that can deliver emissions reductions. Estimated emission reductions for each strategy that will achieve quantifiable reductions are summarized in the table below.

Table 4-3 Estimated Emission Reductions for District Measures

						Total Reductions in 2024		Total Reductions in 2029	
Measure #	**Measure Description**	**# of Units**	**Unit Life**	**Funding Amount**	**Timeframe**	**PM2.5**	**NOX**	**PM2.5**	**NOX**
	Heavy Duty Mobile Sources								
HD.1	Provide Enhanced Incentive Funding for Zero and Near-Zero Emission Technology	75	5	$7,500,000	2019-2024	0.14	49.20	Reductions occur before 2029	
HD.2	Deployment of Zero Emission Yard Trucks and Truck Refrigeration Units (TRUs)	25	5	$3,500,000	2020-2024	0.16	0.90		
HD.3	Measures to Reduce Idling: Charging Plugs for Trucks	33	5	$100,000	2020-2024	0.03	2.07		
HD.7	Enhance Outreach and Access to Incentive Funding for New School Buses	16	10	$6,400,000	2019-2024	0.83	2.08	0.83	2.08
HD.9	Incentives for Locomotives	2	15	$5,200,000	2021	0.19	8.40	0.19	8.40
HD.10	Incentives for Railcar Movers/Switchers	3	15	$4,100,000	2020-2024	0.12	4.43	0.12	4.43
	Older/High Polluting Passenger Cars								
C.1	Host Tune-In Tune-Up Events within Community	1250	1	$1,000,000	2020	0.00	1.15	0.00	1.15
C.2	Enhanced Access/Outreach to Incentives through Drive Clean	220	10	$1,600,000	2019	0.01	0.20	0.01	0.20
	Residential Wood Burning								
RB.1	Provide Enhanced Incentives to Replace Wood Burning Devices	500	20	$1,500,000	2019-2024	12.30	0.00	12.30	0.00
	Land Use and Urban Sources								
CC.1	Incentives to reduce PM from commercial underfired charbroilers	8	10	$1,200,000	2020	5.84	0.01	5.84	0.01

LG.1	Provide Enhanced Incentives for Replacement of Residential Lawn and Garden Equipment	570	10	$200,000	2019-2024	0.01	0.02	0.01	0.02
Subtotal: District Measures						**19.63**	**68.46**	**19.3**	**16.29**

CARB provided the following information regarding 2024 and 2029 emissions reductions for each proposed statewide measure regulation/amendment (see tables below). CARB calculated these emission reductions by applying the 2024 and 2029 statewide benefits to the community-scale baseline forecasted inventories for 2024 and 2029. These emissions represent the estimated reductions of each pollutant within the years 2024 and 2029, with the implementation of the proposed statewide measures.

Table 4-4: Baseline Emissions (tpy) for Proposed State Measures

Proposed Statewide Measures	**Baseline Emissions (tons per year)**							
	PM2.5		**DPM**		**NOx**		**VOC**	
Year	2024	2029	2024	2029	2024	2029	2024	2029
Advanced Clean Car 2		1.5		0.04		67.7		129.8
Advanced Clean Truck	11.0	11.2	3.0	2.8	468.0	456.7		
Heavy-Duty Inspection and Maintenance	2.4	2.4	2.4	2.4	415.4	429.1		
Small Off-Road Engine Amendment					14.4	14.7	62.6	65.1

Table 4-5: Estimated Emission Reductions in Community (tpy) for Proposed State Measures

Proposed Statewide Measures	**Emission Reductions (tons per year)**							
	PM2.5		**DPM**		**NOx**		**VOC**	
Year	2024	2029	2024	2029	2024	2029	2024	2029
Advanced Clean Car 2		0.020		0.001		1.083		0.4
Advanced Clean Truck	0.01	0.1	0.001	0.02	0.2	4.2		
Heavy-Duty Inspection and Maintenance	0.9	1.0	0.9	1.0	59.0	72.6		
Small Off-Road Engine Amendment					1.4	3.2	17.6	28.5

Table 4-6: Estimated Emission Reductions in Community (tpy) for Proposed State Measures

Proposed Statewide Measures	Reduction Percentage (%)							
	PM2.5		DPM		NOx		VOC	
Year	2024	2029	2024	2029	2024	2029	2024	2029
Advanced Clean Car 2		1.34%		1.34%		1.60%		0.33%
Advanced Clean Truck	0.06%	1.10%	0.02%	0.67%	0.04%	0.91%		
Heavy-Duty Inspection and Maintenance	37.33%	42.29%	37.33%	42.29%	14.21%	16.92%		
Small Off-Road Engine Amendment					9.72%	21.89%	28.13%	43.84%

5. ENFORCEMENT PLAN

5.1 INTRODUCTION

Enforcement of air quality rules and regulations by the San Joaquin Valley Air Pollution Control District (District) and the California Air Resources Board (CARB) is critical to continuing air quality progress and achieving the air quality goals contained in the Valley's State Implementation Plans. Compliance with federal, state, and local air quality rules and regulations is ensured by operating robust inspection programs along with a full range of educational and compliance assistance programs.

This Enforcement Plan describes the stationary and mobile source enforcement history for the South Central Fresno community. In addition, the plan describes the overall enforcement programs operated by the District and CARB. Based on the analysis of the enforcement history and input from the Community Steering Committee, the Community Emissions Reduction Plan (CERP) includes focused enforcement measures to enhance enforcement and compliance assistance activities within the community in support of the emission reduction commitments in the CERP.

5.2 OVERVIEW OF SAN JOAQUIN VALLEY AIR POLLUTION CONTROL DISTRICT ENFORCEMENT PROGRAM

The District's mission is to improve the health and quality of life for all Valley residents through efficient, effective, and entrepreneurial air quality management strategies. The District's Enforcement Department seeks to aid in achieving this mission through fair, consistent, and comprehensive enforcement utilizing a full suite of enforcement and compliance assistance related activities to ensure compliance with District, state and federal rules and regulations. The program objectives for the Enforcement Department are set forth in federal and state law and the District's air quality attainment plans. In order to meet these program objectives, District staff perform inspections at approximately 9,200 permitted facilities and at approximately 5,600 agricultural operations, responds to approximately 3,000 public complaints, and verifies emissions reductions at thousands of locations where emission reduction incentive projects have been implemented.

The major functions of the District's Enforcement Department are as follows:

Inspections of Stationary Sources

The District performs thousands of comprehensive on-site inspections each year to ensure compliance with District requirements. These compliance evaluations are unannounced whenever possible and play a key part to meeting clean air requirements. The frequency of regular inspections depends on the type of facility. When considering limited resources, priority is given to federal Title V (Major) sources, facilities that emit non-attainment criteria or toxic pollutants, facilities with equipment that is more susceptible to upsets, compliance history of operation, etc. Under this scenario, a chrome plating facility will be inspected more frequently than a back-up, emergency generator which only operates a few hours per year.

Compliance inspections are conducted by well-trained District air quality inspectors. Inspections include a physical inspection of the facility and equipment, a review of operating and monitoring records, and the use of advanced detection equipment, where appropriate, to determine compliance with permitted emission limits. During the inspection, District staff ensures that the equipment is permitted appropriately, and that the facility is operating in compliance with all permit requirements and applicable local, state, and federal regulations. If the facility is determined to be in non-compliance, the inspector issues the facility an enforcement action that requires prompt correction of the issue and generally results in the imposition of a civil penalty.

Complaint Investigations

The District receives thousands of complaints each year for which timely responses and investigations of alleged sources of non-compliance are top priorities. Inspectors are on-call 24 hours per day and use automated voicemail and computer systems to facilitate the timely response to complaints in order to abate potential public nuisances. Along these same lines, the District added the ability to easily submit complaints, including video and photographs, online and through mobile smartphone applications. District staff are required to keep the reporting party apprised of the investigation findings until it has been completed. The District provides a bilingual (Spanish-English) telephone complaint line and also has the capability to utilize multilingual translation services, in the field or over the telephone, to ensure that all communities and groups within the Valley are properly served.

Emissions Testing

District inspectors oversee hundreds of third-party emissions tests conducted at stationary sources each year for the purpose of measuring air pollutants and ensuring compliance with established standards. District staff have three main tasks when overseeing source tests at stationary source sites. First they review the source test protocol, submitted by the third party source testing contractor. District staff reviews the protocol to ensure the proper testing will be conducted and that the source test contractor has the proper equipment and certifications to conduct the test. The second task is to witness the test to ensure the source test contractor follows the correct test procedures. Lastly, District staff reviews the source test results to ensure the data is properly reported and to act promptly on any compliance issues related to the testing.

In addition, the District utilizes its monitoring van and portable exhaust gas analyzers to assess the emissions from internal combustion engines, boilers, and other combustion devices to ensure they are operating according to specifications and complying with all permitted and/or rule emission limits.

Gasoline Station Permitting, Inspecting and Testing Program

Gasoline stations, in aggregate, are one of the largest potential sources of volatile organic compounds in the Valley. A comprehensive and effective permitting, inspection and testing program is important to ensure the vapor recovery systems operate as designed and the Valley realizes the emission reductions anticipated in Rule 4621

(Gasoline Transfer Into Stationary Storage Containers, Delivery Vessels and Bulk Plants) and Rule 4622 (Gasoline Transfer into Motor Vehicle Fuel Tanks).

District staff continues to inspect gasoline station vapor recovery systems on a routine basis looking for torn hoses, damaged nozzles, and missing parts. However, during recent years there have been many changes in vapor recovery technology and state laws such that the simple visual inspections are no longer sufficient. More emphasis is now being placed on performance tests that evaluate gasoline station equipment effectiveness. As a result, the District implemented a gasoline dispensing tester certification and training program to ensure qualified third party contractors are available for operators of this equipment.

Agricultural and Prescribed Burning

Agricultural burning in the San Joaquin Valley is closely regulated by the District. Legislation is phasing out such activity, but it is still allowed for a few crop types where there are no economically or technologically feasible alternatives to burning available. In accordance with state law, on a daily basis District staff determines when, how much, and where burning can occur.

District staff utilizes a sophisticated Smoke Management System (SMS) to determine the burn status. Air quality and meteorological conditions determine if burning is allowed. The SMS divides the Valley into over 100 zones. Each zone is analyzed and given a burn status and permissible burn acreage allocation. The goal of the SMS is to protect the public and prevent violations of air quality standards.

In order for a farmer to burn, they must first receive a District permit and must receive approval to burn each day they wish to do so. Field staff monitors burning to ensure only authorized materials are burned and that best management practices are followed to minimize smoke impacts to the public.

Prescribed burning by land management agencies is another activity regulated by the District. In accordance with state requirements, the District reviews burn plans, provides burn authorizations, and monitors the fires. District staff also has an ongoing dialogue with Land Management Agencies (LMAs) and other air districts to improve communication and cooperation among all parties when planning fires and while the fires are burning.

State leaders and agencies are recognizing the need for decisive actions to restore California's forested lands to resiliency. As a result, there was a need to develop potential changes to the District's policies and procedures to facilitate a more effective use of prescribed burning. Based on this direction, and in collaboration with local LMAs, over the last several years the District has employed more flexible policies to facilitate the use of prescribed burning as a tool to reduce fuel more rapidly. Examples of these efforts include identifying ways to facilitate the more effective use of prescribed burning and other practices as means to reduce the number and severity of future wildfires, supporting federal and state legislation to increase funding for land and forest management, developing a targeted public education campaign regarding wildfires, and

working with state and federal land managers to formulate new strategies to reduce fuel-buildup and address wildfire emissions.

Wood Burning Heaters and Fireplaces

Further reducing residential wood smoke emissions is a high priority under the District's 2018 PM2.5 Plan given the significant localized health impacts associated with residential wood smoke. Scientific studies show that prolonged inhalation of wood smoke contributes to lung disease, pulmonary arterial hypertension, and pulmonary heart disease, which can eventually lead to heart failure. District Rule 4901 is designed to improve public health by reducing toxic wood smoke emissions in Valley neighborhoods during the peak PM2.5 winter season (November through February).

Since 2004, the District has had a robust enforcement program for designated wood burning curtailment days to ensure the District is achieving the expected emission reductions as a result of the requirements of the rule. This includes having a significant portion of field staff mandatorily assigned to conduct proactive surveillance in counties with declared wood burning curtailments. The District also conducts surveillance in counties with curtailments on days that District offices are closed and performs periodic night-time surveillance throughout the Check Before You Burn season.

In the District's ongoing efforts to utilize the latest forms of technology to improve efficiency and effectiveness, the District tested several technologies for nighttime fireplace and wood burning heater enforcement. The District purchased ultra-low light cameras, which has the greatest capacity to capture non-compliance through photographic and video evidence. The use of the cameras are able to clearly document smoke coming from chimneys in extremely low-light conditions in a way that previous technologies used and tested were unable to match.

Compliance Assistance

The District believes in working closely with businesses and residents to assist in achieving compliance with air pollution rules and regulations. The Compliance Assistance program has emphasized an educational approach to help Valley residents and businesses comply with a variety of air pollution regulations. Businesses and individuals throughout the Valley are provided with:

- **Individualized Assistance:** Personal, one-on-one help is provided to thousands of businesses and individuals to ensure they understand the District's requirements.

- **Compliance Assistance Bulletins:** Actively evaluate upcoming rule compliance dates and develop educational materials that are sent to affected groups including, but not limited to, realtors, building departments, contractors, industrial and commercial facilities, farmers, and residents.

- **Compliance Schools:** Training classes provide information on the topics of open burning, gasoline vapor recovery and wood burning fireplaces and wood burning heaters.

- **Gasoline Station Tester Training:** Ongoing training for contractors is provided for those wishing to perform vapor recovery tests within the District. District rules require testers be certified to ensure there is a qualified pool of contractors from which stakeholders can choose to perform their equipment's testing.

- **Asbestos Training:** Comprehensive assistance on asbestos regulations is provided to the public, building industry, building departments, fire departments, and realtors. Staff continues to spend considerable time providing one-on-one assistance, in addition to group trainings, to the regulated community. The District has also developed online tools and resources to educate the public on asbestos notification requirements in the Valley.

- **Residential Wood Burning Heater Professional Training:** Training requirements for qualified individuals (those people having either a certification from the Fireplace Investigation Research and Education, Chimney Safety Institute of America, or the National Fireplace Institute or has documentation demonstrating they are qualified to perform inspections, maintenance and cleaning activities on wood burning heaters) who may be hired to perform inspections of wood burning heaters and pellet stoves to ensure they can be operated in a compliant manner prior for individuals who voluntarily request to register their wood burning heaters and pellet stoves.

- **Regulation VIII (Fugitive Dust) Education:** Staff organizes and conducts classroom training for all groups required to submit dust control plans for construction activities and provides ongoing training and outreach as needed and as requested.

- **Prescribed Burning Outreach:** The District meets periodically with the land managers of the USDA Forest Service, National Park Service, US Fish and Wildlife Service, Bureau of Land Management, California Department of Forestry and Fire Protection, and Southern California Edison Company in order to minimize impacts of smoke from prescribed burns and wildfires. Compliance staff participate on the daily calls during fire season to keep abreast of wildfire and prescribed burn activities throughout the area.

- **Access to District Policies:** District policies are available on the internet for stakeholders to review, comment on, and use to assist them with complying with District requirements. The internet is updated regularly with new or modified policies to ensure availability of current information.

Emission Reduction Incentive Program Inspections

To ensure that the emission reduction projects funded by the District's incentive programs are real and permanent, the District monitors the pre-contract and post-contract performance of grant recipients. Thousands of field inspections are conducted to verify that equipment is appropriately controlled or replaced and that it is adequately maintained and verification that older equipment has been properly disposed of.

Incentive projects requiring compliance inspections include the replacement of older trucks with new less polluting ones, school bus replacements, agricultural pump engine replacements, emissions controls on trucks, and other related control strategies. Each funded project requires a minimum of two initial inspections and several types of projects require ongoing inspections to assure emission reductions are realized for the life of the project.

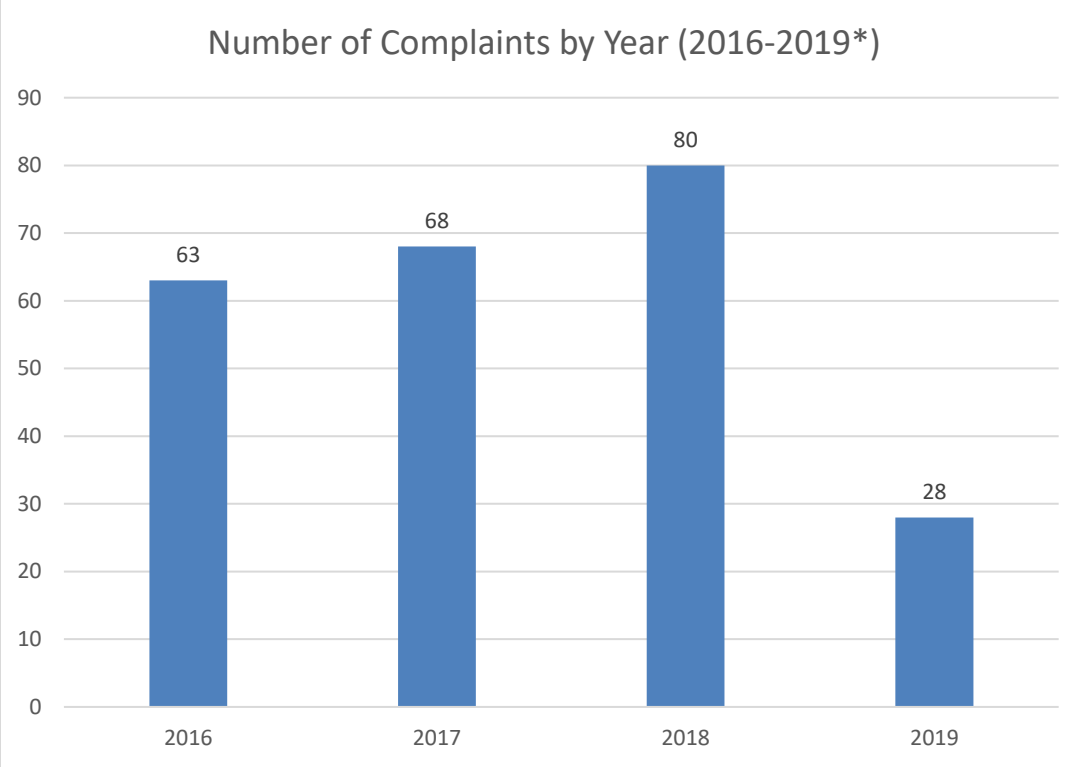
5.3 SAN JOAQUIN VALLEY AIR POLLUTION CONTROL DISTRICT ENFORCEMENT HISTORY IN SOUTH CENTRAL FRESNO COMMUNITY

The District's enforcement presence within the South Central Fresno community is comprised of many different facets including, but not limited to, performing facility inspections, investigating complaints from the public, investigating breakdowns, and overseeing third-party emissions testing at facilities. Since 2016, the District has conducted inspections of 2,409 equipment units during 1,121 inspections at permitted facilities within the South Central Fresno Community, has received and responded to 239 air quality complaints from the public, and has issued 312 enforcement actions associated with violations of air pollution rules and regulations. A listing of the facilities, inspections, complaints, and enforcement actions can be found in Appendix F.

5.3.1 RESPONSE TO PUBLIC AIR POLLUTION COMPLAINTS

The public plays an important role in protecting public health by reporting local air quality issues that they observe in their communities. Often these complaints serve as the first warning of an air pollution compliance issue that needs to be addressed. The District places the highest priority of responding to complaints from the public and responds to each and every complaint received. In addition, the District operates an "on-call" program to ensure that complaints received outside of normal business hours can be appropriately addressed since air pollution related issues are not bound by normal business hours. The process of responding to a complaint can be unique for each complaint received depending on factors such as whether the issue is currently in progress, whether the issue is a recurring/ongoing issue, the type of source, the time of day, and the number of complaints received about the issue. Figure 5-1 shows the number of complaints received by the District each year since 2016.

Figure 5-1: Number of Complaints by Year from 2016-2019

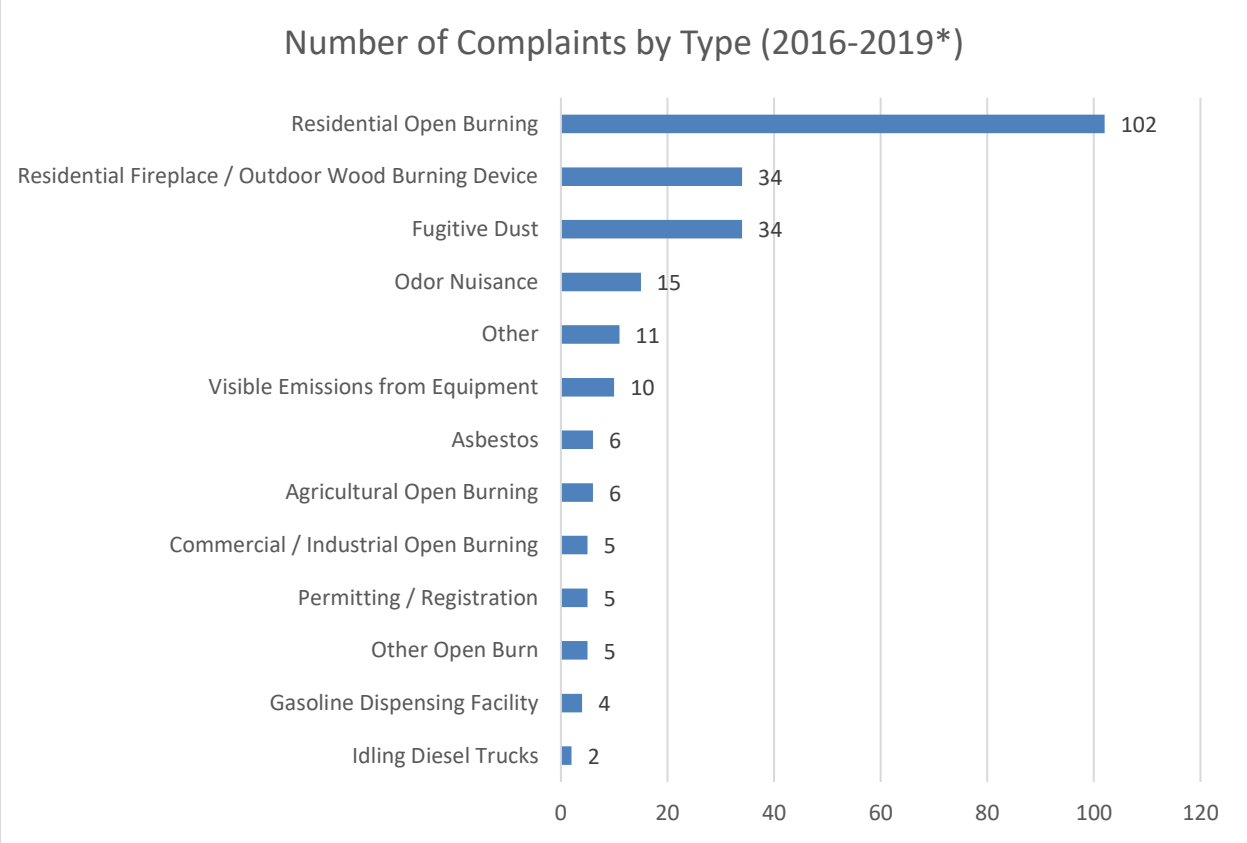


* 2019 data is through April 30, 2019

Based on the resulting complaint investigations, the District confirmed a violation of District rules or regulations and took enforcement action in 47 of the complaints, determined that the issue did not constitute a violation of any federal, state, or local air quality rule in 102 of the complaints, referred 8 complaints to the proper agency with jurisdiction over the issue, and was unable to confirm whether or not a violation occurred in the 82 remaining complaints (at times, the issues associated with public complaints can be transient in nature and the information provided by the reporting party may lack sufficient information to track down and confirm the issue). Of the 47 enforcement actions taken as the result of public complaints, 28 were for illegal residential open burning of waste, 5 were for illegal use of a residential fireplace or outdoor wood burning device, 4 were for fugitive dust related issues, 4 were for permitting/registration related issues, 2 were for excess visible emissions, 2 were for escaped agricultural open burns, 1 was for work practices issues at an automobile coating operation, and 1 was for an illegal commercial/industrial open burn.

Figure 5-2 below details the complaints received by type since 2016. Complaints concerning residential open burning made up 43% of the total complaints received in the community. Complaints regarding residential fireplaces/outdoor wood burning devices and fugitive dust each made of 14% of the complaints received in the community. In total, these three categories made up over 70% of the complaints received.

Figure 5-2: Number of Complaints by Type from 2016-2019



* 2019 data is through April 30, 2019

The District received and responded to 136 complaints regarding residential open burning and residential fireplace/outdoor wood burning devices during this period. The District confirmed illegal open burning and took enforcement action in 33 of these cases, determined that 35 were not a violation (permissible fireplace burn day or small outdoor cooking fire), and was unable to confirm 68 of the complaints. In addition to the complaints received in these categories, members of the Community Steering Committee have suggested increased outreach/education and enforcement in these categories. The District has included specific enhanced enforcement and outreach/education measures as part of the CERP to reduce the potential for localized air quality impacts associated with failure to comply with District rules pertaining to residential open burning and residential fireplace/outdoor wood burning devices.

Of the 34 fugitive dust complaints received, the District issued an enforcement action in 4 of the cases for various fugitive dust related issues. In 24 of the instances, the District determined that the operation was complying with the District's Regulation VIII fugitive dust rules and public nuisance rules. In 5 of the instances, the District was unable to confirm the complaint, and the remaining complaint was referred to City of Fresno Code Enforcement. The complaints that led to enforcement actions or were unable to be confirmed were primarily associated with construction/ earthmoving activities or open areas. The District has included specific enhanced enforcement measures as part of the CERP to reduce the potential for localized air quality impacts associated with

fugitive dust from construction/earthmoving activities and open areas subject to District Regulation VIII. Since 80 percent of the complaints have been received between April and September, these enhanced enforcement efforts will be conducted during the 2nd and 3rd calendar quarters.

The District received 15 odor complaints during this period and determined that none of the complaints resulted in a violation failing under the District's jurisdiction. Under state law, odors are regulated under public nuisance requirements. To become a violation, an odor must cause "injury, detriment, nuisance, or annoyance" to a considerable number of people or the public. Each of the odor complaints were separate instances from a single party; and therefore, did not rise to the level of a public nuisance under state law. Three of the complaints fell outside of the District's jurisdiction and were referred to the appropriate agency.

The District received 10 complaints regarding visible emissions from equipment at facilities within the community. The District confirmed and took enforcement action in 1 of the cases. Additionally, the District took enforcement action for an unpermitted piece of equipment as the result of another one of the complaints. The District determined no violation of District rules occurred in 3 of the cases and was unable to confirm whether or not a violation occurred in the remain 5 complaints in this category. Nine of the 10 complaints in this category involved allegations against sources under permit with the District. As discussed below under the District Enforcement Action section, the District has included specific enhanced enforcement measures as part of the CERP to address failure to comply with emission standards at permitted facilities.

The District received 6 complaints regarding agricultural open burning. In 5 of the instances, the District confirmed that the burn in question was conducted under a District authorization for the day in question. However, in 2 of the 5 cases, the burn had escaped containment resulting in the District taking enforcement action for burning impermissible materials as the result of an escaped agricultural burn. The 6th complaint specified was a location that was too vague to conduct an investigation and the reporting party was anonymous and provided no contact information to aid the investigation.

The District received 6 complaints regarding federal asbestos requirements associated with regulated demolitions and renovations. In all of these instances, the District confirmed that the projects were either complying with federal asbestos requirements or were exempt under federal law.

The District received 10 complaints associated with commercial/industrial open burning or other open burning. One of these complaints resulted in enforcement actions for illegal open burning, 4 were exempt from open burning rules (2 cooking fires and 2 religious ceremonial fires), 3 were a spontaneous combustion fires, and in the 2 remaining the District was either unable to locate the burn or the responsible party for the burn. The enhanced enforcement and outreach/education CERP measures for

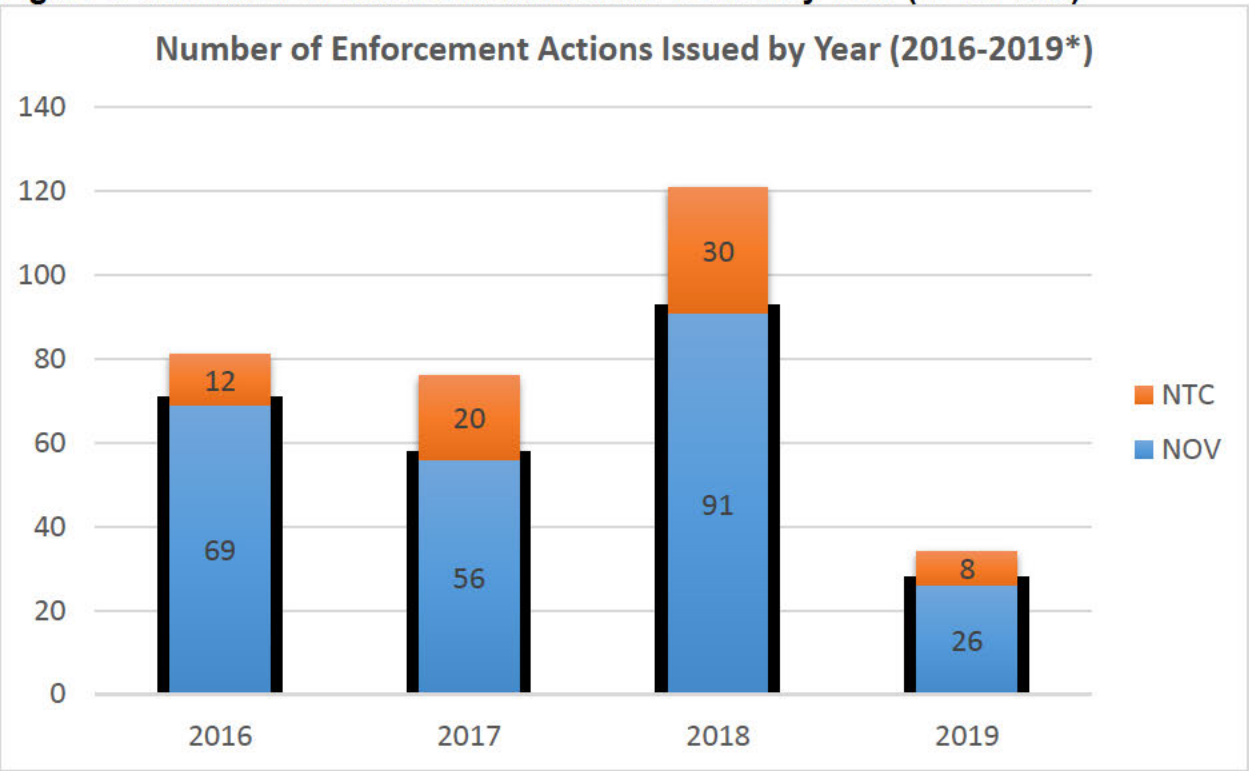
residential open burning will aid in compliance with the rules pertaining to illegal open outdoor burning.

5.3.2 DISTRICT ENFORCEMENT ACTIONS

Federal and state law, along with local rules, require the enforcement of air quality rules and regulations. The District takes formal enforcement action for all violations of applicable federal, state, and local rules and regulations within its jurisdiction. In addition, the District enforces conditional permit requirements, Hearing Board orders, and at times seeks delegation to enforce statewide mobile source and greenhouse gas measures. Generally a Notice of Violation (NOV), which normally results in a civil penalty, is issued to document a violation. Under the limited circumstances specified in District Rule 1180, a Notice to Comply (NTC) may be issued for first-time, minor violations. An NTC does not carry a monetary penalty but does require quick resolution of the minor violation. Should a party not correct the violation within the timeframe established by the NTC, an NOV will be issued.

Over the past 3 years, the District has issued 242 NOVs and 70 NTCs in the South Central Fresno Community. Figure 5-3 shows the annual breakdown of NOVs and NTCs since 2016.

Figure 5-3: Number of Enforcement Actions Issued by Year (2016-2019)



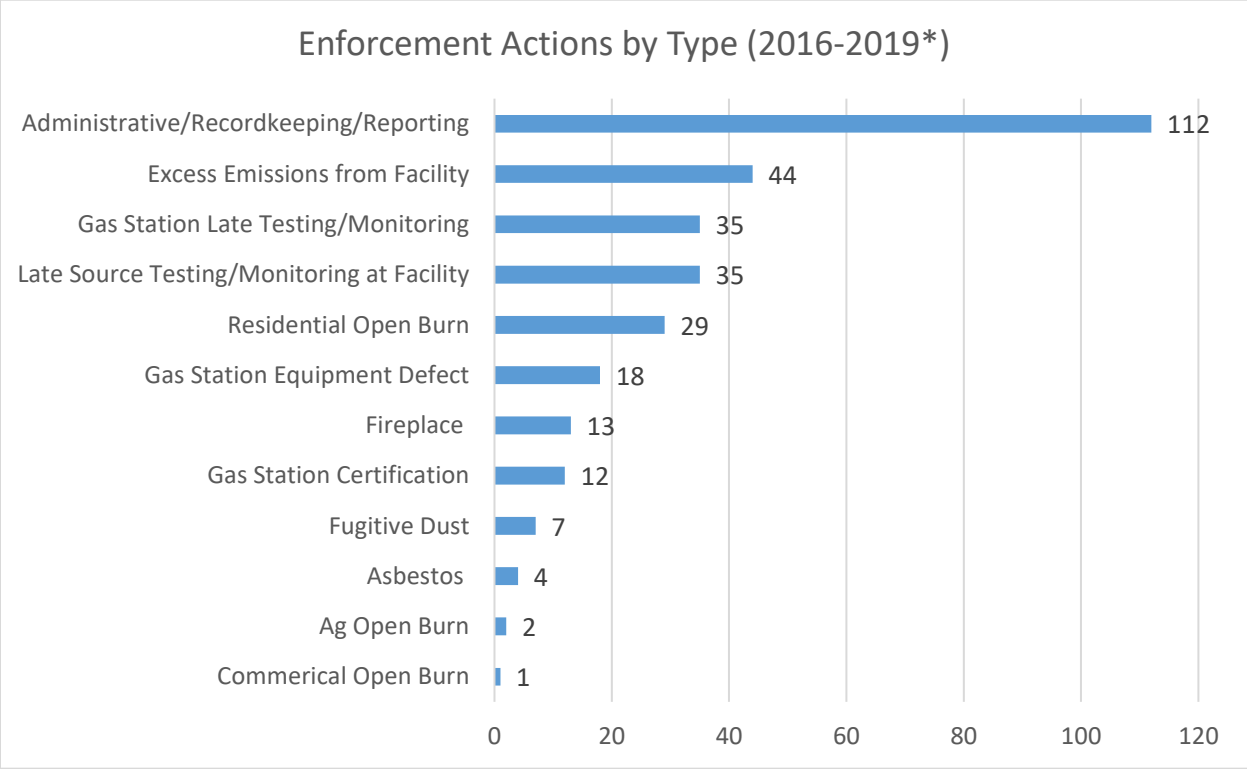
* 2019 data is through April 30, 2019

Figure 5-4 shows the enforcement actions categorized by type. Since 2016, 112 of the 312 enforcement actions resulted from violations of administrative requirements such as recordkeeping, late report submittal, operating with a suspended permit, or operating

without a permit. The District issued 44 enforcement actions for violations resulting in excess emissions from facilities (not including gas stations). These violations occurred at 24 permitted facilities in the area. The District also issued 18 enforcement actions to gas stations for violations resulting in excess emissions. These violations occurred at 10 gas stations in the area. The District believes that more frequent inspections for these 34 facilities would be prudent to limit the potential for air quality impacts associated with failure to comply with emission standards established by District permit, rule, or regulation. The District has included a specific enhanced enforcement measures as part of the CERP to increase the frequency of inspection to at least twice per calendar year for the next five years or until the facility has 4 consecutive inspections without an emission violation, whichever occurs first.

In addition, the District believes a new pilot training program for conducting self-inspections of equipment at gas stations may help to limit the potential for air quality impacts associated with vapor recovery defects at gasoline dispensing operations. Accordingly, the District has included a compliance assistance CERP measure to develop a new training program to instruct gas station operators on conducting thorough self-inspections to aid in the identifications and timely repair of system defects. The District will provide the hands on training to each gas station operator in the community.

Figure 5-4: Enforcement Actions by Type from 2016-2019



* 2019 data is through April 30, 201

A review of the data also shows that the District has issued 29 violations for residential open burning, 13 enforcement actions for fireplace/outdoor wood burning heater violations, and 7 enforcement actions for fugitive dust related issued violations. This

further demonstrates the need to include the aforementioned enhanced enforcement and outreach/education CERP measures.

It should be noted that during this period there were 12 enforcement actions taken against gas stations in the community for failing to comply with various statewide compliance deadlines to upgrade their vapor recovery equipment to meet new certification standards. These deadlines have since passed and the District does not foresee ongoing issues in this category.

5.4 CALIFORNIA AIR RESOURCES BOARD PROGRAM OVERVIEW AND ENFORCEMENT HISTORY IN SOUTH CENTRAL FRESNO COMMUNITY

Section 5.4 Provided by the California Air Resources Board

The California Air Resources Board (CARB or the Board) enforcement programs cover the vehicles we drive, the diesel engines that power our economy, consumer products that we purchase, and greenhouse gas (GHG) emissions from our industries and activities. The goal of CARB enforcement programs is to achieve comprehensive compliance in every regulation the Board adopts. Through enforcement, we work to bring responsible parties into compliance and in doing so achieve a level playing field across industry so that no company can benefit from non-compliance at the expense of another; and to deter industry from future violations. We take compliance seriously because the success of our programs, and public health protection, depends on it.

CARB applies enforcement programs professionally in accordance with our enforcement policy, which we updated in 2017. We use data and inspections to identify potential non-compliance, and then investigate each case. Once a violation is identified, we notify the responsible party and evaluate what happened. We work with the party to achieve compliance and measure the relevant facts and circumstances of each case, relative to eight factors set in law and described in our enforcement policy, to determine an appropriate penalty. The case is settled when the responsible party has achieved compliance and paid an appropriate penalty. If the case cannot be settled, we work with CARB legal staff to refer the case to California's Attorney General for litigation.

Field inspectors are a critical component of the diesel enforcement program. The inspectors work across the state to inspect trucks and other equipment for compliance with CARB's diesel regulations, such as the Heavy-Duty Diesel Vehicle Inspection Program, Drayage Truck, Statewide Truck and Bus, Smart Way, and Transport Refrigeration Unit. Field inspectors also conduct inspections for compliance with In-Use Off-Road and School Bus Idling regulations. CARB inspectors examine heavy-duty vehicles and equipment at numerous locations throughout California, such as at

California Highway Patrol scale facilities, warehouses, fleet yards, construction sites, random roadside locations, truck stops, rest areas, ports, and rail yards.

In addition, CARB has a Supplemental Environmental Project (SEP) Policy that allows community-based projects to be funded from a portion, up to 50 percent, of the penalties received during settlement of enforcement actions. SEPs can improve public health, reduce pollution, increase environmental compliance, and bring public awareness to neighborhoods most burdened by environmental harm.

5.4.1 CALIFORNIA AIR RESOURCES BOARD THREE YEAR ENFORCEMENT HISTORY

Heavy-Duty Vehicle Inspection Program (HDVIP): The HDVIP requires heavy-duty trucks and buses to be inspected for excessive smoke and tampering, and engine certification label compliance. Any heavy-duty vehicle traveling in California, including vehicles registered in other states and foreign countries, may be tested. Tests are performed by CARB inspection teams at border crossings, CHP weigh stations, fleet facilities, and randomly selected roadside locations. Owners of trucks and buses found in violation are subject to minimum penalties starting at $300 per violation.

Idling: Idling and opacity inspections are performed to ensure a heavy-duty vehicle (HDV) is compliant with emission standards and is not violating CARB's Idling regulation. Idling for more than five minutes is prohibited unless the HDV is certified clean idle and the vehicle is more than 100 feet away from a school or restricted area (exceptions apply). Vehicle owners and drivers in violation are subject to minimum penalties starting at $300 per violation and up to $1000 per day.

Off-Road Construction Equipment (off-road regulation): Construction equipment is a major contributor to air pollution, especially when large construction projects are adjacent to neighborhoods. To address this source of air pollution, CARB adopted the nation's first regulation aimed at cleaning up 'off-road' construction equipment such as bulldozers, graders, and backhoes. The off-road regulation requires off-road fleets to meet fleet average emission standards and be equipped with Best Available Control Technology (BACT) (a few specific exceptions apply).

SmartWay: The Tractor-Trailer Greenhouse Gas Regulation requires 53-foot or longer dry van or refrigerated van trailers and the tractors that pull them on California highways to use certain equipment that the U.S. Environmental Protection Agency SmartWay program has verified or designated to meet their efficiency standards.

Transport Refrigeration Unit (TRU): Transport Refrigeration Units (TRUs) are refrigeration systems powered by diesel internal combustion engines designed to refrigerate or heat perishable products that are transported in various containers, including semi-trailers, truck vans, shipping containers, and rail cars. Since diesel particulate matter has been identified as a toxic air contaminant, CARB adopted an Airborne Toxic Control Measure (ATCM) for TRUs and TRU generator sets. CARB staff

inspect TRUs to ensure that the units are meeting labeling and in-use performance standards identified in the TRU regulation.

Drayage: The Drayage Truck Regulation is part of CARB's ongoing efforts to reduce particulate matter (PM) and oxides of nitrogen (NOx) emissions from diesel-fueled engines and improve air quality associated with goods movement. Heavy-Duty Vehicles that carry goods to or from a port or intermodal facility are required to be equipped with a 2007 or newer model year engine. This requirement becomes stricter in 2023, when Drayage trucks are required to be equipped with a 2010 or newer model year engine, because Drayage trucks will be required to the meet the standards of the Truck and bus regulation.

State-wide Truck and Bus (STB): The State-wide Truck and Bus regulations requires diesel trucks with a Gross Vehicle Weight Rating (GVWR) greater than 14,000 pounds that operate in California to install diesel particulate filters or replace older engines with cleaner engine technology on a schedule based on the model year of the engine and GVWR.

Over the last three years, the California Air Resources Board (CARB) has conducted 1,008[25] inspections on Heavy-Duty Vehicles (HDV) within the selected AB 617 South Central Fresno community. These inspections occurred across ten of twelve CARB HDV enforcement programs. The following represents a year-by-year breakdown of enforcement action for CARB HDV programs in the community between 2016 and 2018:

[25] Number is preliminary and may change as data is reviewed.

Figure 5-5: Enforcement History of Heavy-Duty Diesel Vehicles: South Central Fresno

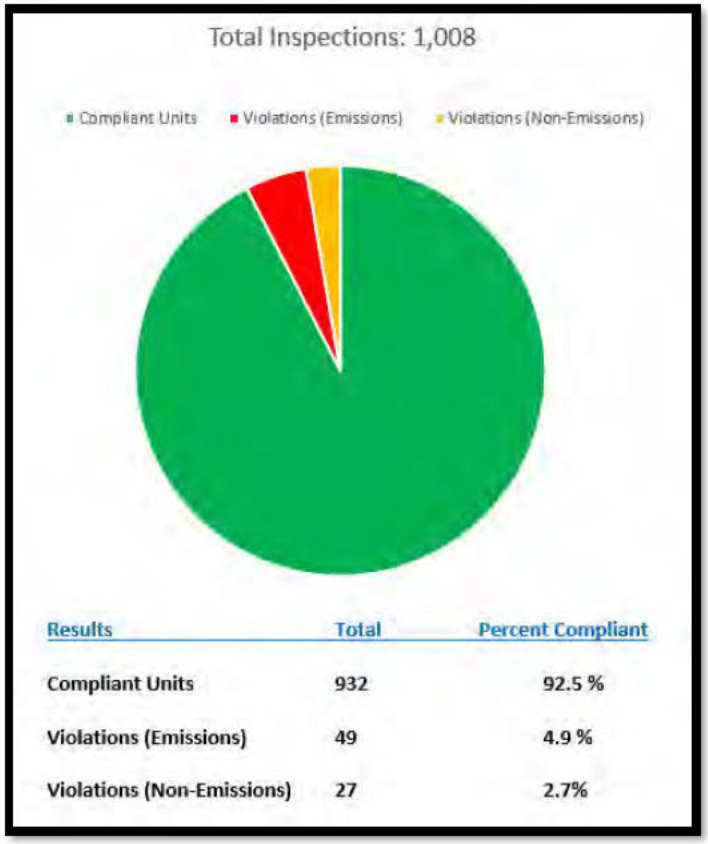
		2016		Violations		2017		Violations		2018		Violations	
	Program	Inspections	Compliant Units	Emission	Non-Emission	Inspections	Compliant Units	Emission	Non-Emission	Inspections	Compliant Units	Emission	Non-Emission
Heavy Duty Vehicle Inspection Program	Diesel Exhaust Fluid	0	0	0	0	0	0	0	0	0	0	0	0
	Emission Control Label	117	106	0	11	118	112	0	6	27	25	0	2
	Smoke Opacity	115	115	0	0	124	124	0	0	28	28	0	0
	Tampering	0	0	0	0	72	68	4	0	28	27	1	0
	Idling	14	13	1	0	1	1	0	0	1	1	0	0
	Off-Road	1	1	0	0	0	0	0	0	1	0	0	1
	Public Agency and Utility	1	1	0	0	0	0	0	0	0	0	0	0
	Smart Way	3	3	0	0	25	22	3	0	6	4	2	0
	Solid Waste Collection	2	2	0	0	0	0	0	0	2	2	0	0
	Transport Refrigeration Unit	14	9	4	1	23	14	5	4	6	3	1	2
	Drayage	0	0	0	0	0	0	0	0	0	0	0	0
	Truck and Bus	129	110	19	0	125	118	7	0	25	23	2	0
	Total	**396**	**360**	**24**	**12**	**488**	**459**	**19**	**10**	**124**	**113**	**6**	**5**

***Inspections per year are program based and some occur concurrently**

Preliminary analysis of Heavy-Duty Vehicle program inspections suggests that overall compliance within the South Central Fresno community is high. As seen in Figure 5-6, from 2016-2018, 92.5 percent of Heavy-Duty Vehicle program inspections showed compliance. However, not all Heavy-Duty Vehicle programs have more than a 90 percent compliance rate when averaged over a three-year period. Transport Refrigeration Unit Inspection data show lower compliance. Averaged over three years, Transport Refrigeration Units had about 60 percent compliance.

During this period, 76 citations were issued to Heavy-Duty Vehicles within the community boundary. Further breakdown of the citations data indicates that 49 citations were issued for emission violations and 27 citations were issued for non-emission violations. The difference between emission and non-emission citations is that emission violations further contribute to air pollution while non-emissions violations do not. An example of a non-emission violation would be a truck not complying with labeling requirements. CARB is working to compile information on the resolution of violations issued in South Central Fresno and will provide this data to the community steering committee (CSC) as it becomes available.

Figure 5-6: Heavy-Duty Vehicle Inspections 2016-2018



Results	Total	Percent Compliant
Compliant Units	932	92.5 %
Violations (Emissions)	49	4.9 %
Violations (Non-Emissions)	27	2.7%

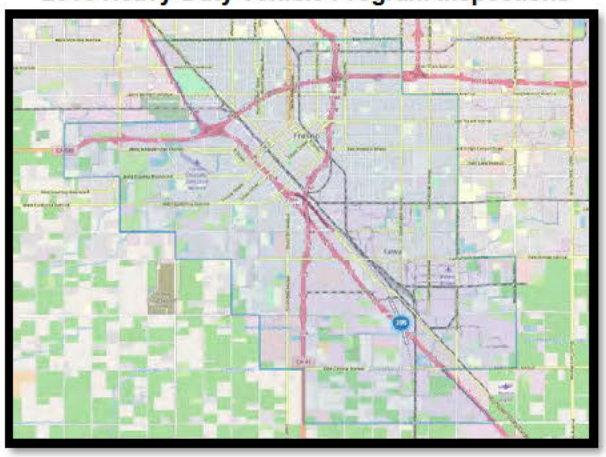
CARB will work closely with the CSC to better determine areas of non-compliance within the community boundary. The high percent compliance observed in the 3-year history may demonstrate the need for more targeted inspections to identify compliance issues within the community.

The inspection history includes several program inspections that were conducted around and in the South Central Fresno community. The maps featured below are to show the program inspection locations. The points on the maps indicate the approximate location and number of inspections in the above-mentioned mobile program areas in the South Central Fresno Community boundary. The goal of the maps are to visually display the location of program inspections to help determine gaps in CARB enforcement activity and where enhanced enforcement is necessary to deter potential violators within the community.

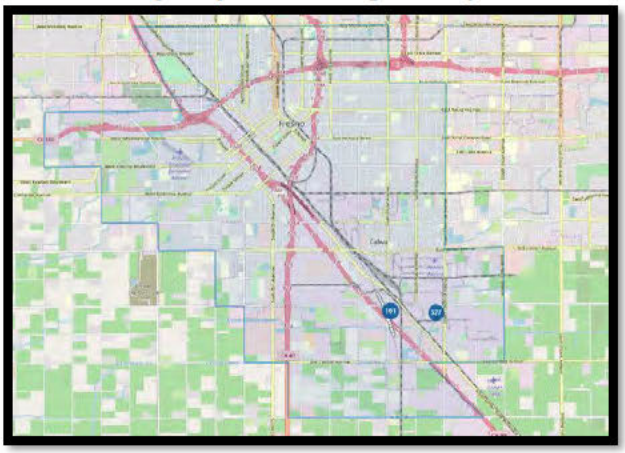
The data presented below reflects CARB's past enforcement efforts. In the past, CARB staff would target areas with large concentrations of Heavy-Duty Diesel Vehicles, such as truck stops. Moving forward, CARB is looking to partner with the San Joaquin Valley Air Pollution Control District (SJVAPCD) and the community to identify new locations to perform mobile source inspections within the South Central Fresno community.

Figure 5-7.

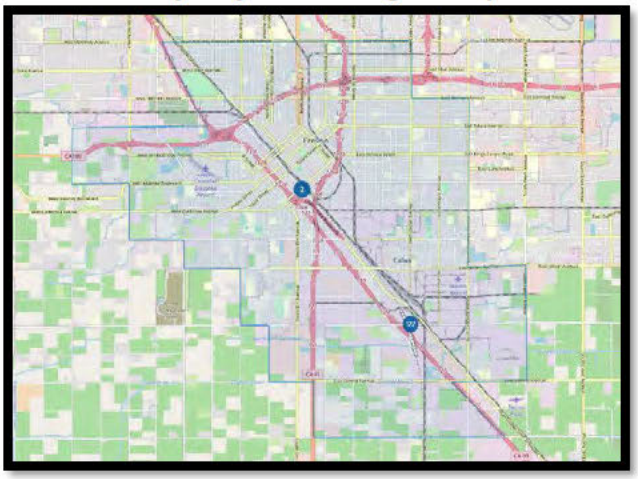
2016 Heavy-Duty Vehicle Program Inspections



2017 Heavy-Duty Vehicle Program Inspections



2018 Heavy-Duty Vehicle Program Inspections



5.4.2 MOTOR VEHICLE FUELS

A primary component of the CARB's Motor Vehicle Fuels Enforcement program is the inspection of California gasoline and diesel fuel at production, transport, and dispensing facilities. CARB Fuels Inspectors conduct frequent, unannounced inspections of refineries, service stations, distribution and storage, bulk purchaser and consumer facilities throughout the State of California to obtain samples of gasoline and diesel fuel. The samples are then analyzed in the Mobile Fuels Laboratory.

As seen in the table below, from 2016 to 2018, CARB staff performed 50 Fuels inspections in the South Central Fresno community. There were no violations issued for these inspections within the community.

Figure 5-8: Motor Vehicle Fuels Inspections 2016 - 2018

	2016		2017		2018	
Program	Inspections	Violations	Inspections	Violations	Inspections	Violations
Gas	16	0	12	0	9	0
Diesel	4	0	5	0	4	0
Racing	0	0	0	0	0	0
Totals	**20**	**0**	**17**	**0**	**13**	**0**

5.4.3 CONSUMER PRODUCTS PROGRAM DESCRIPTIONS

Consumer Products are chemically formulated products used by household and institutional consumers. Some examples are: detergents, cleaning compounds; polishes, floor finishes; cosmetics and personal care products; home, lawn, and garden products; disinfectants and sanitizers; aerosol paints and automotive specialty products. Consumer Products do NOT include: other paint products, furniture coatings, or architectural coatings. Investigators in the Consumer Products program 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.

Composite Wood Products - CARB's Airborne Toxic Control Measure (ATCM) to control formaldehyde emissions from composite wood specifically focuses on three products: hardwood plywood, particleboard, and medium density fiberboard. Investigators in the Composite Wood Products program purchase samples of regulated products from outlets all over California. They inspect products and packaging for compliance with labeling requirements and send selected products to the laboratory for testing.

Consumer product inspections are an important regulatory tool to improve public health in the community. Consumer products, such as hairsprays, deodorants and flooring, are widely used, but can be sources of toxic air containments (TACs) and volatile organic compounds (VOC) that community members willingly bring into their homes.

In 2018, the California Air Resources Board has conducted approximately 56 inspections within the selected AB617 South Central Fresno community. The following represents a breakdown of enforcement action in the community in 2018:

Figure 5-9: Consumer Products Investigations - 2018

Program	Investigations	Compliant units	pending results	violations
Aerosol Coatings	2	2	0	0
Antiperspirant/ deodorant	1	0	1	0
Composite Wood	0	0	0	0
Consumer Products	53	0	53	0

5.4.4 SUMMARY OF COMPLAINTS RECEIVED AND THEIR RESOLUTION

CARB's previous complaint management system for complaints related to heavy-duty diesel vehicles lacked the ability to track complaints by specific location. However, CARB staff have begun to work/track all complaints through the California Environmental Protection Agency Complaint Reporting system. This will allow CARB staff to better track complaints by community and to see the resolution of the complaint. Furthermore, this process will enhance CARB's complaint response by encouraging better complaint referrals (e.g. referring complaints to the proper agency and/or identifying complaints that may require multiple agencies to be involved in their resolution).

5.5 LEVERAGING COMMUNITY INVOLVEMENT IN ENFORCING RULES TO REDUCE AIR POLLUTION

Members of the community play an important role in protecting public health by reporting air quality issues that they observe to both the District and CARB. The District and CARB value input from the public who reside and work in the community. The complaint process aids both agencies in identifying issues within the communities and ensuring timely resolution. Filing a complaint is easy. The following is the contact information for the District and CARB.

San Joaquin Valley Air Pollution Control District

Stationary Sources - Smoke, Dust, Odors or Other Contaminants

Phone: 1-800-870-1037

Valley Air Smart Phone App

Online: https://www.valleyair.org/busind/comply/onlinecomplaint.htm

California Air Resources Board

Automobiles, Trucks, Off-road Equipment, or Other Vehicles

Phone: 1-800-END-SMOG

Online: https://calepa.ca.gov/enforcement/complaints/

An effective complaint should contain as much information and as many details as possible as this helps the inspector in responding to the issue and conducting the investigation. The following information is helpful when filing a complaint:

- Time, date, and location of possible violation; including name of facility if known.
- Type of air quality concern. Describe what you see, smell, and feel.
    - See: smoke, fire, dust falling ash, etc.
    - Smell: rotten eggs, gasoline, oil, sweet, sour, smoke, etc.
    - Feel: burning eyes, throat/nose irritation, breathing problem, headache, etc.
- Is the issue still occurring? If not, when did it occur? Is it recurring? If so when?
    - Time of day
    - Day of week
- Your name and contact information – anonymous complaints can be filed but contact information often helpful in fine tuning the investigation.

To better leverage community involvement, the District and CARB will also assign a dedicated team to work with the Community Steering Committee to follow-up on community concerns, and to conduct community-level compliance assistance, outreach, and education related to compliance and enforcement of local and state rules and regulations. As part of this partnership, the District and CARB will track and report back to the Community Steering Committee on the ongoing enforcement activities within the community to monitor progress in meeting community enforcement measures and to look for innovative strategies to enforcement practices with the goal of increased compliance with air pollution rules and regulations within the community.

5.6 ENFORCEMENT STRATEGIES

5.6.1 DISTRICT ENFORCEMENT STRATEGIES

The District has used the assessment of the three (3) year compliance history in the South Central Fresno community and comments shared by the Community Steering Committee to develop the list of enforcement strategies below which aim to reduce the potential for localized air quality impacts within the South Central Fresno community.

1. **Enhanced enforcement of District Rule 4901 (*Wood Burning Fireplace and Wood Burning Heaters*) mandatory wood burning curtailments:**
   To limit the potential for localized PM2.5 impacts associated with the failure to comply with mandatory episodic wood burning curtailments, District staff will conduct at least four (4) hours of surveillance within the South Central Fresno community on each declared curtailment day for the next five (5) winter seasons to enhance the enforcement of District Rule 4901. The District will work with the Community Steering Committee to focus surveillance efforts in areas where wood burning is more prevalent.

2. **Enhanced enforcement of District Rule 4103 (*Open Burning*) to reduce the illegal open burning of residential waste:**
   To limit the potential for localized PM2.5 and toxic impacts associated with the illegal open burning of residential waste, District will conduct targeted surveillance efforts within the South Central Fresno community. Building on the District's existing surveillance and complaint response efforts, the District will conduct additional targeted surveillance efforts in South Central Fresno community at least once per quarter for the next 5 years. The District will work with the Community Steering Committee to focus surveillance efforts in areas where illegal residential open burning has historically occurred.

3. **Enhanced inspection frequency of permitted sources:**
   To limit the potential for localized air quality impacts associated with the failure to comply with emissions standards established by District permit, rule, or regulation, the District will increase the frequency of inspection at each facility that has had an emission violation over the past three (3) years. These facilities will be inspected at least twice per calendar year for the next five (5) years or until the facility has 4 consecutive inspections without an emission violation, whichever occurs first.

4. **Enhanced enforcement of fugitive dust requirements**
   To limit the potential for localized air quality impacts associated with fugitive dust from construction/earthmoving activities and open areas subject to District Regulation VIII, the District will conduct targeted surveillance efforts within the South Central Fresno community. Building on the District's existing surveillance and complaint response efforts, the District will conduct at least one targeted enforcement effort within the South Central Fresno community during both the 2nd and 3rd quarter for the next five (5) years.

5. **Pilot training program for conducting self-inspections at gas stations:**
   To limit the potential for air quality impacts associated with vapor recovery defects at gasoline dispensing stations, the District will develop a pilot training program to instruct gas station operators on conducting thorough self-inspections of the vapor recovery systems at their stations to aid in the identification and timely repair of vapor recovery system defects. The District will provide this hands-on training to each gas station operator in the community.

6. **Enhanced enforcement of the state's heavy-duty vehicle anti-idling regulation:**
   To limit the potential for localized PM2.5 and toxic air quality impacts associated with failure to comply with the state's heavy-duty vehicle anti-idling regulation, the District will partner with CARB to conduct additional targeted anti-idling enforcement efforts in South Central Fresno community at least once per quarter for the next 5 years. The District and CARB will work with the Community Steering Committee to identify heavy-duty vehicle idling "hot spots," especially those near schools, to aid in focusing the enforcement efforts.

7. **Report back to the Community Steering Committee on Enforcement Activities:**
   The District will track and provide an annual report to the Community Steering Committee to summarize the District enforcement efforts within the community and to monitor progress in implementing community enforcement measures and meeting enforcement goals.

8. **Coordinate with other agencies**
   The District will seek opportunities to coordinate with other agencies within the South Central Fresno community to address multimedia compliance issues as they arise.

9. **Update enforcement strategies as appropriate**
   The District committed to evaluating the results of ongoing compliance activities within the South Central Fresno community and moving forward will work with the Community Steering Committee to update measures as appropriate.

5.6.2 CARB ENFORCEMENT STRATEGIES

CARB acknowledges that the high compliance rates identified in the enforcement history may not necessarily reflect compliance across the community. In cases where enhanced enforcement activities uncover non-compliance issues, CARB's goal will be to achieve the same or higher compliance rates as observed in the three-year history. CARB staff will also work closely with the community steering committee, the Air District, and other agencies (e.g. City of Fresno) to address gaps in the enforcement of mobile sources and seek opportunities to close these gaps.

To support achieving these goals, CARB is committed to enhancing enforcement activities within South Central Fresno by utilizing the following tools:

- An assessment of the enforcement history data
- Targeting areas that may require additional enforcement with guidance from the community steering committee

CARB will utilize current regulations and enforcement programs across all sources CARB regulates to target areas of non-compliance within the South Central Fresno community.

Listed below are CARB's enforcement strategies to help improve air quality in the South Central Fresno community:

1. **Increase the frequency of compliance inspections with guidance from the community steering committee:**
   CARB will collaborate with the South Central Fresno community steering committee to actively enhance enforcement activities. This will be done through a combination of improved complaint reporting, more focused inspections, and report-back meetings to update the community steering committee on both the status of inspections and to obtain additional areas of mobile source concern. CARB will work with the steering committee to meet annually in order to prioritize enforcement strategies and identify possible locations where non-compliant

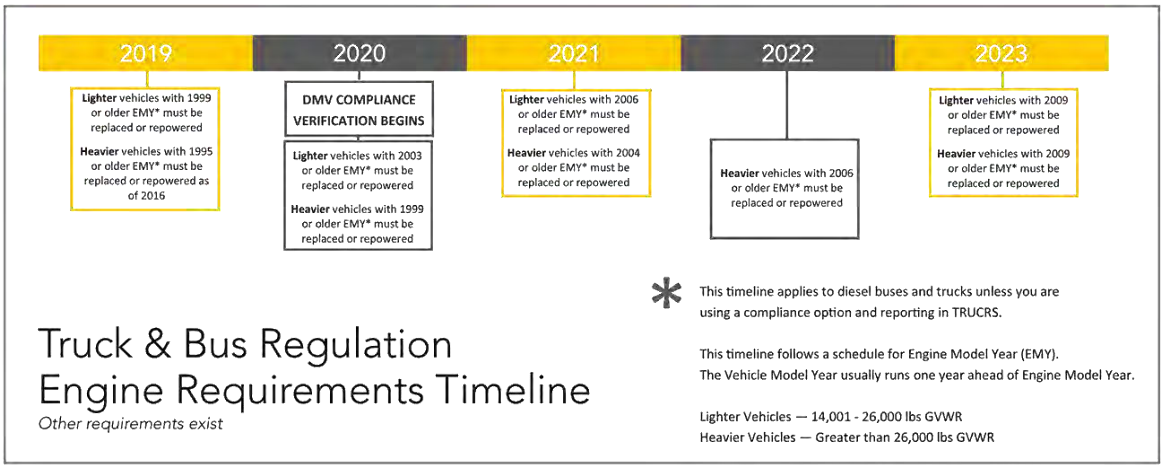
vehicles are present. CARB will additionally report to the community the number of inspections performed, mapped locations of the enforcement, and the number of citations and/or Notices of Violations issued.

As of July 2019, the community steering committee has guided CARB staff to focus enforcement efforts in the following areas:

a. HDV near Jensen Ave, North Ave, American Ave and Central Ave
b. Idling HDV near schools and residential areas

2. **Achieve Compliance with the Truck and Bus Regulation via Senate Bill 1:** In April 2017, the Governor signed Senate Bill 1 (SB 1) into law which included a provision that, beginning in 2020, a vehicle must demonstrate compliance with the STB regulation before it can be registered with the Department of Motor Vehicles (DMV). Beginning in 2020, the DMV, in conjunction with data provided by CARB, will deny vehicle registration to non-compliant HDVs based on the model year of the HDV.

Figure 5-10: Truck and Bus Regulation Engine Requirements Timeline



3. **Provide Annual Report of Enforcement Activities**
CARB's enforcement division will provide an annual report to the CSC to update and summarize CARB's enforcement activities within the community.

4. **Coordinate with other agencies**
CARB will seek opportunities to coordinate with other agencies with enforcement authority in South Central Fresno. One such opportunity could be CARB staff working with the City of Fresno to provide truck idling signage in areas where community members observe trucks idling.

5. **Enhance CARB's Data Management Practices**
   CARB is committed to enhancing the quality of enforcement data for the South Central Fresno community. Moving forward, CARB will maintain the location of enforcement activity and received complaints to provide the community steering committee with the most accurate data available. CARB has recently completed a visualization tool that makes CARB enforcement data more transparent and available. The tool can be accessed online by visiting https://webmaps.arb.ca.gov/edvs/.

6. **Provide in-person community specific training**
   CARB will develop and implement a new program that will be offered to the South Central Fresno community. Information will cover topics like the fundamentals of enforcement, how the enforcement process works, instructions on filing a thorough complaint, and what to expect from the enforcement process after filing a complaint. Through this program, community members will be able to better support CARB or air district enforcement processes. CARB may also develop online trainings in the future.

7. **Update enforcement strategies as applicable**
   CARB staff are committed to updating enforcement strategies as requested by the community steering committee, if said strategies are enforceable by CARB staff or if CARB can reasonably accommodate the request (e.g., additional enforcement training for idling vehicles).

6. METRICS TO TRACK PROGRESS

6.1 METRICS TO TRACK PROGRESS IN ANNUAL REPORTS

Identifying metrics to track progress is critical for both the public and implementing agencies to understand whether the CERP is achieving heath-based air quality objectives. AB 617 requires that the community emissions reduction program result in emissions reductions, which can be demonstrated based on monitoring or other data. Per CARB guidance, community emissions reduction programs must identify and describe how progress on achieving emission reductions for specific categories of sources will be tracked on an annual basis, and track emissions for any pollutant that has an identified emissions reduction target.

For annual reporting, the District will report on the emission reductions achieved and progress towards meeting individual emissions reduction targets for each pollutant.

For each incentive-based emission reduction measure, the District will include information about dollar amounts invested and number of projects implemented in the community.

For proximity-based goals, the District will report on the following factors:

- Number of schools registered for the District's HAL Schools Program
- Number of schools with advanced filtration systems installed, and number of classrooms with room filtration units installed at each school
- Number of educational events held related to health-protective measures for the public
- Number of facilities that have installed vegetative barriers as a result of District outreach and partnership programs
- Footage of vegetative barrier installed along roads or train routes as a result of District outreach and partnership programs

For compliance goals, the following metrics will be reported on annually:

- Inspections conducted including type, date, and location.
- Notices of violations issued including date, recipient, and regulation cited
- Number of complaints received by type and their resolution
- Percentage of notices of violations/notices to comply that have been resolved

The District will report annually on the status of rules and regulations adopted that impact the community of South Central Fresno. For strategies in partnership with other agencies, the District will report on the number of interactions with city and county governments to address local exposure to air pollution. In addition to the measures committed to be implemented as a part of the CERP, the District will continue to implement existing incentive programs and will report on incentive projects deployed in and around the community, and associated emissions reductions. Finally, annual reports will include metrics to track additional co-benefits, such as trainings, outreach, workforce development, or technical capacity-building, including the number of public meetings held in the community and number of people in attendance.

6.2 METRICS FOR FIVE-YEAR MILESTONE EVALUATION

Strategies implemented as a part of this CERP are designed to improve air quality in the community of South Central Fresno. The five-year milestone evaluation is intended, per CARB guidance, to illustrate community scale emissions reductions and air quality trends that may not be evident on an annual reporting basis. To this end, the five year milestone report submitted to CARB for South Central Fresno will include a comprehensive report of air quality monitoring data obtained in the community throughout the term of the CERP, as well as a complete accounting of all projects, emissions reductions, and associated co-benefits implemented as a result of AB 617 program implementation in the community of South Central Fresno.

Table 6-1: Metrics Associated with Incentive Measures in Chapter 4 (note: best estimates, will vary based on program demand and other factors)

				Units Implemented				
Measure #	Measure Description	Type of Unit	Total # Units	2020	2021	2022	2023	2024
	Heavy Duty Mobile Sources							
HD.1	Provide Enhanced Incentive Funding for Zero and Near-Zero Emission Technology	Trucks	75	10	25	25	15	
HD.2	Deployment of Zero Emission Yard Trucks and Truck Refrigeration Units (TRUs)	Yard Trucks or TRUs	25	0	10	10	5	
HD.3	Measures to Reduce Idling: Charging Plugs for Trucks	Charging plugs	33	15	10	8		
HD.4	Support Planning and Development of Clean Fueling Infrastructure: Alternative Fuel Fueling Station	Alternative Fueling Stations	1		1			
HD.7	Enhance Outreach and Access to Incentive Funding for New School Buses	School Buses	16	0	6	6	4	
HD.9	Incentives for Locomotives	Locomotives	2			1	1	

				Units Implemented				
Measure #	Measure Description	Type of Unit	Total # Units	2020	2021	2022	2023	2024
HD.10	Incentives for Railcar Movers/Switchers	Switcher Locomotives	3		1	1	1	
	Older/High Polluting Passenger Cars							
C.1	Host Tune-In Tune-Up Events within Community	Vehicle Repairs	1250	325	325	300	300	
C.2	Enhanced Access/Outreach to Incentives through Drive Clean	Clean-air Vehicles	220	80	100	40		
C.5	Increased Educational Training for EV Mechanics	Training Events	5	1	2	2		
	Residential Burning							
RB.1	Provide Enhanced Incentives to Replace Wood Burning Devices	Devices	500	125	125	125	125	
	Agricultural Open Burning							
AG.1	Provide Incentives for Alternatives to Agricultural Burning (chipping/soil incorporation)	Acres	700	140	140	140	140	140
	Land Use and Urban Sources							
CC.1	Incentives to reduce PM from commercial underfired charbroilers	Control Systems	8		2	4	2	
LG.1	Provide Enhanced Incentives for Replacement of Residential Lawn and Garden Equipment	Lawn & Garden Units	570	150	150	150	120	
LG.2	Enhance Outreach and Access to Incentive Funding for Commercial Lawn and Garden Equipment	Lawn & Garden Units	60	10	20	20	10	

Measure #	Measure Description	Type of Unit	Total # Units	Units Implemented 2020	2021	2022	2023	2024
PF.1	Enhance Outreach and Access to Incentive Funding for Public Fleet Vehicles	Vehicles	400	80	80	80	80	80
	Exposure Reduction Measures							
SC.1	Air Filtration Systems in Community Schools	Filtration Systems	55	0	20	20	10	5

Table 6-2: Metrics Associated with Non-incentive Measures in Chapter 4

Measure #	Measure Description	Type of Metric	Total # of Units	2019	2020	2021	2022	2023	2024
HD.6	Enhanced Enforcement of Statewide Anti-Idling Regulation	Enforcement efforts (1 per quarter)	20		4	4	4	4	4
HD.11	Heavy Duty Truck Rerouting	Traffic Study	1		1				
HD.12	Promote the use of Biodiesel and Renewable Diesel Fuels	Advocacy as opportunities arise		X	X	X	X	X	X
RB.3	Enhanced Enforcement of Wood Burning Curtailments	Hours enforcement per curtailment day	4	X	X	X	X	X	X
RB.4	Outreach to Reduce Illegal Activity	Public workshops, plus outdoor ads and 2 postcard mailers	5		2	1	1	1	
RB.5	Enhanced Enforcement to Reduce Illegal Burning of Residential Waste	Targeted enforcement efforts (1 per quarter for 5 years)	20		4	4	4	4	4
IS.1	Provide incentives to plating operations to further reduce chrome emissions	Chrome plating operations contacted to offer incentives available under new CAPP guidelines	2		2				

Measure #	Measure Description	Type of Metric	Total # of Units	2019	2020	2021	2022	2023	2024
IS.4	Enhanced Inspection Frequency (2 inspections per calendar for 5 years or until 4 consecutive inspections with no violation)	Enforcement plan implemented		X	X	X	X	X	X
IS.5	Pilot Training Program for Conducting Self-Inspections at Gas Stations	Gas station self-inspection training opportunities	52		26	26			
IS.6	Provide Incentives to Install Advanced Control Technology	Incentive program guideline developed			X	X	X	X	X
IS.7	Regulatory Actions: Evaluation of BARCT Requirements for Rules that Apply to Cap and Trade Facilities	Rules Evaluated per adopted BARCT expedited schedule		6	5	5			
IS.8	Regulatory Actions: Evaluation of Rules to Determine Whether Additional Reductions are Possible for Sources of NOx and PM2.5	Rule evaluations per PM2.5 Plan schedule		1	4	2			
IS.9	Regulatory Actions: Expedited Facility Risk Assessment And Risk Reduction Under District Implementation of the Air Toxics Hot Spots Information And Assessment Act (Ab 2588)	Expedited facility risk assessment for all community facilities		X	X	X			
LU.1	Land Use/Sustainable Development: Support Projects that Reduce VMT	Meetings with City of Fresno to discuss District support of projects that reduce VMTs, plus ongoing support as needed.			X	X	X	X	X

Measure #	Measure Description	Type of Metric	Total # of Units	2019	2020	2021	2022	2023	2024
LU.2	New Development: Provide assistance during the CEQA process	Meetings with City and County to discuss ongoing CEQA coordination			X	X	X	X	X
LU.3	Provide Education and Outreach on Available Tools for Public Information Regarding Land Use Projects	Public training	1		X				
LU.4	Collaborating to Enhance Community Participation in Land Use Processes	Ongoing discussions with land use agencies to discuss potential opportunities for enhancing community participation		X	X	X	X		
SD.1	Seek incentives for local businesses and homeowners to install solar power and energy storage	Community Steering Committee meeting(s) to discuss available programs for solar installation in the community, co-hosted by PUC, PG&E, or other state agencies involved with solar programs		X	X	X	X		
FD.1	Fugitive Dust: Enhanced Enforcement Regulation VIII Fugitive Dust Requirements	Targeted enforcement efforts (1 per quarter in 2 and 3 quarters for 5 years)	10		2	2	2	2	
FD.3	Road Dust: Evaluate feasibility of road paving improvements	District meetings with City and County to discuss feasibility of road paving improvements in community		X	X	X			
SC.2	HAL Schools: Increase Participation	School Districts Enrolled in HAL	5		3	2			
IAQ.1	Mitigate indoor exposure to air pollution through weatherization and enhanced energy efficiency	Educational meeting held by Fresno EOC	1		X				

Measure #	Measure Description	Type of Metric	Total # of Units	2019	2020	2021	2022	2023	2024
UG.1	Identify opportunities for increased urban greening and forestry in the community	District meetings with City and County to discuss opportunities for increased urban greening and forestry in the community		X	X	X			
VB.1	Provide Incentives for Installation of Vegetative Barriers Around/Near Sources Of Concern	Community Steering Committee meetings with City/County/Caltrans to discuss vegetative barrier installations in community			X	X	X		
IR.1	Idling-Reduction Strategy: Reducing Automobile Idling Near Sensitive Receptors	Bilingual sets of idle reduction street signs, plus 5 presentations	30		15	15			
O.1	Outreach: Community Air Quality Outreach Strategy	Annual Goals for these actions in SC Fresno include: • Attend/host 4 community meetings to share information • 1 community targeted social media campaign			4/1	4	4	4	4
O.2	Outreach: Sharing Clean Air Efforts and How Communities Can Get Involved	Annual Goals for these actions in SC Fresno include: • Attend/host 4 community meetings to share information • 1 community targeted social media campaign			4	4	4	4	4
O.3	Joint Advocacy for Continued/Additional Funding to Support Air Quality Improvement Measures	Community Steering Committee meetings to discuss ongoing advocacy for continued state funding			X	X	X	X	X

7. CALIFORNIA ENVIRONMENTAL QUALITY ACT (CEQA) PROJECT REVIEW

According to Section 15061 (b)(3) of the California Environmental Quality Act (CEQA) Guidelines, a project is exempt from CEQA if, "the activity is covered by the common sense rule that CEQA applies only to projects which have the potential for causing a significant effect on the environment. Where it can be seen with certainty that there is no possibility that the activity in question may have a significant effect on the environment, the activity is not subject to CEQA." Since the Project will result in an air quality benefit to the community, the Project is not expected to result in a significant impact under CEQA. As such, the common sense exemption applies.

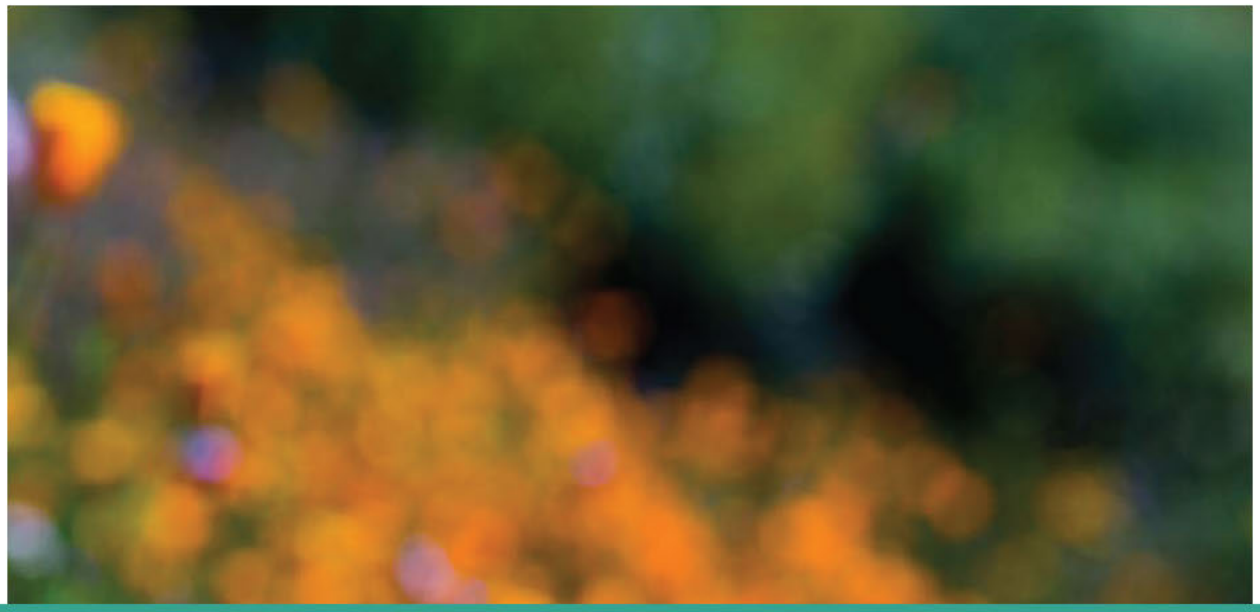
In addition, this Project is an action taken by a regulatory agency, the San Joaquin Valley Air District, as authorized by state law for the protection and betterment of air quality in the San Joaquin Valley. CEQA Guidelines §15308 provides a categorical exemption for "actions taken by regulatory agencies, as authorized by state or local ordinance, to assure the maintenance, restoration, enhancement, or protection of the environment where the regulatory process involves procedures for protection of the environment. Construction activities and relaxation of standards allowing environmental degradation are not included in this exemption." No construction activities or relaxation of standards are included in this project. As such, for this additional reason, the District finds that the project is exempt from CEQA.

Pursuant to Section 15062 of the CEQA Guidelines, the District will file a Notice of Exemption upon Governing Board approval of the Project.

Attachment L

CALIFORNIA
AIR RESOURCES BOARD

December 2022



2022 Scoping Plan for Achieving Carbon Neutrality

CARB's mission is to promote and protect public health, welfare, and ecological resources through effective reduction of air pollutants while recognizing and considering effects on the economy. CARB is the lead agency for climate change programs and oversees all air pollution control efforts in California to attain and maintain health-based air quality standards.

Table of Contents

Table of Contents i
List of Figures vii
List of Tables x
List of Appendices xii
Abbreviations xiii
Executive Summary 1
The Scoping Plan Process 5
Ensuring Equity and Affordability 7
Energy and Technology Transitions 8
Cost-Effective Solutions Available Today 9
Continue with a Portfolio Approach 10
Conclusion 11
Post-adoption of the Scoping Plan 11
Chapter 1: Introduction 13
Severity of Climate Change Impacts 15
Wildfires 15
Drought 17
Extreme Heat 19
Imperative To Act 21
Consequences of Further Warming 21
Scoping Plan Overview 23
Previous Scoping Plans 23
Overview of this Scoping Plan 24

Principles That Inform Our Approach to Addressing the Climate Challenge 25
Unprecedented Investments in a Sustainable Future 25
Centering Equity 27
Role of the Environmental Justice Advisory Committee 29
Partnering with Tribes 30
Maximizing Air Quality and Health Benefits 32
Economic Resilience 34
Partnering Across Government 35
Partnering with the Private Sector 35
Supporting Innovation 37
Engagement with Partners to Develop, Coordinate, and Export Policies 38
Working Toward Carbon Neutrality 41
Supporting Healthy and Resilient Lands 42
Maintaining the Focus on Methane and Short-Lived Climate Pollutants 42
Process for Developing the Scoping Plan 44
Guidance from the Administration and Legislature 44
Consideration of Relevant State Plans and Regulations 53
Input from Partners and Stakeholders 54
Emissions Data That Inform the Scoping Plan 54
Greenhouse Gas Emissions 54
Natural and Working Lands 57
Black Carbon 60
Tracking Life-Cycle and Out-of-State Emissions 60
Tracking Progress 61
Chapter 2: The Scoping Plan Scenario 63
Scenarios for the AB 32 GHG Inventory Sectors 63
Scenarios for Natural and Working Lands 65
Evaluation of Scoping Plan Alternatives 67

NWL Scoping Plan Alternatives 67
Scoping Plan Scenario 70
AB 32 GHG Inventory Sectors 70
Natural and Working Lands 79
Strategies for Carbon Removal and Sequestration 83
The Role of Carbon Capture and Sequestration 84
The Role of Natural and Working Lands Emissions and Sequestration 89
The Role for Carbon Dioxide Removal (Direct Air Capture) 91
Carbon Dioxide Removal and Capture Targets for 2030 and 2045 94
Scenario Uncertainty 97
Greenhouse Gas Emissions Modeling 97
Implementation 98
Targeted Evaluations for the Scoping Plan: Oil and Gas Extraction and Refining 100
Oil and Gas Extraction 101
Petroleum Refining 106
Progress Toward Achieving the Accelerated 2030 Target 108
Cap-and-Trade Program Update 112
Chapter 3: Economic and Health Evaluations 118
Economic Analysis 118
Estimated Direct Costs 119
AB 32 GHG Inventory Sectors 120
Natural and Working Lands 121
Economy and Employment 123
AB 32 GHG Inventory Sectors 123
Natural and Working Lands 127
Health Analysis 128
AB 32 GHG Inventory Sectors 129

Natural and Working Lands 133
AB 197 Measure Analysis 135
Estimated Emissions Reductions 136
AB 32 GHG Inventory Sectors 136
Natural and Working Lands 139
Estimated Health Endpoints 140
AB 32 GHG Inventory Sectors 140
Natural and Working Lands 146
Estimated Social Cost 148
AB 32 GHG Inventory Sectors 150
Natural and Working Lands 151
Social Costs of GHGs in Relation to Cost-Effectiveness 153
Estimated Cost per Metric Ton 153
AB 32 GHG Inventory Sectors 154
Natural and Working Lands 155
Climate Vulnerability Metric 157
Public Health 160
Health Analysis Overview 160
Health Analysis Components 162
Social and Environmental Determinants of Health Inequities 164
Environmental Determinants of Health Inequities 166
Climate Vulnerabilities 169
Summary of the Qualitative Health Analysis 171
Heat Impacts 172
Wildfires and Smoke 172
Children's Health and Development 172
Economic Security 173

Food Security 173
Mobility and Physical Activity 173
Affordable Housing 174
Urban Greening 174
No Action Scenario (Reference) 174
Take Action Scenario 175
Summary of Health Benefits 177
Environmental Analysis 180
Chapter 4: Key Sectors 182
Transportation Sustainability 184
Sector Transition 185
Technology 185
Strategies for Achieving Success 187
Fuels 189
Strategies for Achieving Success 191
Vehicle Miles Traveled 192
Strategies for Achieving Success 194
Clean Electricity Grid 195
Sector Transition 199
Strategies for Achieving Success 205
Sustainable Manufacturing and Buildings 206
Sector Transition 207
Industry 207
Strategies for Achieving Success 210
Buildings 211
Strategies for Achieving Success 214
Carbon Dioxide Removal and Capture 216

Sector Transition 220
Strategies for Achieving Success 221
Short-Lived Climate Pollutants (Non-Combustion Gases) 222
Methane 225
Hydrofluorocarbons 227
Anthropogenic Black Carbon 229
Sector Transition 230
Methane 230
Dairy and Livestock Methane 231
Strategies for Achieving Success 232
Landfill Methane 233
Strategies for Achieving Success 234
Upstream Oil and Gas Methane Reduction 235
Strategies for Achieving Success 236
Hydrofluorocarbons 237
Strategies for Achieving Success 239
Anthropogenic Black Carbon 240
Strategies for Achieving Success 240
Natural and Working Lands 241
Landscapes 243
Trends of Carbon on Landscapes 245
Goals and Accelerating Nature-Based Solutions 246
Strategies for Achieving Success: Crosscutting Items for all NWL 249
Forests, Shrublands, and Chaparral 250
Strategies for Achieving Success 252
Grasslands 252
Strategies for Achieving Success 253

Croplands 254
Strategies for Achieving Success 255
Wetlands.....257
Strategies for Achieving Success 257
Developed Lands.....258
Strategies for Achieving Success 259
Sparsely Vegetated Lands.....260
Strategies for Achieving Success 260
Additional Management Strategies 261
Considerations.....261
Additional NWL Actions and Strategies 263
Chapter 5: Challenge Accepted.....265
State-level Action 265
Regulations and Programmatic Development.....266
Incentive Programs 266
Local Action.....267
Local Climate Action Planning and Permitting 268
Unlocking CEQA Mitigation for Local Success.....270
Communities and Environmental Justice 271
Academic Institutions and the Private Sector 277
Individuals 279

List of Figures

Figure 1-1: California total and per capita GHG emissions..... 14
Figure 1-2: The real costs of inaction..... 23
Figure 1-3: Comprehensive California climate change investments 26

Figure 1-4: California climate investments cumulative outcomes 29

Figure 1-5: Carbon neutrality: Balancing the net flux of GHG emissions from all sources and sinks 42

Figure 1-6: Short-lived climate pollutant impacts 43

Figure 1-7: 2019 State GHG emission contributions by GHG..... 55

Figure 1-8: 2019 State GHG emission contributions by Scoping Plan sector 56

Figure 1-9: Carbon stocks in natural and working lands (MMT carbon) 58

Figure 1-10: Changes in carbon stock by landscape type 59

Figure 2-1: Reference and Scoping Plan Scenario GHG emissions..... 71

Figure 2-2: Forms of carbon removal and sequestration considered in this Scoping Plan 84

Figure 2-3: Petroleum refining emissions with and without carbon capture and sequestration 88

Figure 2-4: Comparison of the Scoping Plan Scenario (NWL) with existing research 90

Figure 2-5: Residual emissions in 2022, 2030, and 2045 for the Scoping Plan Scenario..... 92

Figure 2-6: Oil and gas extraction sector GHG emissions in 2022 and 2045 when activity is phased down with in-state fuel demand.....102

Figure 2-7: California in-state crude oil production 103

Figure 2-8: Crude oil imports by transportation type.....104

Figure 2-9: Petroleum refining sector GHG emissions in 2022 and 2045 (with and without CCS) when activity is phased down with fuel demand 107

Figure 2-10: Impact of delayed implementation on 2030 GHG emissions.....111

Figure 3-1: Projected California gross state product (left) and employment growth (right) from 2021 to 2035 and 2045.....119

Figure 3-2: Cost and savings relative to the growing California economy for the Scoping Plan Scenario in 2035 and 2045 (AB 32 GHG Inventory sectors) 121

Figure 3-3: Gross state product (left) and employment (right) relative to a growing California economy for the Scoping Plan Scenario in 2035 and 2045 (AB 32 GHG Inventory sectors)..124

Figure 3-4: Illustration of NOx emission reductions from current levels for the Reference Scenario and the Scoping Plan Scenario (AB 32 GHG Inventory sectors).....130

Figure 3-5: Difference in annual average $PM_{2.5}$ (μg/m^3) in the Scoping Plan scenario relative to the Reference scenario in 2045 (AB 32 GHG Inventory sectors) 131

Figure 3-6: Total health benefits estimated from air quality improvements in the Scoping Plan Scenario (AB 32 GHG Inventory sectors).....132

Figure 3-7: Disadvantaged community health benefits relative to the Reference Scenario for the Scoping Plan Scenario (AB 32 GHG Inventory sectors).....133

Figure 3-8: Total average annual health benefits relative to the Reference Scenario for the Scoping Plan Scenario (NWL).....134

Figure 3-9: Categories of climate change impacts on human welfare included in the Climate Vulnerability Metric. 158

Figure 3-10: Combined impacts of climate change in 2050 under a moderate emissions scenario; damages as share of 2019 tract income (%) 159

Figure 3-11: Scoping Plan outcome and the path to health improvements.....163

Figure 3-12: Least and most impacted neighborhoods from CalEnviroScreen.....165

Figure 3-13: Top sources of $PM_{2.5}$ and their contribution to $PM_{2.5}$ exposures by race and in disadvantaged communities 168

Figure 3-14: Quantified health benefits of active transportation from increased physical activity 177

Figure 4-1: Transition of on-road vehicle sales to ZEV technology in the Scoping Plan Scenario 186

Figure 4-2: Transportation fuel mix in 2022, 2030, and 2045 in the Scoping Plan Scenario ..190

Figure 4-3: 2021 total system electric generation (based on GWh).....196

Figure 4-4: Electricity supply trend by resource for a California summer day, July 2022.....199

Figure 4-5: Projected new electricity resources needed by 2045 in the Scoping Plan Scenario 203

Figure 4-6: Electric loads in 2022, 2030 and 2045 for the Scoping Plan Scenario 204

Figure 4-7: Final energy demand in industrial manufacturing (left) and in oil and gas extraction and petroleum refining (right) in 2022, 2030, and 2045 in the Scoping Plan Scenario 208

Figure 4-8: Final energy demand in buildings in 2022, 2030, and 2045 in the Scoping Plan Scenario 213

Figure 4-9: Residential space heating appliance sales in the Scoping Plan Scenario.....214

Figure 4-10: Carbon management infrastructure 217

Figure 4-11: Expected progress toward SB 1383 targeted emissions reductions by 2030 through strategies currently in place 224

Figure 4-12: Sources of California methane emissions (2019) 226

Figure 4-13: Sources of hydrofluorocarbon (HFC) emissions (2019) 229

Figure 4-14: Sources of anthropogenic black carbon (preliminary 2017 estimates; AR5 100-yr GWP 900) 230

Figure 4-15: Methane emissions in 2022, 2030, and 2045 in the Scoping Plan Scenario 231

Figure 4-16: Degradable carbon deposited in landfills 234

Figure 4-17: Hydrofluorocarbon emissions in 2022, 2030, and 2045 in the Scoping Plan Scenario 237

Figure 4-18: Potential emissions from refrigerants in existing equipment 239

Figure 4-19: Remaining non-combustion emissions in 2022, 2030, and 2045 in the Scoping Plan Scenario 241

Figure 4-20: Acreage of burned wildland vegetation area 242

Figure 4-21: Forest (left) and shrubland (right) carbon stocks by 2045 251

Figure 4-22: Grassland carbon stocks by 2045 253

Figure 4-23: Cumulative CO_2e emissions from annual croplands in 2045 255

Figure 4-24: Cumulative CO_2e emissions from Delta wetlands by 2045 257

Figure 4-25: Carbon stocks in urban forests by 2045 259

Figure 4-26: Carbon stocks in sparsely vegetated lands by 2045 260

List of Tables

Table 1-1: Major climate legislation and executive orders enacted since the 2017 Scoping Plan 45

Table 2-1: Actions for the Scoping Plan Scenario: AB 32 GHG Inventory sectors 72

Table 2-2: Actions for the Scoping Plan Scenario: NWL sectors 80

Table 2-3: GHG emissions and removals needed to achieve carbon neutrality and meet the 20 $MMTCO_2$ removal and capture target in 2030 and the 100 $MMTCO_2$ removal and capture target in 2045. 96

Table 2-4: Estimates of 2030 GHG emissions 109

Table 2-5: Comparison of 2017 Scoping Plan and two Reference Scenarios 116

Table 3-1: Cost and savings relative to a growing California economy for the Scoping Plan Scenario (NWL) 122

Table 3-2: Income Impacts by California household income group in 2035 and 2045 for the Scoping Plan Scenario (AB 32 GHG Inventory Sectors) 125

Table 3-3: Percentage of households in each race/ethnicity category by household income group 127

Table 3-4: Gross state product and employment relative to a growing California economy for the Scoping Plan Scenario in 2035 / 2045 (NWL) 128

Table 3-5: Estimated GHG and criteria pollutant emission reductions relative to the Reference Scenario for the Scoping Plan Scenario in 2035/2045 (AB 32 GHG Inventory sectors) 138

Table 3-6: Estimated average annual GHG and criteria pollutant emission reductions relative to the Reference Scenario for the Scoping Plan Scenario from 2025–2045 (NWL) 140

Table 3-7: Estimated avoided incidence of mortality, cardiovascular and respiratory disease onset, work loss days and hospital admissions relative to the Reference Scenario for the Scoping Plan Scenario (AB 32 GHG Inventory sectors) 143

Table 3-8: Estimated average annual avoided incidence of hospital admissions, emergency room visits, and mortality relative to the Reference Scenario for the Scoping Plan Scenario resulting from forest, shrubland, and grassland wildfire emissions (NWL) 148

Table 3-9: Estimated social cost (avoided economic damages) of measures considered in the Scoping Plan Scenario (AB 32 GHG Inventory sectors) 151

Table 3-10: Estimated social cost (avoided economic damages) of measures considered in the Scoping Plan Scenario (NWL) 152

Table 3-11: Estimated cost per metric ton of reduced CO_2e relative to the Reference Scenario for measures considered in the Scoping Plan Scenario (AB 32 GHG Inventory sectors) 155

Table 3-12: Estimated average cost per metric ton of reduced CO_2e relative to the Reference Scenario for measures considered in the Scoping Plan Scenario (NWL) 156

Table 3-13: Examples of vulnerable groups due to socioeconomic, environmental, developmental, and climate change factors 171

Table 3-14: Scoping Plan directional benefits for health co-benefit areas (heat, affordable housing, food security, economic security, and urban greening) 178

Table 3-15: Scoping Plan directional benefits for health co-benefit areas (traffic pollution, wildfire, and active transportation) 179

Table 4-1: Scoping Plan modeled target for NWL, based on increasing action on NWL 247

List of Appendices

Appendix A. Public Process

Appendix B. Final Environmental Analysis

Appendix C. AB 197 Measure Analysis

Appendix D. Local Actions

Appendix E. Sustainable and Equitable Communities

Appendix F. Building Decarbonization

Appendix G. Public Health

Appendix H. AB 32 GHG Inventory Sector Modeling

Appendix I. Natural and Working Lands Technical Support Document

Appendix J. Uncertainty Analysis

Appendix K. Climate Vulnerability Metric

Abbreviations

°F	Fahrenheit
°C	Celsius
AB	Assembly Bill
AQMD	Air Quality Management District
AR5	IPCC Fifth Assessment Report
BECCS	bioenergy with carbon capture and storage
CAISO	California Independent System Operator
CalEPA	California Environmental Protection Agency
CalGEM	California Geologic Energy Management Division
CalSTA	California State Transportation Agency
CAP	climate action plan
CARB	California Air Resources Board
CCR	California Code of Regulations
CCS	carbon capture and sequestration
CCUS	carbon capture, utilization, and storage
CDFA	California Department of Food and Agriculture
CDPH	California Department of Public Health
CDR	carbon dioxide removal
CE	common era
CEC	California Energy Commission
CEQA	California Environmental Quality Act
CES	CalEnviroScreen
CH_4	methane
CMAQ	Community Multiscale Air Quality
CNRA	California Natural Resources Agency
CO_2	carbon dioxide
COPD	chronic obstructive pulmonary disease

CORE	Clean Off-Road Equipment
CPUC	California Public Utilities Commission
CVM	Climate Vulnerability Metric
DAC	direct air capture
DPR	Department of Pesticide Regulation
Draft EA	Draft Environmental Analysis for this Scoping Plan
EA	Environmental Analysis
ED	emergency department
EIA	U.S. Energy Information Administration
EJ	environmental justice
EJ Advisory Committee	Environmental Justice Advisory Committee
EO	executive order
EV	electric vehicle
F-gas	fluorinated gas
FCEV	fuel cell electric vehicle
GCF	Governors' Climate and Forests Task Force
GDP	gross domestic product
GHG	greenhouse gas
GSP	gross state product
GW	gigawatt
GWh	gigawatt-hour
GWP	global warming potential
HDV	heavy-duty vehicle
HD ZEV	heavy-duty zero-emission vehicle
HFC	hydrofluorocarbon
IBank	Infrastructure and Economic Development Bank
ICE	internal combustion engine
IPCC	Intergovernmental Panel on Climate Change

IPT	incidence-per-ton
IWG	Interagency Working Group
LCFS	low-carbon fuel standard
LDV	light-duty vehicle
MDV	medium-duty vehicle
MMT	million metric tons
$MMTCO_2e$	million metric tons of carbon dioxide equivalent
MOU	memorandum of understanding
MRR	Mandatory Reporting of GHG Emissions
$MTCO_2e$	metric tons of carbon dioxide equivalent
MW	megawatt
N_2O	nitrous oxide
NEMS	National Energy Systems Model
NF_3	nitrogen trifluoride
NOAA	National Oceanic and Atmospheric Administration
NOx	nitrogen oxides
NRDC	National Resources Defense Council
NWL	Natural and Working Lands
OEHHA	Office of Environmental Health Hazard Assessment
OGV	Ocean-Going Vessel
OPR	Governor's Office of Planning and Research
OTC	once-through cooled
PFC	perfluorocarbon
PHMSA	Pipelines and Hazardous Materials Safety Administration
PM	particulate matter
$PM_{2.5}$	fine particulate matter
PPP	public-private partnership
RFS	renewable fuel standard

ROG	reactive organic gases
RPS	Renewables Portfolio Standard
SB	Senate Bill
SC-CH_4	social cost of methane
SC-CO_2	social cost of carbon
SC-GHG	social cost of greenhouse gases
SC-N_2O	social cost of nitrous oxide
SF_6	sulfur hexafluoride
SGIP	Self-Generation Incentive Program
SLCP	short-lived climate pollutant
TSD	Technical Support Document
UC	University of California
UCLA	University of California, Los Angeles
UNFCCC	United Nations Framework Convention on Climate Change
U.S. EPA	United States Environmental Protection Agency
VMT	vehicle miles traveled
WUI	wildland-urban interface
ZEV	zero-emission vehicle

Executive Summary

This Scoping Plan lays out the sector-by-sector roadmap for California, the world's fifth[1] largest economy, to achieve carbon neutrality by 2045 or earlier, outlining a technologically feasible, cost-effective, and equity-focused path to achieve the state's climate target. This is a challenging but necessary goal to minimize the impacts of climate change. There have been three previous Scoping Plans. Previous plans have focused on specific greenhouse gas (GHG) reduction targets for our industrial, energy, and transportation sectors—first to meet 1990 levels by 2020, then to meet the more aggressive target of 40 percent below 1990 levels by 2030. This plan, addressing recent legislation and direction from Governor Newsom, extends and expands upon these earlier plans with a target of reducing anthropogenic emissions to 85 percent below 1990 levels by 2045. This plan also takes the unprecedented step of adding carbon neutrality as a science-based guide and touchstone for California's climate work. The plan outlines how carbon neutrality can be achieved by taking bold steps to reduce GHGs to meet the anthropogenic emissions target and by expanding actions to capture and store carbon through the state's natural and working lands and using a variety of mechanical approaches.

What this means for California is an ambitious and aggressive approach to decarbonize every sector of the economy, setting us on course for a more equitable and sustainable future in the face of humanity's greatest existential threat, and ensuring that those who benefit from this transformation include communities hardest hit by climate impacts and the ongoing pollution from the use of fossil fuels. The combustion of fossil fuels has polluted our air—particularly in low-income communities and communities of color—for far too long and is the root cause of climate change. This Scoping Plan helps us chart the path to a future where race and class are no longer predictors of disproportionate burdens from harmful air pollution and climate impacts.

The major element of this unprecedented transformation is the aggressive reduction of fossil fuels wherever they are currently used in California, building on and accelerating carbon reduction programs that have been in place for a decade and a half. That means rapidly moving to zero-emission transportation; electrifying the cars, buses, trains, and trucks that now constitute California's single largest source of planet-warming pollution. It also means phasing out the use of fossil gas used for heating our homes and buildings. It means clamping down on chemicals and refrigerants that are thousands of times more powerful at trapping heat than carbon dioxide (CO_2). It means providing our communities with sustainable options for walking, biking, and public transit to reduce reliance on cars and their associated expenses. It means continuing to build out the solar arrays, wind turbine capacity, and other resources that provide clean, renewable energy to displace fossil-fuel fired electrical generation. It also means scaling up new options such as renewable hydrogen for hard-to-electrify end uses and biomethane where needed. Successfully achieving the outcomes called for in this Scoping Plan would reduce demand for liquid petroleum by 94 percent

1 In October 2022, California was poised to become the world's fourth largest economy.

and total fossil fuel by 86 percent in 2045 relative to 2022.[2] Despite these world-leading efforts, some amount of residual emissions will remain from hard-to-abate industries such as cement, internal combustion vehicles still on the road, and other sources of GHGs, including high global warming chemicals used as refrigerants.

The plan addresses these remaining emissions by re-envisioning our natural and working lands—forests, shrublands/chaparral, croplands, wetlands, and other lands—to ensure they play as robust a role as possible in incorporating and storing more carbon in the trees, plants, soil, and wetlands that cover 90 percent of the state's 105 million acres while also thriving as a healthy ecosystem. Modeling indicates that natural and working lands will not, on their own, provide enough sequestration and storage to address the residual emissions. For that reason, it is necessary to research, develop, and deploy additional methods of capturing CO_2 that include pulling it from the smokestacks of facilities, or drawing it out of the atmosphere itself and then safely and permanently utilizing and storing it, as called for in recent legislation. Carbon removal also will be necessary to achieve net negative emissions to address historical GHGs already in the atmosphere.

This is a plan that aims to shatter the carbon status quo and take action to achieve a vision of California with a cleaner, more sustainable environment and thriving economy for our children. This ambitious plan will serve as a model for other partners around the world as they consider how to make their transition. As we have so often in the past, California can continue to serve as a leader in innovation that has produced not only the fifth largest economy on the planet, but ultimately one of the most energy-efficient economies, with a track record of demonstrating the ability to decouple economic growth from carbon pollution. This plan also builds upon current and previous environmental justice efforts to integrate environmental justice directly into the plan, to ensure that all communities can reap the benefits of this transformational plan. Specifically, this plan identifies a path to keep California on track to meet its SB 32 GHG reduction target of at least 40 percent below 1990 emissions by 2030.

2 See *CARB's energy demand reductions*.

- Identifies a technologically feasible, cost-effective path to achieve carbon neutrality by 2045 and a reduction in anthropogenic emissions by 85 percent below 1990 levels.
- Focuses on strategies for reducing California's dependency on petroleum to provide consumers with clean energy options that address climate change, improve air quality, and support economic growth and clean sector jobs.
- Integrates equity and protecting California's most impacted communities as driving principles throughout the document.
- Incorporates the contribution of natural and working lands (NWL) to the state's GHG emissions, as well as their role in achieving carbon neutrality.
- Relies on the most up-to-date science, including the need to deploy all viable tools to address the existential threat that climate change presents, including carbon capture and sequestration, as well as direct air capture.
- Evaluates the substantial health and economic benefits of taking action.
- Identifies key implementation actions to ensure success.

The path forward is informed by robust science. The recent Sixth Assessment Report (AR6) of the Intergovernmental Panel on Climate Change (IPCC) summarizes the latest scientific consensus on climate change. It finds that atmospheric concentrations of CO_2 have increased by 50 percent since the industrial revolution and continue to increase at a rate of two parts per million each year.[3] By the 2030s, and no later than 2040, the world will exceed 1.5°C warming unless there is drastic action. While every tenth of a degree matters—every incremental increase in warming brings additional negative impacts—climate-related risks to human health, livelihoods, and biodiversity are projected to increase further under 2°C warming, compared to 1.5°C.[4] For example, at 1.5°C of global warming, we would experience increasing heat waves, longer warm seasons, and shorter cold seasons, but at 2°C of global warming, heat extremes would more often reach critical tolerance thresholds for human health and agriculture.[5] We are already seeing unprecedented climate change impacts, such as continued sea level rise, that are "irreversible" for centuries to millennia, and we are dangerously close to hitting 1.5°C in the near term.[6] To avoid climate catastrophe and remain below 1.5°C with limited or no overshoot of that threshold, global net anthropogenic CO_2 emissions need to reach net zero by 2050.

3 *IPCC. 2021. Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. [Masson-Delmotte, V., P. Zhai, A. Pirani, S. L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M. I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J. B. R. Matthews, T. K. Maycock, T. Waterfield, O. Yelekçi, R. Yu, and B. Zhou (eds.)]. Cambridge University Press. In Press.*

4 *IPCC. 2018. Global Warming of 1.5°C. World Meteorological Organization. Geneva, Switzerland. 32 pp.*

5 *IPCC. 2021. Climate change widespread, rapid, and intensifying – IPCC. August.*

6 *United Nations. 2021. IPCC report: 'Code red' for human driven global heating, warns UN chief. August 9.*

It has been 16 years since the Global Warming Solutions Act of 2006 was passed and signed into law. In 2017, the second update to the Assembly Bill (AB) 32 Climate Change Scoping Plan[7] (2017 Scoping Plan) laid out a cost-effective and technologically feasible path to achieve the 2030 GHG reduction target. At the time, many characterized the plan and the AB 32 target as unachievable, citing that it would lead to massive business and job loss, and excessive costs. Those predictions proved to be incorrect as California achieved its AB 32 target years ahead of schedule, all the while growing our economy, with the state distinguishing itself as a hub for green technology investment. This Scoping Plan draws on a decade and a half of proven successes and additional new approaches to provide a balanced and aggressive course of effective actions to achieve carbon neutrality in 2045, if not before, in addition to the 2030 goal.

California's economy is projected to grow vigorously in the coming years and decades. In 2045, under a Reference Scenario, the gross state product would be $5.1 trillion, nearly $2 trillion more than in 2021, and allow growth that would add hundreds of thousands of jobs. Under the Scoping Plan scenario, impacts to economic and job growth would be negligible in both 2035 and 2045, while delivering $199 billion of benefits in the form of reduced hospitalizations, asthma cases, and lost work and school days due to the cleaner air supported by this plan. This should come as no surprise given the tremendous growth of California's economy since the Great Recession of 2007–2009, even as the state has taken drastic measures to lower emissions. As noted, the savings associated with ambitious climate action are extensive, both in terms of avoided climate impacts and health costs. As described in Chapter 1, the health costs of climate and air pollution in the U.S. are well over $800 billion today and will continue to grow in the coming years[8] without robust action. Similarly, the costs of delayed or insufficient climate action could cost the U.S. upwards of $14.5 trillion over the next 50 years.[9] We can either take action now or pay the cost of inaction, both now and later.

Grows CA's economy to $5.1 trillion by 2045

New jobs ↑ 4 million

Health costs ↓ $200 billion

We cannot take on this unprecedented challenge alone. Collaboration with the federal government, other U.S. states, and other jurisdictions around the world will continue to be fundamental for California to succeed in achieving its climate targets, especially as the pace of our efforts increases in the coming years. We believe this collaboration and coordination also creates a race to the top, encouraging and enabling other jurisdictions to achieve climate and air quality goals as well, and often providing lessons for national action.

One example of fruitful collaboration is California's longstanding vehicle emissions standards programs, which have repeatedly been freely adopted by other states, consistent with the federal Clean Air Act. California's programs frequently pioneer more rigorous standards or new technologies—such as the now-standard catalytic converter and the rules that led directly to the nation-leading numbers of zero-emission vehicles on our roads today. From initial standards for cars

7 *CARB. 2017. California's 2017 Climate Change Scoping Plan.*

8 *Alwis, D. D., and V. S. Limaye. No date. The Costs of Inaction: The Economic Burden of Fossil Fuels and Climate Change on Health in the United States. NRDC, The Medical Society Consortium on Climate and Health, and WHPCA.*

9 *Deloitte. 2022. The Turning Point: A New Economic Climate in the United States.*

and trucks decades ago to the world-leading Advanced Clean Trucks program currently helping to electrify heavy-duty vehicles, this partnership continues to offer regulatory options and spread innovative technologies. A major example of future work is the Advanced Clean Cars II program, which lays out California's legally binding path to achieving 100 percent zero emission vehicle (ZEV) sales in 2035.[10] The California Air Resources Board (CARB) continues to work closely with many other states that also see zero-emission vehicles as critical to their climate and public health goals and expects many states to choose to adopt this regulation as well. This partnership with other states also creates market certainty for automakers, which in turn helps to ensure that California consumers have access to a variety of ZEVs at multiple price points.

The Scoping Plan Process

Four scenarios were extensively modeled to develop this Scoping Plan, with the objective of informing the most viable path to remain on track to achieve our 2030 GHG reduction target: a reduction in anthropogenic emissions by 85% below 1990 levels and carbon neutrality by 2045. All four have their merits and are informed by stakeholder input. The scenario ultimately chosen as the basis of this Scoping Plan is the alternative that most closely aligns with existing statute and Executive Orders. It was selected because it best achieves the balance of cost-effectiveness, health benefits, and technological feasibility.

For the first time, this Scoping Plan includes modeling and quantification of GHG emissions and carbon sequestration in natural and working lands (NWL). To date, the focus has been only on reducing the emissions of GHGs from our transportation, energy, and industrial sectors. The state's 2020 and 2030 GHG reductions targets only include these sources, as they are the primary drivers of climate change and disproportionate harmful air pollution in our vulnerable communities. This Scoping Plan, through the lens of carbon neutrality, expands the scope to more meaningfully consider how our NWL contribute to our long-term climate goals. For the first time, new and cutting-edge modeling tools allow us to estimate the quantitative ability of our forests and other landscapes to remove and store carbon under different scenarios. These cutting-edge tools were developed through a stakeholder process and in coordination with other agencies for the purpose of this update and will continue to be refined over time and made available to others seeking to do similar work.

10 *Executive Department. State of California. Executive Order N-79-20.*

As recent data and Scoping Plan modeling shows, our NWL also can act as a source of emissions, principally in the form of wildfires. California's forests are experiencing a deadly combination of drought and heat combined with a century of misguided fire suppression management. Scoping Plan modeling shows that, at this time and until our forests reach a balance through appropriate treatments, California's NWL will act as a net source of emissions, not a sink. As such, the Scoping Plan includes policy direction and actions intended to quickly move the sector toward being a net sink and a more natural state, where wildfires will continue to be an important part of the healthy forest cycle but not at the intensity and frequency observed in recent years.

Development of this Scoping Plan also includes careful consideration of, and coordination with, other state agencies, consistent with Governor Gavin Newsom's whole-of-government approach to tackling climate change. State agency plans and regulations, including the SB 100 Joint Agency Report,[11] State Implementation Plan, Climate Action Plan for Transportation Infrastructure,[12] AB 74 Studies on Vehicle Emissions and Fuel Demand and Supply,[13,14,15] Short-Lived Climate Pollutant Strategy (SLCP Strategy),[16] CARB's Achieving Carbon Neutrality Report,[17] Climate Smart Lands Strategy,[18] Natural Working Land Implementation Plan,[19] and the California Climate Insurance Report: Protecting Communities, Preserving Nature, and Building Resiliency,[20] among others, provided critical inputs and data points for this plan. This Scoping Plan is the product of work by multiple agencies across the Administration, including dozens of public workshops and years of rigorous analysis and economic modeling by California's leading institutions. This cooperation on planning lays the foundation for even closer coordination among and between state agencies to put the plan into effect.

The plan is also the product of tireless efforts of, and recommendations from, the AB 32 Environmental Justice Advisory Committee (EJ Advisory Committee). The EJ Advisory Committee, created by statute, plays a critical role to inform the development of each Scoping Plan and helps to ensure environmental justice is integrated throughout the plan. CARB reconvened the EJ Advisory Committee in early 2021 to advise on the development of this Scoping Plan. In their advisory role, the EJ Advisory Committee has worked together to provide inputs to CARB to inform the development of scenarios and the associated modeling. And in April 2022, the EJ Advisory Committee provided draft preliminary recommendations in advance of the Draft 2022 Scoping Plan to help ensure the draft plan meaningfully addresses environmental justice. The CARB Board and EJ Advisory Committee held a joint board hearing on September 1, 2022, where the EJ Advisory Committee presented their final recommendations on the Scoping Plan. Over five dozen of the recommendations are reflected in the Scoping Plan. Going forward, as this plan is ultimately acted on by the Board, ongoing input from the EJ Advisory Committee will be essential to address environmental justice and achieve the ambitious vision outlined in the plan throughout its implementation in the coming years.

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11 *California Public Utilities Commission (CPUC), California Energy Commission (CEC), and CARB. 2021. SB 100 Joint Agency Report.*
12 *California State Transportation Agency (CalSTA). 2021. Climate Action Plan for Transportation Infrastructure.*
13 *California Environmental Protection Agency (CalEPA). 2021. Carbon Neutrality Studies.*
14 *Brown, A. L., et. al. 2021. Driving California's Transportation Emissions to Zero. University of California Institute of Transportation Studies.*
15 *Deschenes, O. 2021. Enhancing equity while eliminating emissions in California's supply of transportation fuels. University of California Santa Barbara.*
16 *CARB. Short-Lived Climate Pollutants.*
17 *Energy and Environmental Economics, Inc. 2020. Achieving Carbon Neutrality in California: PATHWAYS Scenarios Developed for the California Air Resources Board. October.*
18 *California Natural Resources Agency (CNRA). 2021. Draft Climate Smart Lands Strategy.*
19 *CARB. 2019. Draft California 2030 Natural and Working Lands Climate Change Implementation Plan.*
20 *California Department of Insurance. 2021. Protecting Communities, Preserving Nature, and Building Resiliency.*

Importantly, per legislative direction, the Scoping Plan development includes modeling and analyses of emissions, economics, air quality, health, jobs, and public health. This work is important to inform the discussion around trade-offs and how to balance the various legislative direction in identifying a path to achieve the state's climate goals. The technical work serves as a backdrop to what this means to Californian's daily lives—to how they will work, play, and live as we act to eliminate fossil fuel combustion and achieve the many public health and environmental benefits that will result from that action.

Ensuring Equity and Affordability

The state has a long history of public health and environmental protection. However racist and discriminatory practices such as redlining have resulted in low-income communities and communities of color being disproportionately exposed to health hazards and pollution burdens.[21] These communities are often located adjacent to major roadways and large stationary sources that not only emit GHGs, but also harmful localized air pollution. The plan delivers on the promise to transform the way we move, live, and work by nearly eliminating our dependence on fossil fuels. It includes effective actions to move with all possible speed to clean energy, zero-emission cars and trucks, energy-efficient homes, sustainable agriculture, and resilient NWL. And it prioritizes working with the communities most impacted to ensure that these strategies address their needs.

An important part of our equity consideration is ensuring the transition to a zero-emission economy is affordable and accessible, and that it uplifts disadvantaged, low-income communities and communities of color. Some aspects of the transition will have associated costs (e.g., escalating efforts to retrofit existing homes and businesses to support electric appliances and vehicles and increased costs of insurance). The state must ensure that these costs do not disproportionately burden consumers. In addition, the state has an important role to play in providing financial incentives, especially to low-income consumers, to allow for uptake of clean technologies. The Department of Community Services and Development's Low Income Weatherization Program is a prime example of this approach, enabling low-income Californians to be part of the zero-emission transition, all while lowering energy bills. The program provides low-income households with solar

21 *CalEPA. 2021. Pollution and Prejudice: Redlining and Environmental Injustice in California. August 16.*

photovoltaic systems and energy efficiency upgrades at no cost to residents, helping cushion the impact of climate change on vulnerable communities.

With this Scoping Plan, the state also adds another tool to help identify and close climate change impact gaps that will emerge over time. As California invests in climate mitigation and adaptation, it is essential to understand the relative impact of climate change across the state's diverse communities. We know not all communities are equally resilient in the face of climate impacts due to persisting health and opportunity gaps. We also know that a global metric such as the Social Cost of Carbon cannot adequately capture the incremental additional impact faced by overly burdened communities. The Climate Vulnerability Metric (CVM) is specifically focused on quantifying the community-level impacts of a warming climate on human welfare.

Energy and Technology Transitions

To support the transformation needed, we must build the clean energy production and distribution infrastructure for a carbon-neutral future. The solution will have to include transitioning existing energy production and transmission infrastructure to produce zero-carbon electricity and hydrogen, and utilizing biogas resulting from wildfire management or landfill and dairy operations, among other substitutes. In almost all sectors, electrification will play an important role. That means that the grid will need to grow at unprecedented rates and ensure reliability, affordability, and resiliency through the next two decades and beyond. It also means we need to keep all options on the table, as it will take time to fully grow the electricity grid to be the backbone for a decarbonized economy. We also know that electrification is not possible in all situations. As such, this plan systematically evaluates and identifies feasible clean energy and technology options that will bring both near-term air quality benefits and deliver on longer-term climate goals.

This transition will not happen overnight. It will take time and planning to ensure a smooth transition of existing energy infrastructure and deployment of new clean technology. And while this Scoping Plan has the longest planning horizon of any Scoping Plan to date, this 25-year horizon is still relatively short in terms of transforming California's economy. We must avoid making choices that will lead to stranded assets and incorporate new technologies that emerge over time. Importantly, given the pace at which we must transition away from fossil fuels, we absolutely must identify and address market and implementation barriers to be successful. The scale of transition includes adding four times the solar and wind capacity by 2045 and about 1,700 times the amount of current hydrogen supply.

As we transition our energy systems, we must also rapidly deploy the clean technologies that rely on a decarbonized grid. As called for in Executive Order N-79-20, all new passenger vehicles sold in California will be zero-emission by 2035, and all other fleets will have transitioned to zero-emission as fully possible by 2045. This means the percentage of fossil fuel combustion vehicles will continue to rapidly decrease, becoming a fading vision of the past. Successful implementation of this Executive

Order (EO) and other zero-emission priorities will have to be attractive to consumers. As an example, electric and hydrogen transportation refueling must be readily accessible, and active transportation and clean transit options must be cheaper and more convenient than driving.

Cost-Effective Solutions Available Today

Ultimately, to achieve our climate goals, urgent efforts are needed to slash GHG emissions. Fortunately, cost-effective solutions are available to do so in many cases. In short, this plan relies on existing technologies—it does not require major technological breakthroughs that are highly uncertain.

For example, targeted action to reduce methane emissions can be achieved at low or negative cost, and with significant near-term climate and public health benefits. In many cases, renewable energy and energy storage are cheaper than polluting alternatives, and are already firmly part of our business-as-usual approach; modeling related to the most recent integrated resource planning process at the California Public Utilities Commission (CPUC) has shown that scenarios associated with the best emissions outcomes had the lowest average rates. As another example, research from Energy Innovation shows that the U.S. can achieve 100 percent zero-carbon power by 2035 without increasing customer costs.[22]

The same is either already true, or soon to be true, for zero-emission vehicles as well. Myriad studies show cost parity for light-duty and heavy-duty ZEVs being achieved by mid-decade or shortly thereafter. A carbon neutrality study conducted by the University of California (UC) Institute of Transportation Studies and funded by the California Environmental Protection Agency (CalEPA) shows that achieving carbon neutrality in the transportation sector will save Californians $167 billion through 2045.[23] Similar research from the Goldman School of Public Policy at UC Berkeley finds that achieving 100 percent light-duty ZEV sales nationwide would save consumers $2.7 trillion through 2050; equivalent to $1,000 per household, per year, for 30 years.[24]

22 *Phadke, A. et al. 2020. "Illustrative Pathways to 100 Percent Zero Carbon Power by 2035 Without Increasing Customer Costs, Energy Innovation." September.*
23 *Brown, A. L., et al. 2021. Driving California's Transportation Emissions.*
24 *Goldman School of Public Policy. 2021. 2035: The Report: Transportation. UC Berkeley. April.*

Many of these outcomes are a direct result of California's vision and policy development to advance clean energy and climate solutions, including through the Renewables Portfolio Standard, Advanced Clean Cars II regulations, SLCP Reduction Strategy, and others. While the world collectively has not yet fully deployed clean energy and climate solutions at the scale needed to adequately address climate change, California has made tremendous progress—even since the last Scoping Plan update in 2017. Continued ambition, leadership, and climate policy development from California will help the state achieve the scale of emissions reductions needed from technologies and strategies that are already cost-effective or close to it today, and will move additional technologies and strategies to that point in the near future. Achieving those outcomes and reducing costs for the entire array of climate solutions needed to achieve carbon neutrality and then maintain net-negative emissions will prove the true measure of California's success. This will enable California to not just meet our own climate targets, but to ultimately develop the replicable solutions that can scale globally to address global warming.

Continue with a Portfolio Approach

Over the past decade and a half, the state has undertaken a successful three-pronged approach to reducing GHGs: incentives, regulations, and carbon pricing. The 2017 Scoping Plan leveraged existing programs such as the Renewables Portfolio Standard, Advanced Clean Cars, Low Carbon Fuel Standard, Short-lived Climate Pollutant Strategy, mobile source measures to achieve federal air quality targets, and a Cap-and-Trade Program, among others, to lay out a technologically feasible and cost-effective path to achieve the 2030 GHG reduction target. When looking toward the 2045 climate goals and the deeper GHG reductions needed across the AB 32 GHG Inventory sectors, all of the existing programs must be evaluated and, as necessary, strengthened to support the rapid production and deployment of clean technology and energy, as well as the increased pace and scale of actions on our natural and working lands.

The challenge before us requires us to keep all tools on the table. Given the climate mitigation co-benefits, critical actions to deliver near-term air quality benefits, such as those included in the State Implementation Plan to achieve the federal air quality standards, are incorporated into this Scoping Plan, as are new legislative mandates to decarbonize the electricity and cement sectors. And, if additional gaps are identified, new programs and policies must be developed and implemented to

ensure all sectors are on track to reduce emissions. Opportunities to leverage these programs to address ongoing air quality disparities must also be considered, along with targeted environmental justice policies such as the AB 617 Community Air Protection Program and the investments made possible through the California Climate Investments Program.

Conclusion

California has never undertaken such a comprehensive, far-reaching, and transformative approach to fighting climate change as that called for in this plan. Once implemented, it will place every aspect of how we live, work, play, and travel in California on a more sustainable footing, with a focus on directly benefitting those communities already most burdened by pollution. This comprehensive approach reflects how climate change is already changing life in California. We have all experienced the impacts of devastating wildfires, extreme heat, and drought. Despite much progress, California still has some of the worst air pollution in the nation, especially in the San Joaquin Valley and the Los Angeles Basin, which is driven by the continued use of fossil fuel-powered trucks and cars.

This Scoping Plan provides a solution; a way forward and a vision of a California where we can and will address those impacts. This plan is fundamentally based on hope. It is a hope grounded in experience and science that we can fundamentally improve the California we leave to future generations. The plan is built on the legacy of effective actions and on the conviction that we can effectively marshal the combined capabilities of California—from state, regional, tribal, and local governments to industry to our research institutions, and most importantly, to the nearly 40 million Californians who will benefit from the actions laid out in the plan. It addresses the challenge of our generation by laying out a pathway and guideposts for action across three decades. But the Scoping Plan is only that: a plan. The hard work—and hopeful work—is putting its recommendations into action. And there is no time to waste.

Post-adoption of the Scoping Plan

As with previous Scoping Plans, CARB Board approval is the beginning of the next phase of climate action. Specifically, approval of this plan catalyzes a number of efforts, including the development of new regulations as well as amendments to strengthen regulations and programs already in place, not just at CARB but across state agencies. The unprecedented rate of transition will also require the identification and removal of market and implementation barriers to the production and deployment of clean technology and energy. All of these actions and more will be needed if we are to achieve our climate goals.

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Chapter 1: Introduction

"The debate is over around climate change. Just come to the state of California. Observe it with your own eyes."

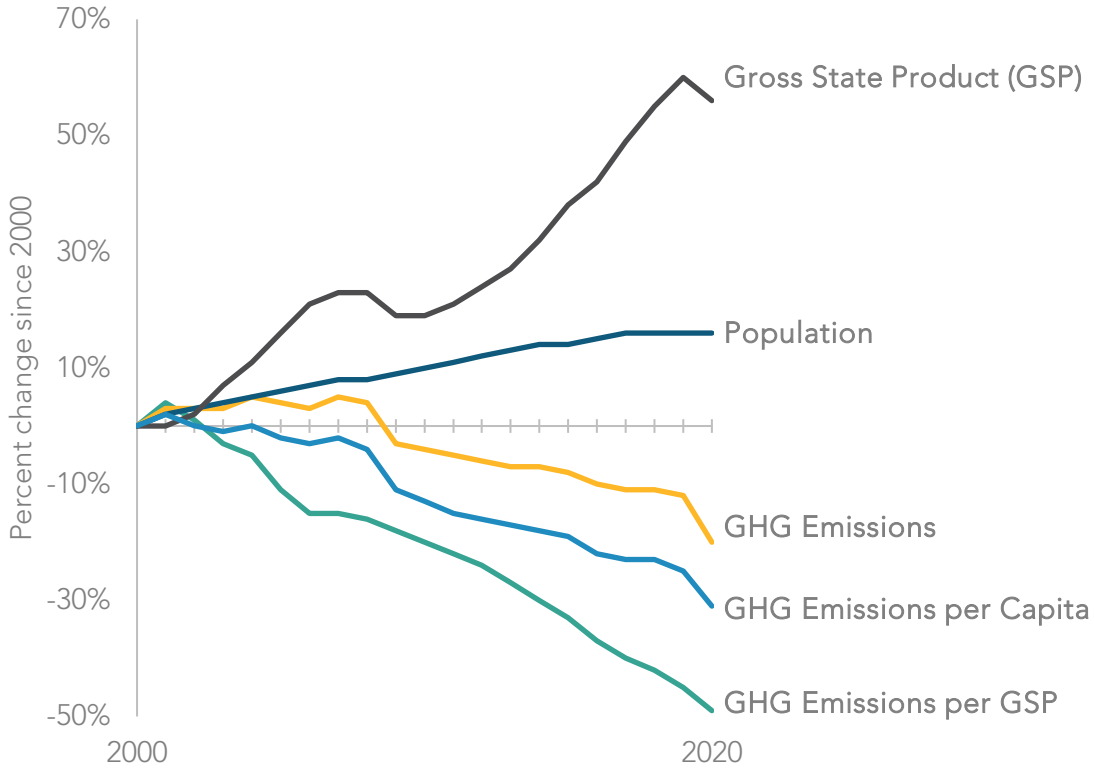
- California Governor Gavin Newsom in September 2020 after surveying the devastation caused by catastrophic wildfires

The impacts of climate change are no longer a distant threat on the horizon—they are right here, right now, with a growing intensity that is adversely affecting our communities and our environment, here in California and across the globe. The science that, decades ago, predicted the impacts we are currently experiencing is even stronger today and unambiguously tells us what we must do to limit irreversible damage: we must act with renewed commitment and focus to do more and do it sooner. That science is indisputable. Unless we increase ambition, we will be faced with more fire, more drought, more temperature extremes, and deadly, choking air pollution. The future of our state—our communities, economy, and ecosystems—is inextricably tied to the way we respond in this decade and the partnerships we forge along the way.

The impacts of climate change fall most heavily on frontline communities that bear the brunt of extreme heat, drought, wildfires, and other effects. Low-income communities and communities of color are also disproportionately impacted by fossil fuel combustion-related air pollution and related health problems. The continued phaseout of fossil fuel combustion will advance both climate and air quality goals and will deliver the greatest health benefits to the most impacted communities.

As it has responded to this climate crisis, California has established itself as a global leader in science-based, public health-focused climate change mitigation and air quality control. The California Legislature has worked with both Republican and Democratic governors to advance action on public health and environmental protections—and California has made progress on addressing climate change during periods of both Republican and Democratic federal administrations. Since the passage of Assembly Bill 32 (AB 32) (Núñez and Pavley, Chapter 488, Statutes of 2006), California has developed bold, creative, and durable policy solutions to protect our environment and public health, all while growing our economy. In fact, California met the target established in AB 32—a return of greenhouse gas (GHG) emissions to 1990 levels by 2020—years ahead of schedule, even as the state established itself as the one of the largest economies in the world. As Figure 1-1 below shows, California's emissions and economic growth have continued to decouple, and California is now the fifth largest economy in the world.

Figure 1-1: California total and per capita GHG emissions[25]



Recognizing both California's early successes in achieving GHG emissions reductions while growing the economy, as well as the worsening impacts of climate change, our governors and legislators have continued to enact ambitious goals. California's unwavering commitment to address climate change is based on indisputable science and data. This commitment is also informed by our collective efforts to address environmental justice and advance racial equity, such that race will no longer be a predictor for disproportionate environmental burdens faced by low-income communities and communities of color. As the Office of Environmental Health Hazard Assessment's

[25] Due to the global pandemic, 2020 is an outlier year and should not be considered indicative of a trend; emissions are likely to increase as economies recover from the impacts of the pandemic.

(OEHHA's) recent analysis of race/ethnicity and air pollution vulnerability and CalEnviroScreen 4.0 scores demonstrate, much work remains to be done.[26]

Many of California's environmental policies have served as models for similar policies in other U.S. states, and at national and international levels. Moving forward, California will continue its pursuit of collaborations and advocacy for action to address climate change at all levels of government. While California is responsible for just one percent of global GHG emissions, and we must do our part, we also play an important role in exporting both political will and technical solutions to address the climate crisis globally.

Today, we have a chance to re-envision California's future and set the state on a path to be carbon neutral no later than 2045 while advancing equity, addressing environmental justice, and continuing to grow our economy. This Scoping Plan provides a roadmap outlining key policies we can implement to achieve our climate goals while improving the health and welfare of Californians and addressing disparities in health outcomes to create a more equitable future. It will enable us to turn the corner in our efforts to protect and preserve our critical natural and public resources, all while providing unparalleled opportunities for clean, pollution-free economic growth.

Severity of Climate Change Impacts

With the increasing severity and frequency of drought, wildfire, extreme heat, and other impacts, Californians just have to look out their windows to know that climate change is real and rapidly getting worse. The impacts we thought we would see in the decades to come are happening now. We must act decisively to both reduce our GHG emissions and build resilience to these impacts for ourselves, future generations, and our iconic landscapes.

Wildfires

Of the twenty largest wildfires ever recorded in California, nine occurred in 2020 and 2021. The worst wildfire season in California's recorded history was in 2018, with over 24,226 structures damaged or destroyed and over 100 lives lost. The largest wildfire season ever recorded in state history was in 2020, where more than 4.3 million acres burned, albeit at different intensity and with varying ecological impacts, and over 112 million metric tons of

[26] OEHHA and CalEPA. 2021. Analysis of Race/Ethnicity and CalEnviroScreen 4.0 Scores. *https://oehha.ca.gov/media/downloads/calenviroscreen/document/calenviroscreen40raceanalysisf2021.pdf*.

carbon dioxide (CO_2) emitted into the atmosphere.[27] The economic damage of these fires was estimated to be over $10 billion in property damage and over $2 billion in fire suppression costs.[28] The Camp Fire, which destroyed much of Paradise, California, was the world's costliest natural disaster in 2018, with overall damages of $16.5 billion.[29] It was also the deadliest fire in California history, with 85 civilian fatalities. Wildfires have always been part of California's natural ecology and will continue to be. However, changes to the state's climate and precipitation expands the footprint of wildfire threat, severity, and intensity, with one quarter of California—more than 25 million acres—now classified as being under very high or extreme fire threat.[30]

The impacts of wildfire smoke have been linked to respiratory infections, cardiac arrests, low birth weight, mental health conditions, and exacerbated asthma and chronic obstructive pulmonary disease.[31] In 2020, with all of California covered by wildfire smoke for over 45 days—and 36 counties for at least 90 days—maximum fine particulate ($PM_{2.5}$) levels persisted in the "hazardous" range of the Air Quality Index for weeks in several areas of the state.[32,33]

Catastrophic wildfire damages extend beyond human health and the economy. The Castle Fire in 2020 and the KNP Complex and Windy Fires in 2021 led to the loss of an unprecedented number of giant sequoias: an estimated 13 to 19 percent of the giant

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[27] CARB. 2020. Public Comment Draft Greenhouse Gas Emissions of Contemporary Wildfire, Prescribed Fire, and Forest Management Activities. *https://ww3.arb.ca.gov/cc/inventory/pubs/ca_ghg_wildfire_forestmanagement.pdf*.

[28] News18. 2021. San Francisco Bay Area Receives its First Wildfire Warning of 2021, After California Concludes its Driest Year. *https://www.news18.com/news/buzz/san-francisco-bay-area-receives-its-first-wildfire-warning-of-2021-after-california-concludes-its-driest-year-3722897.html*.

[29] Munich RE. 2019. Extreme Storms, Wildfires and Droughts Cause Heavy Nat Cat Losses In 2018. *https://www.munichre.com/en/company/media-relations/media-information-and-corporate-news/media-information/2019/2019-01-08-extreme-storms-wildfires-and-droughts-cause-heavy-nat-cat-losses-in-2018.html#-1808457171*.

[30] CARB. No date. Wildfires. *https://ww2.arb.ca.gov/our-work/programs/wildfires/about*.

[31] Reid, C. E., M. Brauer, F. H. Johnston, M. Jerrett, J. R. Balmes, and C. T. Elliott. 2016. "Critical Review of Health Impacts of Wildfire Smoke Exposure." *Environmental Health Perspectives* *http://dx.doi.org/10.1289/ehp.1409277*.

[32] Vargo J. A. 2020 (updated in 2021 using the *NOAA Hazard Mapping System*). "Time Series of Potential US Wildland Fire Smoke Exposures." *Frontiers in Public Health* *https://doi.org/10.3389/fpubh.2020.00126*.

[33] CalFire. 2020 *Fire Siege Report.* *https://www.fire.ca.gov/media/hsviuuv3/cal-fire-2020-fire-siege.pdf*.

sequoia population in the Sierra Nevada. An iconic species, giant sequoias are the largest trees on earth, with exceptional longevity outside of climate extremes.[34,35]

It is clear that we must take drastic measures to prepare for future wildfires, which is why California invested $2.7 billion in wildfire resilience from fiscal years 2020 to 2023. The exponential increase in funding launched more than 552 wildfire resilience projects in less than a year, and CAL FIRE met its 2025 goal of treating 100,000 acres a full three years ahead of schedule. Since Fiscal Year 2019–20, treatment work has significantly increased, and CAL FIRE has averaged 100,000 acres treated each fiscal year.

Although we are making progress, we have a lot more work to do in order to achieve our goal of treating one million acres annually by 2025. The Governor's Wildfire and Forest Resilience Strategy details 99 actions needed to address the key drivers of catastrophic wildfires, ramp up the pace and scale of forest management, and make threatened communities more resilient to catastrophic fires. It is also important to note that natural wildfire cycles are a part of a sustainable forest ecosystem and will continue to play a role in a healthy forests' future. We should not expect wildfires to cease, but we must manage our lands to address catastrophic wildfires that result from buildup of carbon stocks due to our interventions to suppress wildfires and from climate change resulting from fossil fuel combustion.

Drought

Drought is a recurring feature of the California climate that has been intensified by increasingly warmer average temperatures. Anthropogenic climate trends have exacerbated drought conditions; human-caused climate change accounts for 19 percent of drought severity and 42 percent of the soil moisture deficit in this region since 2000. The governor declared a drought state of emergency in October 2021, and as of September 2022, 94 percent of California was in severe drought, and 99.8 percent[36] of the state was in at least moderate drought. The first three months of 2022 were the driest January, February, and March on record in California.[37] The harsh drought conditions affecting California are part of a larger megadrought—a drought lasting more than two

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[34] Shive, K., C. Brigham, T. Caprio, and P. Hardwick. 2021. 2021 Fire Season Impacts to Giant Sequoias. The Nature Conservancy and National Park Service. *https://www.nps.gov/articles/000/2021-fire-season-impacts-to-giant-sequoias.htm*.

[35] Shive, K. L., A. Wuenschel, L. J. Hardlund, S. Morris, M. D. Meyer, and S. M. Hood. 2022. "Ancient Trees and Modern Wildfires: Declining Resilience to Wildfire in the Highly Fire-adapted Giant Sequoia." *Forest Ecology and Management* 511, 120110. *https://doi.org/10.1016/j.foreco.2022.120110*.

[36] Drought.gov. California. National Oceanic and Atmospheric Administration (NOAA) and the National Integrated Drought Information System. *https://www.drought.gov/states/california*.

[37] Drought.ca.gov. September 26, 2022. California Drought Update. *https://drought.ca.gov/media/2022/09/Weekly-CA-Drought-Update-09262022-FINAL.pdf*.

decades—that has been ongoing in the Southwestern region of North America since 2000. The past 22 years have been the region's driest period since at least 800 CE.[38]

While large urban water districts with diversified sources of water supply have maintained water deliveries to customers through the drought, hundreds of individual well owners and some small water systems have suffered disruption. The state is providing funding for water system consolidation and modernization projects in small communities, emergency repairs and replacements for dry wells, and bottled and hauled water deliveries. A 2021 law requires small suppliers to create drought contingency plans. During the drought of the last three years the state has delivered emergency drinking water assistance to nearly 10,000 households and 150 water systems.

California agriculture is responsible for more than half of all U.S. domestic fruit and vegetable production, and in 2021 drought resulted in the fallowing of nearly 400,000 acres of fields.[39] Direct crop revenue losses were approximately $962 million, and total economic impacts were more than $1.7 billion, with over 14,000 full- and part-time job losses.[40] During the 2011–2017 drought, California's agricultural industry suffered at least $5 billion in losses.[41] The 2022–23 budget includes $100 million to support agricultural water conservation practices, provide on-farm technical assistance, and provide direct relief to small farm operators.

Though native California species are adapted to drought, human engineering has altered most streams and wetlands in the state, making drought increasingly stressful to fish and wildlife. The state has conducted hundreds of fish and amphibian rescues in this drought to move creatures from diminished habitat, upgraded hatcheries, and boosted hatchery production, and has hauled millions of young hatchery salmon to San Francisco Bay to avoid adverse river conditions. State biologists monitor dozens of streams statewide and have negotiated voluntary agreements with landowners and water users to improve stream flows and temperatures.

California has started to implement major policies to build resilience to combat drought—such as the Sustainable Groundwater Management Act of 2014, the governor's Water Resilience Portfolio (2020), the governor's Water and Supply Strategy (August 2022), and

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[38] Williams, A. P., B. I. Cook, and J. E. Smerdon. 2022. "Rapid Intensification of The Emerging Southwestern North American Megadrought in 2020–2021." *Nature Climate Change* https://doi.org/10.1038/s41558-022-01290-z.

[39] Medellín-Azuara, J. 2022. *Economic Impacts of the 2021 Drought on California Agriculture.* University of California Merced. https://wsm.ucmerced.edu/wp-content/uploads/2022/02/2021-Drought-Impact-Assessment_20210224.pdf.

[40] Medellín-Azuara. *Economic Impacts of the 2021 Drought*.

[41] National Resources Defense Council (NRDC). 2019. Climate Change and Health in California. Issue Brief. https://www.nrdc.org/sites/default/files/climate-change-health-impacts-california-ib.pdf.

new standards for indoor, outdoor, and industrial water use. However, it is crucial that we take further actions to minimize the impacts of drought in the years to come.

Extreme Heat

California's hottest summer on record was 2021.[42] Death Valley recorded the world's highest reliably measured temperature (130°F) in July 2021, breaking its own record (129°F) from summer 2020.[43] Meanwhile, Fresno also broke one of its own records, with 64 days over 100°F in 2021.[44] This is part of a trend: the daily maximum average temperature, an indicator of extreme temperature shifts, is expected to rise 4.4°F–5.8°F by 2050 and 5.6°F–8.8°F by 2100.[45] Heat waves that result in public health impacts are also projected to worsen throughout the state. By 2050, these heat-related health events are projected to last two weeks longer in the Central Valley and occur four to ten times more often in the Northern Sierra region.[46]

Heat ranks among the deadliest of all climate hazards in California, and heat waves in cities are projected to cause two to three times more heat-related deaths by mid-century.[47] Climate vulnerable communities[48] will experience the worst of these effects, as heat risk is associated and correlated with physical, social, political, and economic factors. Aging populations, infants and children, pregnant people, and people with chronic illness are especially sensitive to heat exposure.[49,50] Combining these characteristics and existing health inequities with additional factors such as poverty, linguistic isolation,

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[42] NOAA. 2022. Climate at a Glance. *https://www.ncdc.noaa.gov/cag/statewide/time-series/4/tavg/3/8/1895-2021?base_prd=true&firstbaseyear=1901&lastbaseyear=2000*.

[43] Masters, J. 2021. Death Valley, California, breaks the all-time world heat record for the second year in a row. Yale Climate Connections. *https://yaleclimateconnections.org/2021/07/death-valley-california-breaks-the-all-time-world-heat-record-for-the-second-year-in-a-row/*.

[44] NOAA. Climate Data Online Search. Accessed on 16 March 2022. *https://www.ncdc.noaa.gov/cdo-web/search*.

[45] Governor's Office of Planning and Research (OPR), CEC, and CNRA. 2018. *California's Fourth Climate Change Assessment*. Page 23. *https://www.energy.ca.gov/sites/default/files/2019-11/Statewide_Reports-SUM-CCCA4-2018-013_Statewide_Summary_Report_ADA.pdf*.

[46] OPR, CEC, and CNRA. *California's Fourth Climate Change Assessment - Statewide Summary Report.* *https://www.energy.ca.gov/sites/default/files/2019-11/Statewide_Reports-SUM-CCCA4-2018-013_Statewide_Summary_Report_ADA.pdf*.

[47] Ostro, B., S. Rauch, and S. Green. 2011. "Quantifying the health impacts of future changes in temperature in California." National Library of Medicine. *https://pubmed.ncbi.nlm.nih.gov/21975126/*.

[48] CARB. Priority Populations. California Climate Investments. *https://www.caclimateinvestments.ca.gov/priority-populations*.

[49] Basu, R. 2009. "High Ambient Temperature and Mortality: A Review of Epidemiologic Studies from 2001 to 2008." National Library of Medicine. *https://pubmed.ncbi.nlm.nih.gov/19758453/*.

[50] Basu, R., and B. Malig. 2011. "High Ambient Temperature and Mortality in California: Exploring the Roles of Age, Disease, and Mortality Displacement." National Library of Medicine. *https://pubmed.ncbi.nlm.nih.gov/21981982/*.

housing insecurity, and the legacy of racist redlining practices, can put individuals at a disproportionately high risk of heat-related illness and death.[51,52] Rising temperatures will also speed up smog-forming chemical reactions, leading to worse asthma, reduced lung function, cardiac arrest, and cognitive decline. African American, American Indian/Alaskan Native, and Puerto Rican Californians are particularly sensitive to smog, as they are between 28.6 and 132.5 percent more likely to be diagnosed with asthma than white Californians.[53]

In addition to the dangers to public health, California's September 2022 heat wave is particularly illustrative of how more frequent extreme heat strains the state's infrastructure we depend on to adapt to a changing climate. For example, as all-time high temperature records were broken in Sacramento, San Jose, Santa Rosa and Fairfield, electricity demand for air conditioning threatened to overwhelm the state power supply.[54]

California has taken major steps to protect communities from the impacts of extreme heat. Our recent budgets invest $800 million to cool our schools and neighborhoods, including projects to reduce urban overheating. The Extreme Heat Action Plan, released in April 2022, outlines the all-of-government approach California is taking to reduce urgent risks and build long-term resilience to the impacts of extreme heat. In September 2022, Governor Newsom signed multiple bills addressing extreme heat, including AB 2238 (Rivas, Chapter 264, Statutes of 2022), which will create the nation's first extreme heat advance warning and ranking system to better prepare communities ahead of heat waves. The Administration is committed to addressing extreme heat, but we still have a lot of work to do.

Wildfires, drought, and extreme heat are some of the most pronounced climate impacts California is experiencing, but they are not the only ones. Sea level rise, rising ocean temperatures, ocean acidification, and inland flooding are also already having devastating impacts on our communities, ecosystems, and economy, and will continue to do so in the years and decades to come. The decisions and actions that we take today will determine how strongly we will feel the impacts of climate change in the future.

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[51] Hoffman, J. S., V. Shandas, and N. Pendleton. 2020. "The Effects of Historical Housing Policies on Resident Exposure to Intra-Urban Heat: A Study of 108 US Urban Areas." MDPI. *https://www.mdpi.com/2225-1154/8/1/12/htm*.

[52] U.S. Climate Resilience Toolkit. No date. Heat and Social Inequity in the United States. *https://toolkit.climate.gov/tool/heat-and-social-inequity-united-states*.

[53] NRDC. 2019. Climate Change and Health. Issue Brief. *https://www.nrdc.org/sites/default/files/climate-change-health-impacts-california-ib.pdf*.

[54] Samenow, Jason. 2022. No September on record in the West has seen a heat wave like this. *The Washington Post.* September 9. *https://www.washingtonpost.com/climate-environment/2022/09/08/western-heatwave-records-california-climate/*.

Imperative To Act

Consequences of Further Warming

The Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment Report (AR6) found that it will not be possible to keep global warming within the threshold of 1.5ºC to avoid the most severe impacts of climate change unless we make immediate and large-scale reductions in GHG emissions. It finds that atmospheric concentrations of CO_2 have increased by 50 percent since the industrial revolution, and that they continue to increase at a rate of two parts per million each year.[55] Without immediate action, the world will exceed 1.5ºC (or 2.7ºF) warming by the 2030s, and no later than 2040.

While every tenth of a degree matters—every incremental increase in warming brings additional negative impacts—climate-related risks to human health, livelihoods, and biodiversity are projected to increase further under 2ºC (or 3.6ºF) warming, compared to 1.5ºC.[56] To remain below 1.5ºC with limited or no overshoot of that threshold, global net anthropogenic CO_2 emissions need to be cut by about half by 2030 and reach net-zero by 2050.

If we fail to make rapid changes, we may not be able to limit global warming to 2ºC,[57] and the consequences of inaction would be catastrophic. Our planet is already 1.2ºC warmer than pre-industrial times due to human-induced warming, and many impacts we are already experiencing, such as sea level rise, are "irreversible" for centuries to millennia.[58] Californians with the fewest resources, who are disproportionately low-income communities and communities of color, are the most vulnerable to the impacts of climate change. While the human costs associated with health impacts can never be fully monetized, a recent report finds that the health costs of climate and air pollution in the U.S. are well over $800 billion today and will continue to grow in the coming years.[59]

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[55] IPCC. 2021. *Climate Change 2021: The Physical Science Basis.* https://www.ipcc.ch/report/ar6/wg1/.
[56] IPCC. 2018. *Special Report: Global Warming of 1.5°C.* World Meteorological Organization. https://www.ipcc.ch/sr15/.
[57] IPCC. 2021. Summary for Policymakers. In: *Climate Change 2021: The Physical Science Basis.* Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Masson-Delmotte, V., P. Zhai, A. Pirani, S. L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M. I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J. B. R. Matthews, T. K. Maycock, T. Waterfield, O. Yelekçi, R. Yu, and B. Zhou (eds.)]. In Press. https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_SPM_final.pdf.
[58] United Nations. 2021. IPCC report: 'Code red.' https://news.un.org/en/story/2021/08/1097362#:~:text=%27Code%20red%20for%20humanity%27&text=We%20are%20at%20imminent%20risk,%2C%20to%20keep%201.5%20alive.%22.
[59] Alwis, D. D., and V. S. Limaye. No date. *The Costs of Inaction*. https://www.nrdc.org/sites/default/files/costs-inaction-burden-health-report.pdf.

Any delays in action or insufficient action are a threat to public health and the environment. The impacts to our economy would be devastating as well. While not specific to California, a 2022 report from Deloitte Economics Institute finds that failing to take sufficient action to reduce emissions could result in economic losses to the U.S. of more than $14.5 trillion over the next 50 years.[60] On a hopeful note, however, the report finds that if the country invests now and in the coming years in a net-zero economy, $3 trillion could be added to the economy over the next 50 years. The U.S. annual gross domestic product (GDP) would be 2.5 percent higher in 2070 in this fast-action scenario than in the delayed action scenario. The lessons for California from these analyses are clear: invest now or pay the price later. As shown in Figure 1-2, inaction can lead to negative consequences for individuals, communities, the economy, and society as a whole. As discussed later, Governor Newsom and the Legislature have accepted this imperative and made significant investments in climate action. This Scoping Plan combined with the historic investments and policy direction from the governor and Legislature, will result in unprecedented action to address the climate crisis.

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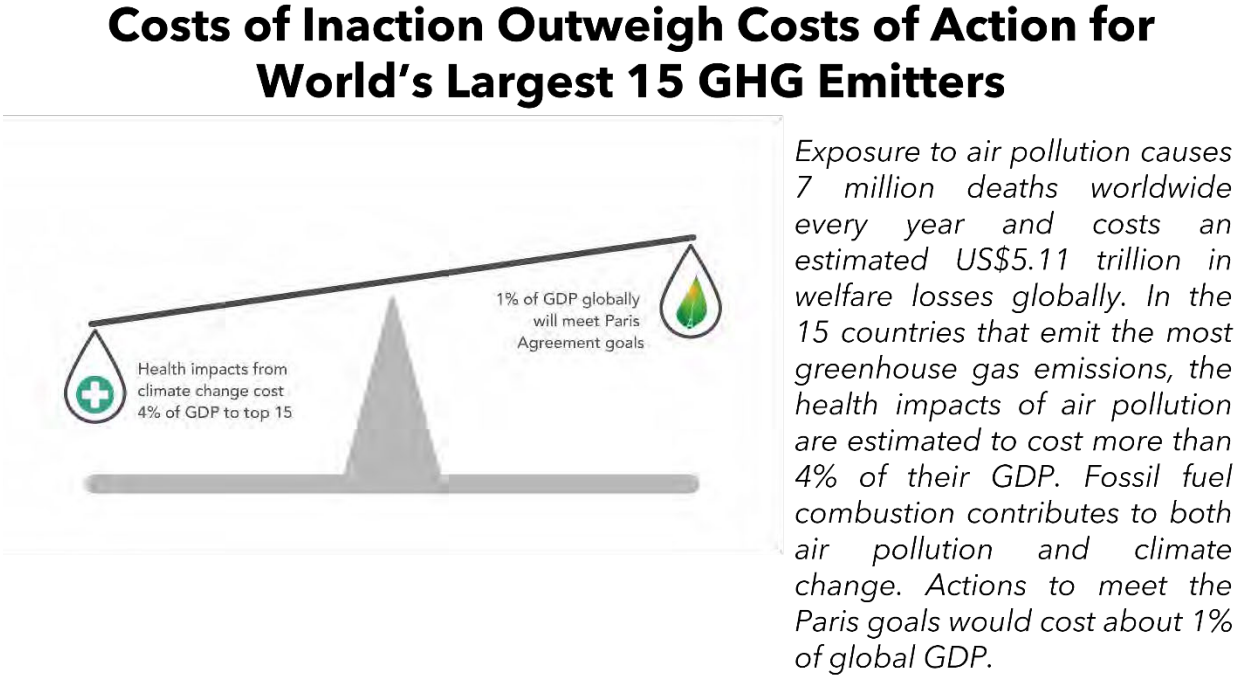
[60] Deloitte. 2022. *The Turning Point.* *https://www2.deloitte.com/content/dam/Deloitte/us/Documents/about-deloitte/us-the-turning-point-a-new-economic-climate-in-the-united-states-january-2022.pdf?id=us:2el:3dp:wsjspon:awa:WSJSBJ:2021:WSJFY22*.

Figure 1-2: The real costs of inaction[61]



Scoping Plan Overview

Previous Scoping Plans

The Scoping Plan is a strategy the California Air Resources Board (CARB) develops and updates at least one every five years, as required by AB 32. It lays out the transformations needed across our society and economy to reduce emissions and reach our climate targets. This Scoping Plan is the third update to the original plan that was adopted in 2008. The initial Scoping Plan laid out a path to achieve the AB 32 2020 limit of returning to 1990 levels of GHG emissions, a reduction of approximately 15 percent below business as usual.[62] The 2008 Scoping Plan included a mix of incentives, regulations, and carbon pricing, laying out the portfolio approach to addressing climate change and clearly making the case for using multiple tools to meet California's GHG targets. The 2013 Scoping Plan assessed progress toward achieving the 2020 limit and made the case for addressing

[61] Katowice, P. 2018. *Health benefits far outweigh the costs of meeting climate change goals.* WHO. https://www.who.int/news/item/05-12-2018-health-benefits-far-outweigh-the-costs-of-meeting-climate-change-goals.

[62] CARB. 2008. *Climate Change Scoping Plan.* https://ww2.arb.ca.gov/sites/default/files/classic/cc/scopingplan/document/adopted_scoping_plan.pdf.

short-lived climate pollutants (SLCPs).[63] The most recent update, the 2017 Scoping Plan,[64] also assessed the progress toward achieving the 2020 limit and provided a technologically feasible and cost-effective path to achieving the Senate Bill 32 (SB 32, Pavley, Chapter 249, Statutes of 2016) target of reducing GHGs by at least 40 percent below 1990 levels by 2030.

Overview of this Scoping Plan

It is paramount that we continue to build on California's success by taking effective actions and doubling down on implementation of the strategies outlined here. As such, this Scoping Plan builds on and integrates efforts already underway to reduce the state's GHG, criteria pollutant, and toxic air contaminant emissions by identifying the clean technologies and fuels that should be phased in as the state transitions away from combustion of fossil fuels. By selecting and pursuing a sustainable and clean economic path, the state will continue to successfully execute existing programs, work to eliminate air pollution inequities, demonstrate the coupling of economic growth and environmental progress, and enhance new opportunities for engagement within the state to address and prepare for climate change.

The 2022 Scoping Plan for Achieving Carbon Neutrality (Scoping Plan) is the most comprehensive and far-reaching Scoping Plan developed to date. It identifies a technologically feasible and cost-effective path to achieve carbon neutrality by 2045 while also assessing the progress California is making toward reducing its GHG emissions by at least 40 percent below 1990 levels by 2030, as called for in SB 32 and laid out in the 2017 Scoping Plan.[65] The 2030 target is an interim but important stepping stone along the critical path to the broader goal of deep decarbonization by 2045. Modeling for this Scoping Plan shows that this decade must be one of transformation on a scale never seen before to set us up for success in 2045.

The relatively longer path assessed in this Scoping Plan incorporates, coordinates, and leverages many existing and ongoing efforts to reduce GHGs and air pollution, while identifying new clean technologies and energy. Given the focus on carbon neutrality, this Scoping Plan also includes discussion for the first time of the Natural and Working Lands (NWL) sectors as both sources of emissions and carbon sinks. Chapter 2 of this document

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[63] CARB. 2014. *First Update to the Climate Change Scoping Plan.* https://ww2.arb.ca.gov/sites/default/files/classic/cc/scopingplan/2013_update/first_update_climate_change_scoping_plan.pdf.
[64] CARB. 2017. *California's 2017 Climate Change Scoping Plan.* https://ww2.arb.ca.gov/sites/default/files/classic/cc/scopingplan/scoping_plan_2017.pdf.
[65] CARB. 2017. *California's 2017 Climate Change Scoping Plan.* https://ww2.arb.ca.gov/sites/default/files/classic/cc/scopingplan/scoping_plan_2017.pdf.

includes a description of a suite of specific actions to drastically reduce GHGs across all sectors. Chapter 3 provides the air quality and economic evaluations of the actions. Chapter 4 provides a broader description of the many actions needed across all sectors to achieve carbon neutrality. Chapter 5 provides an overview of the next steps and partnerships needed to implement this Scoping Plan. Guided by legislative direction, the actions identified in this Scoping Plan reduce overall GHG emissions in California and deliver policy signals that will continue to drive investment and certainty in a low carbon economy. This Scoping Plan builds upon the successful framework established by the Initial Scoping Plan and subsequent updates while identifying new, technologically feasible, and cost-effective strategies.

Principles That Inform Our Approach to Addressing the Climate Challenge

California has decades of experience addressing the climate challenge. Through this experience, and based on extensive engagement with stakeholders through our regulatory and program development processes, we have developed a set of principles to inform our approach.

Unprecedented Investments in a Sustainable Future

The scale of transformation needed over this decade to avoid the worst impacts of climate change and meet our ambitious climate goals is extraordinary. This is why Governor Newsom and the Legislature invested over $15 billion in climate action through the 2021–2022 California Comeback Plan, and why the 2022–2023 budget marks the beginning of the California Climate Commitment—the governor's multi-year plan to invest $54 billion in climate action. The enacted budgets (Figure 1-3) and the California Climate Commitment represent investments of a historic scale and will advance precisely the type of all-of-government approaches necessary to create the whole-of-society changes described in this Scoping Plan that will enable us to avert the worst impacts of climate change.

Figure 1-3: Comprehensive California climate change investments

The *California Climate Commitment* includes the following game-changing elements:

- $10 billion for zero-emission vehicles (ZEVs), including $1.5 billion for electric school buses to protect students' health and $3 billion to build an accessible charging network. ZEV investments will particularly focus on programs such as heavy-duty vehicle and port electrification that will reduce emissions and protect public health in low-income communities.
- $2.1 billion for clean energy investments, such as long duration storage, offshore wind, green hydrogen,[66] and industrial decarbonization.
- $13.8 billion for programs that reduce emissions from the transportation sector, such as improving public transportation while also funding walking, biking, and adaptation projects.
- Over $720 million for California's higher education institutions and research that will support the next generation of climate innovations.

[66] For the purposes of this Scoping Plan, "renewable hydrogen" and "green hydrogen" are interchangeable and are not limited to only electrolytic hydrogen produced from renewables.

- Nearly $1 billion to build sustainable, affordable housing and over $1 billion to help low-income Californians realize energy cost savings through building decarbonization.
- Nearly $9 billion for wildfire risk reduction, drought mitigation, extreme heat resilience, and nature-based solutions.

These investments are incredibly important in the context of this Scoping Plan in that they accompany and help support implementation of the many policies and regulations that will continue to be necessary to achieve our 2030 and carbon neutrality targets. In addition, these incentive programs jump-start emission reduction strategies for priority sectors, sources, and technologies, leveraging private-sector investment and building sustainable, growing markets for clean and efficient technologies. Many of California's incentive programs work in concert with federal and other state programs to drive emission reductions. As an example, as California pushes to move to 100% sales of new zero emission-vehicles, including plug-in hybrid vehicles, the Newsom Administration continues to invest heavily in incentive programs that allow families, communities, and businesses to choose zero-emission vehicles. This is done while simultaneously working with the federal government, other states, and jurisdictions around the world to align policies, regulations, and incentives, creating market certainty for the automakers that serve our markets.

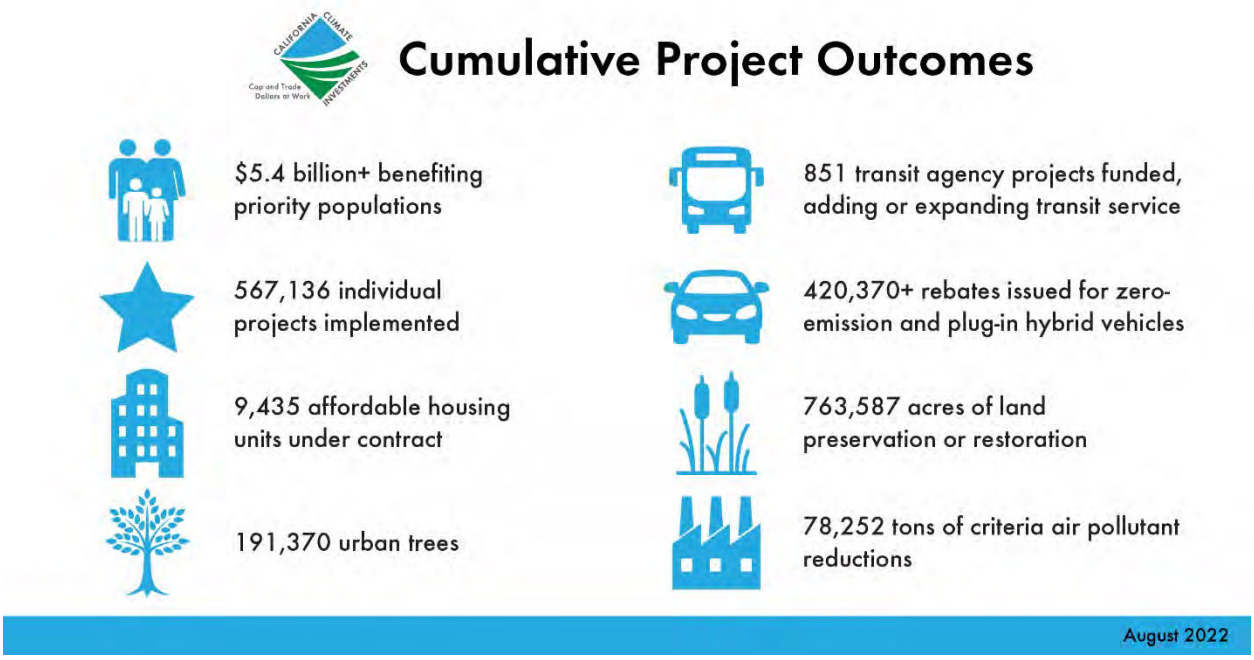
Centering Equity

Prioritizing equity is just as important as the magnitude of the climate investments California is making. Addressing climate change and advancing our equity and economic opportunity goals cannot be decoupled. In line with the governor's Executive Order[67] to take additional actions to embed equity analysis and considerations, this plan works to center equity by addressing disparities for historically underserved and marginalized communities. California strives to ensure that our climate and air research, regulations, investments, and plans include provisions that specifically address and advance equity. This includes reducing and eliminating air pollution disparities, removing barriers that can prevent frontline communities from accessing benefits, lowering costs for low-income Californians, and promoting high-quality jobs. CARB's incentive programs regularly surpass their mandated equity targets, and CARB has incorporated equity-focused provisions in our research, planning, and regulatory efforts. For instance, statute requires that a minimum of 35 percent of California Climate Investments benefit low-income households along with disadvantaged and low-income communities (referred to as *priority*

[67] Executive Department. State of California. 2022. Executive Order N-16-22. *GSS 9320 2-20220912152941 (ca.gov)*.

populations). However, 48 percent—over $5.4 billion—of implemented California Climate Investments project funding is benefiting priority populations, greatly exceeding the statutory minimums (see Figure 1-4). Senate Bill 535 (De León, Chapter 830, Statutes of 2012) and AB 1550 (Gomez, Chapter 369, Statutes of 2016) direct state and local agencies to make significant investments using auction proceeds to assist California's most vulnerable communities. Under these laws, a minimum of 25 percent of the total investments are required to be located within and provide benefits to disadvantaged communities, and at least 10 percent of the total investments must benefit low-income communities and households. Moving forward, the state will continue to devote a greater share of incentive funding to priority populations, with the light-duty vehicle incentive program as just one example. We can simultaneously confront the climate crisis and build a more resilient, just, and equitable future for all communities.

Figure 1-4: California climate investments cumulative outcomes[68,69]



Role of the Environmental Justice Advisory Committee

To inform the development of the Scoping Plan, AB 32 calls for the convening of an Environmental Justice Advisory Committee (EJ Advisory Committee) to advise CARB in developing the Scoping Plan, and any other pertinent matter in implementing AB 32. It requires that the Committee be comprised of representatives from communities with the most significant exposure to air pollution, including communities with minority populations and/or low-income populations. On January 25, 2007, CARB appointed the first

[68] CARB. 2022. California Climate Investments program implements $10.5 billion in greenhouse gas-reducing programs, expected to reduce 76 million metric tons of emissions. April 11. *https://ww2.arb.ca.gov/news/california-climate-investments-program-implements-105-billion-greenhouse-gas-reducing-projects*.

[69] SB 535 and AB 1550 require investments located in and benefiting low-income communities and households, which are termed *priority populations. Disadvantaged communities* are currently defined by CalEPA as the top 25 percent of communities experiencing disproportionate amounts of pollution, environmental degradation, and socioeconomic and public health conditions according to the Office of Environmental Health Hazard Assessment's *CalEnviroScreen tool,* plus certain additional communities including federally recognized Tribal Lands. Low-income communities and households are defined by statute as those with incomes either at or below 80 percent of the statewide median or below a threshold designated as low-income by the Department of Housing and Community Development.

Environmental Justice Advisory Committee to advise it on the Initial Scoping Plan and other climate change programs.

For this Scoping Plan, CARB reconvened the EJ Advisory Committee in May 2021. The committee is currently comprised of 14 environmental justice and disadvantaged community representatives, including the EJ Advisory Committee's first tribal representative, who was appointed in February 2022. In October 2021, the EJ Advisory Committee formally created eight workgroups. These workgroups are a space for EJ Advisory Committee members to better understand specific sectors of the Scoping Plan and to assist the EJ Advisory Committee in the development of recommendations on this Scoping Plan. In December 2021, the EJ Advisory Committee provided scenario input responses to help shape the modeling for this Scoping Plan. In February 2022, San Joaquin Valley EJ Advisory Committee members hosted their first community workshop, with over 100 attendees. In March 2022, the CARB Board held a joint public meeting with the EJ Advisory Committee to discuss their draft preliminary recommendations for this Scoping Plan. In June 2022, over 165 attendees participated in a statewide community workshop held by EJ Advisory Committee members. The full schedule of EJ Advisory Committee Meetings and meeting materials are available on CARB's website.[70] This Scoping Plan includes references where EJ Advisory Committee Final Recommendations[71] are included in the document. The final recommendations were discussed at a joint CARB and EJ Advisory Committee Hearing on September 1, 2022.

The integration of environmental justice is critical to ensure that certain communities are not left behind. The AB 32 EJ Advisory Committee provided recommendations on September 30 in advance of the final Scoping Plan. There are footnotes to indicate where there is alignment between the AB 32 EJ Advisory Committee's recommendations and this Scoping Plan. While the language in the text may not fully incorporate the specific EJ Advisory Committee's recommendation, the footnotes do acknowledge the places in the text where there is general alignment with the spirit of the EJ Advisory Committee's recommendation.

Partnering with Tribes

[70] CARB. Environmental Justice Advisory Committee Meetings and Events. https://ww2.arb.ca.gov/environmental-justice-advisory-committee-meetings-and-events.

[71] Environmental Justice Advisory Committee. September 30, 2022. 2022 Scoping Plan Recommendations. https://ww2.arb.ca.gov/sites/default/files/barcu/board/books/2022/090122/finalejacrecs.pdf.

There are 109 federally recognized tribes and over 60 non-federally recognized tribes in California. [72] In 2011, Governor Brown issued Executive Order B-10-11, recognizing and reaffirming the inherent right of tribes to exercise sovereign authority over their members and territory and directing state agencies to engage in government-to-government consultation with tribe and to work to develop partnerships and consensus.[73] In 2019, Governor Newsom issued Executive Order N-15-19, which acknowledges and apologizes on behalf of the state for the historical "violence, exploitation, dispossession and the attempted destruction of tribal communities."[74] Establishing partnerships with tribal leaders to incorporate their priorities, traditional expertise, and knowledge will be important to achieving California's climate goals. The Scoping Plan includes actions that tribal partners can voluntarily implement for sources under their jurisdiction (e.g., transitioning to zero emission fleets, installing infrastructure and control technologies, conducting climate smart land management). The Scoping Plan also uplifts the importance of having our tribal partners help guide actions that may impact tribal cultural resources and of benefitting from tribal input.

We also need alignment between state and local partners and tribes on actions related to land-use decisions. This means respecting and reinforcing tribal sovereignty and self-determination. As tribes do not always draw clear lines between the "natural" and "cultural" resources of a place, taking a holistic perspective will result in positive impacts in ability to address the complex issues of land management and regulatory undertakings.

Tribes have an intimate and historical knowledge of places and should be engaged early on to inform planning and future management related to activities that may impact tribal resources and areas including potential funding opportunities, technical assistance, and capacity building, where appropriate. Additionally, tribes should be involved in the identification of their own significant resources and areas of use. As decisions are made related to Scoping Plan undertakings, agencies should recognize and appropriately consider cultural resources and management from the beginning, not as an afterthought; and consider how the project could impact tribes.

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[72] These numbers are subject to change depending on determinations made by the Bureau of Indian Affairs (BIA) and the Native American Heritage Commission (NAHC). Please consult the most current Federal Register for a list of federally recognized tribes and the NAHC for a list of non-federally recognized tribes in California. As of the date of the Scoping Plan, the current list for federally recognized tribes is located at 87 Fed. Reg. 4636 (Jan. 28, 2022).

[73] Executive Order B-10-11. *https://www.ca.gov/archive/gov39/2011/09/19/news17223/index.html#:~:text=EXECUTIVE%20ORDER%20B-10-11%20Published%3A%20Sep%2019%2C%202011%20WHEREAS,and%20affirmed%20in%20state%20and%20federal%20law%3B%20and*.

[74] Executive Order N-15-19. *https://tribalaffairs.ca.gov/wp-content/uploads/sites/10/2020/02/Executive-Order-N-15-19.pdf*.

Finally, to the extent allowed by law, traditional ecological knowledge and culturally sensitive information should be protected, as this is information that may not be common knowledge and may not be known outside the tribe, as each tribe is unique and influenced by its local environment and cultural practices. Protection of this information will help foster productive relationships with tribes and should be included as part of the process. CARB and other agencies should continue to foster relationships with tribal partners.

Maximizing Air Quality and Health Benefits

The state has over 50 years of experience successfully cleaning the air in California by addressing criteria pollutants and toxic air contaminants from mobile and stationary sources. CARB has been a leader in measuring, evaluating, and reducing sources of air pollution that impact public health. Its air pollution programs have been adapted for national programs and emulated in other countries. Significant progress has been made in reducing diesel particulate matter (PM), which is a designated toxic air contaminant, and many other hazardous air pollutants. CARB partners with local air districts to address stationary source emissions and adopts and implements state-level regulations to address sources of criteria and toxic air pollution, including mobile sources. CARB also collaborates with federal agencies to address air pollution from sources primarily under federal jurisdiction. In many instances, actions to reduce fossil fuel combustion and achieve federal air quality standards also help to reduce GHG emissions.

However, air pollution disparities still exist, and more must be done to ensure the most vulnerable populations have safe air to breathe. California must continue to evaluate opportunities to harmonize our climate and air quality programs through innovative policymaking and by building on existing programs like the Low Carbon Fuel Standard (LCFS) and Community Air Protection Program. The LCFS includes a provision that allows electric utilities to opt-in and generate residential electric vehicle (EV) charging credits, where some of the revenues are invested back into rebate programs that address air quality and climate pollution.[75] The Community Air Protection Program[76] is the first of its kind in the country and brings together diverse stakeholders, including CARB, local air districts, and residents of environmental justice communities to increase local air monitoring and develop community-led plans to improve air quality in the communities most impacted by air pollution.

This Scoping Plan identifies actions that will deliver near-term air quality benefits to communities with the highest exposures and provide long-term GHG benefits. Many of the actions in this Scoping Plan are key elements of the 2022 State Strategy for the State

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[75] CARB. LCFS Utility Rebate Programs. *https://ww2.arb.ca.gov/resources/documents/lcfs-utility-rebate-programs*.
[76] CARB. Community Air Protection Program. *https://ww2.arb.ca.gov/capp*.

Implementation Plan to meet federal air quality standards,[77] which has a primary focus of reducing harmful air pollution and achieving federal air quality targets. California's approach of leveraging air quality and GHG policies together has yielded results. A 2022 report by the Office of Environmental Health and Hazard Assessment (OEHHA)[78] that evaluated GHG and harmful air pollution emissions from the heavy-duty vehicle (HDV) and large stationary source sectors found declines in emissions in both sectors, with the greatest declines in disadvantaged communities. Both sectors are subject to state GHG and air quality policies, in addition to federal and local rules on harmful air pollution. Because of historically racist and discriminatory practices such as redlining, both types of sources are disproportionately located adjacent to vulnerable communities, which are predominantly communities of color.[79] The key findings from the OEHHA report are as follows:

- Both HDVs and facilities subject to the Cap-and-Trade Program have reduced emissions of co-pollutants, with HDVs showing a clearer downward trend when compared to stationary sources. These emission reductions have major health benefits, including a reduction in premature pollution-related deaths.
- The greatest beneficiaries of reduced emissions from both HDVs and facilities subject to the Cap-and-Trade Program have been in communities of color and in disadvantaged communities in California, as identified by CalEnviroScreen (CES). This has reduced the emission gap between disadvantaged and non-disadvantaged communities, but a wide gap still remains.
- The transition to zero-emission HDVs will expedite further emissions reductions.
- While the progress observed is encouraging, inequities persist, and federal, state, and local climate and air quality programs must do more to reduce emissions of GHGs and co-pollutants to reduce the burden of emissions on disadvantaged communities and communities of color.

It will take all tools at all levels of government, with robust enforcement, to ensure that vulnerable communities continue to see improvements in air quality until no disparities exist in air pollution across the state.

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[77] CARB. 2022 State Strategy for the State Implementation Plan. https://ww2.arb.ca.gov/resources/documents/2022-state-strategy-state-implementation-plan-2022-state-sip-strategy.

[78] OEHHA. 2022. *Impacts of Greenhouse Gas Emission Limits within Disadvantaged Communities: Progress Toward Reducing Inequities.* https://oehha.ca.gov/environmental-justice/report/ab32-benefits.

[79] CalEPA. 2021. Pollution and Prejudice. https://storymaps.arcgis.com/stories/f167b251809c43778a2f9f040f43d2f5.

Economic Resilience

The state's efforts to tackle the climate crisis will create economic and workforce development opportunities in the clean energy economy in communities across the state. Transitioning existing skills and expanding workforce training opportunities in climate-related fields are critical for reducing harmful emissions and supporting workers in transitioning to new, high-quality jobs. The Administration's recent budgets acknowledge the challenges facing workers in industries most affected by the state's response to climate change—especially those in the fossil fuel industry. It will invest $1 billion in regional partnerships and economic diversification to create new jobs and support a local tax base and workforce transition and development once opportunities are identified. It also will invest in safety nets to protect, and support impacted communities as part of the transition to a carbon neutral economy. Specifically, the Community Economic Resilience Fund Program[80] (CERF) supports communities and regional groups in producing regional roadmaps for economic recovery and transition that prioritize the creation of accessible, high-quality jobs in sustainable industries. The budget investments create the opportunity to future-proof and increase economic resilience in the face of more frequent climate impacts and shifting economic conditions. For these investments and implementation of the Scoping Plan to be successful in supporting the transition to a carbon neutral economy, workers and affected communities must be included in ongoing dialogue to ensure a high-road transition for regional economies.

That state also recognizes it can play a more direct role in supporting a sustainable work force through its incentive programs. In 2021, Assembly Bill 680 (AB 680) (Burke, Chapter 746, Statutes of 2021) was signed into law, requiring CARB to work with the California Labor and Workforce Development Agency to update the Funding Guidelines to include new workforce standards. CARB's Funding Guidelines currently include requirements for administering agencies to, wherever possible, foster job creation within California, provide employment opportunities or job training tied to employment, and target these opportunities to priority populations. The Funding Guidelines also recommend administering agencies prioritize investments in projects that directly support jobs or a job training and placement program, and that they report the estimated employment benefits and employment outcomes for projects that meet specified criteria. These new requirements apply to agencies administering certain California Climate Investments

[80] Office of Planning and Research. Community Economic Resilience Fund. *https://opr.ca.gov/economic-development/cerf/*.

programs that receive continuous appropriations from the Greenhouse Gas Reduction Fund and fall into the following six categories of standards:

- fair and responsible employer standards,
- inclusive procurement policies,
- prevailing wage for construction work,
- community workforce agreements for construction projects over one million dollars,
- preference for projects with educational institutions or training programs, and
- creation of high-quality jobs. CARB will be updating the Funding Guidelines through a public process over the next year to operationalize these new requirements.

Partnering Across Government

The Scoping Plan is an actionable plan to identify and align programs and policies to achieve California's climate targets. To realize the outcomes and deliver results in any Scoping Plan, action is critical. For this Scoping Plan, there are also actions that rely on our federal partners to take on sources primarily under their jurisdiction (such as aviation, and federally owned/managed lands) while they also continue to develop national programs for GHG reductions. The federal government is already taking major steps to advance these types of programs. The Inflation Reduction Act of 2022[81] includes $369 billion for domestic energy production and manufacturing and is expected to lead to U.S. GHG emission reductions of roughly 40 percent by 2030. Direct incentives will include those for clean vehicles and ENERGY STAR appliances, as well as improving transportation and clean energy in underserved communities.

We also need our local partners to align on actions related to land-use decisions that support sustainable, resilient, low-carbon communities and permitting for clean energy production facilities and infrastructure; diversion of organics from landfills; and other climate-related projects. State agencies also should use the Scoping Plan to review and update their own programs and policies to support the actions identified in this Scoping Plan. Importantly, the Scoping Plan also can serve as a resource as the Legislature considers new legislative direction and funding to support the state's path to carbon neutrality and continue action to address near-term air pollution disparities.

Partnering with the Private Sector

Government cannot achieve our climate targets alone. The scale of investment needed requires both private-sector investment and partnerships with philanthropies. Public

[81] Pub.L. No. 117-169 (August 16, 2022).

sector dollars, accompanied by strong and steady policy signals, must be a catalyst for deeper and broader investments by the private sector in both reducing emissions and building the resilience of our communities. Governor Newsom is committed to working collaboratively with businesses, including small businesses, to deploy the technologies, capital, and ingenuity that are hallmarks of the private sector.

California structures our climate policies and regulations to create market signals and certainty that spur private sector investment. For example, the Governor's Executive Order on Zero-Emission Vehicles[82] set 2035 as the target year for 100 percent zero-emission vehicle sales, creating a time horizon that allows automakers to scale up zero-emission fleets and sending a clear signal to the companies and utilities that would deploy charging infrastructure. The Executive Order has been followed by development and adoption of the Advanced Clean Cars II regulation. CARB convened auto manufacturers, environmental justice groups, labor organizations, and many other stakeholders to provide input into development of the regulation in a robust and transparent manner; again, with the aim of providing certainty for producers and consumers.

California also pursues public-private partnerships (PPP) as a mechanism to advance our collective climate goals. We know these vehicles can be effective at increasing the impact of public sector dollars and helpful in moving markets in a direction aligned with state policy. A new PPP the Administration is advancing is the Climate Catalyst Revolving Loan Fund, housed at the state's Infrastructure and Economic Development Bank (IBank). The fund offers a range of financial instruments—including flexible credit and credit support—to help bridge financing gaps currently preventing advanced climate solutions from scaling in the marketplace. The Catalyst Fund's initial areas of investment include forest biomass management and utilization (unlocking innovation to reduce wildfire threats), climate-smart agriculture, and clean energy transmission. The fund leverages public sector investments by mobilizing private finance for shovel-ready projects that are stuck in the deployment phase. As such, IBank is ideally positioned as the state's all-purpose "Green Bank," with increasing connection to federal financing programs such as US DOE's Loan Programs Office and the United States Environmental Protection Agency's (U.S. EPA) Greenhouse Gas Reduction Fund.

The Catalyst Fund builds from existing IBank financing programs that are themselves increasingly focused on the climate imperative. The IBank's Infrastructure State Revolving Fund provides supportive capital to climate-aligned projects promoted by local governments and certain nonprofit entities, and will be refining its criteria and market outreach strategies to increase its level of service. IBank's bonds program has supported

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[82] Executive Department. State of California. Executive Order N-79-20. *https://www.gov.ca.gov/wp-content/uploads/2020/09/9.23.20-EO-N-79-20-Climate.pdf.*

multiple large environmental projects, including more than $2 billion in "green bonds," and is poised to help expand access to the state's deep and liquid bond capital market. Within IBank's Small Business Finance Center, the new Climate Tech Loan Guarantee program encourages commercial banks to back climate-focused small businesses, leveraging federal capital to insure a portion of the private bank's loan. And through IBank's Expanding Venture Capital Access Fund program, the state is promoting greater diversity in the venture capital community, including climate equity and climate justice.

All of these financing programs exist to leverage private capital in support of the state's climate goals, and to partner with state policy agencies driving the transition. IBank will also continue to collaborate closely with the State Treasurer's Office in its provision of capital support to climate solutions, ensuring that funding flows to programs best positioned to deliver success. This partnership of public and private capital, responsive to and in communication with the climate policy community, will ensure that California gets the maximum possible benefit from its allocation of scarce resources.

Supporting Innovation

Reaching our ambitious, deep decarbonization goals will require continued technological innovation. Investment in research, development, and deployment of clean technologies has never been more critical. Sending clear and sustained market and policy signals will encourage large and small companies alike to pursue innovation that can be scaled up and deployed here and beyond our borders. The full suite of AB 32 policies[83] has touched nearly every sector of California's economy and spurred technology innovation in the state, including the growth of technology developers, manufacturers, processors, and assemblers in many areas. Specifically, AB 32 policies and programs support both the supply side and the demand side to build new markets in California. On the supply side, AB 32 policies support businesses to demonstrate and refine technologies, and to help establish critical supply chains. On the demand side, AB 32 policies and programs provide outreach, education, and incentives—as well as disincentives—to motivate everyone from consumers to institutional purchasers to utility planners to adopt new, climate smart technologies. Innovations resulting directly from the state's climate policies include the following:

- In the past 10 years, a growing market for heavy-duty zero-emission vehicles (HD ZEVs) was established in California, and this market now represents the largest single share of North American supply and demand for HD ZEVs. Vehicle

[83] CARB. Climate Change Programs. *https://ww2.arb.ca.gov/our-work/topics/climate-change*.

and component manufacturers are making long-term investments to develop and produce HD ZEVs within California.

- Total consumption of renewable diesel in the California LCFS market has skyrocketed from approximately 1.8 million gallons in 2011 to nearly 589 million gallons in 2020. The LCFS is a key driver of market development for renewable diesel and its coproducts. While the federal renewable fuel standard (RFS) and blenders tax credit also benefit producers, an analysis of their respective contributions to market development, and interviews with industry representatives and independent experts, point to LCFS as a more important factor in market development, at least in recent years.
- In the past five years, a market for small-scale energy storage in California was created where none previously existed. As of 2020, 185 megawatts (MW) of small-scale energy storage projects have been interconnected to the grid. The significant increase in deployment in the last five years is a result of the Self-Generation Incentive Program (SGIP), which significantly reduces the upfront costs to purchase and install small-scale energy storage devices, and of growing customer interest in disaster resiliency in the face of increasing risk from wildfire and related utility outages. These systems have already provided disaster resiliency benefits for residential and non-residential customers.

We have seen how quickly market barriers can be overcome in response to strong policy signals, as occurred in the solar panel and electric vehicle battery space. Government-stated priorities have a significant role in guiding private and public research, development, and deployment. This Scoping Plan unequivocally puts the marker down on the need for innovation to continue in non-combustion technologies, clean energy, CO_2 removal options, and alternatives for SLCPs. The five-year update to the Scoping Plan allows for a periodic evaluation of new tools to add to the state's toolkit.

Engagement with Partners to Develop, Coordinate, and Export Policies

California works closely with other states, tribal governments, the federal government, and international jurisdictions to identify the most effective strategies and methods to reduce GHGs, manage GHG control programs, and facilitate the development of integrated and cost-effective regional, national, and international GHG reduction programs. For example, the state's Cap-and-Trade Program has been linked with Québec's since 2014, and CARB staff regularly engage with jurisdictions throughout the world on the design features of our Cap-and-Trade Program through memoranda of understanding (MOUs) and venues such as the International Climate Action

Partnership.[84] Low carbon fuel mandates similar to California's LCFS have been adopted by the U.S. EPA and by other jurisdictions, including Oregon, Washington, British Columbia, the European Union, and the United Kingdom. Many other jurisdictions from Japan to New Zealand, Australia, and the European Commission also continue to seek information and technical experience on our LCFS. California has and will continue to share information and encourage ambitious emissions reductions with interested jurisdictions, with a focus on China, India, Mexico, Canada, and the European Union. California's early action to reduce super-pollutants such as methane and other SLCPs was reaffirmed by the 2021 Global Methane Pledge signed by the U.S. and over 100 other countries at the 26th Conference of the Parties to the United Nations Framework Convention on Climate Change (UNFCCC).[85]

In addition, under the Clean Air Act, the federal government is authorized to allow California to set more stringent vehicle emissions regulations than federal standards. California's goals and regulations to transition to 100 percent sales of new zero-emission passenger vehicles by 2035 (including plug-in hybrid vehicles), to drayage trucks by 2035, and other trucks and buses where feasible by 2045 are being emulated by partner states across the U.S. and in jurisdictions around the world. CARB's Advanced Clean Cars II regulation, [86] which codifies these targets, was approved in August 2022, and already at least four other states have announced their plans to adopt this regulation. Earlier in June 2020 CARB adopted the Advanced Clean Truck regulation, which requires truck manufacturers to meet increasing sale targets of zero-emission trucks in California through 2035. Since adoption, at least five other states—20 percent of the U.S. truck market—have adopted this regulation. These kinds of coordinated policies help signal to vehicle manufacturers a widespread and growing demand for zero-emissions technology, which in turn helps scale production and lower costs for consumers.

With the Mexican Secretariat for Environment and Natural Resources (SEMARNAT), California has engaged in a technical exchange on clean vehicle policies and helped to establish Mexico's Emissions Trading System (being piloted in 2022). A 2019 MOU signed between California and Environment and Climate Change Canada enables in-depth collaboration on policies and programs to decarbonize vehicles, engines, and fuels. This partnership has led to tangible emissions reductions, from aligning vehicle emissions targets and policies to collaborating on emissions testing and research critical to enforcing

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[84] International Carbon Action Partnership (ICAP). Homepage. *https://icapcarbonaction.com/en?msclkid=dac30cb7b4f511ec94ccd0f1ae323e98*.
[85] Global Methane Pledge. Homepage. *https://www.globalmethanepledge.org/*.
[86] Cal. Code Regs., tit. 13, §§ 1900,1961.2, 1961.3, 1962.2, 1962.3, 1962.4, 1962.5, 1962.6, 1962.7, 1962.8, 1965, 1968.2, 1969, 1976, 1978, 2037, 2038, 2112, 2139, 2140, 2147, and 2903; and Test Procedures located here: *https://ww2.arb.ca.gov/rulemaking/2022/advanced-clean-cars-ii*.

emissions limits for vehicle manufactures. At the national level, China has looked to California for cutting-edge requirements for car diagnostics and policies that promote zero-emissions vehicles. At a local level, Beijing has adopted California's vehicle emissions standards and several other progressive environmental regulations. California will continue and renew such efforts across China, including through a 2022 MOU signed with China's Ministry of Ecology and Environment.

Between 2021 and 2023, California also will serve as president of the Transport Decarbonisation Alliance, a global network of countries, regions, cities, and companies that come together to share experiences and technical expertise, and to increase the ambition and accelerate the deployment of targeted transportation decarbonization policies across freight, electric vehicle infrastructure, and active mobility. Throughout its presidency, California will focus its leadership on decarbonizing the cross-jurisdiction network of medium- and heavy-duty vehicles, both to ensure cleaner air in freight-adjacent communities and to stem the effects of climate change.

Over the years, California has also asserted the importance of and supported the ongoing efforts of state and local clean air and climate leadership. Through our participation in the Pacific Coast Collaborative alongside British Columbia, Washington, and Oregon,[87] the Under2 Coalition,[88] the U.S. Climate Alliance,[89] the International ZEV Alliance,[90] the Transportation Decarbonisation Alliance, and many more organizations, California has and will continue to build climate partnerships with state and local governments.

California also recognized the need to address the substantial emissions caused by the deforestation and degradation of tropical and other forests, and continues its work alongside other subnational governments as part of the Governors' Climate and Forests Task Force (GCF).[91] Founded in 2008, there are currently 39 GCF members, including states and provinces in Brazil, Colombia, Ecuador, Indonesia, Ivory Coast, Mexico, Nigeria, Peru, Spain, and the United States—all of whom are considering or operating programs to reduce emissions from deforestation, land-use, and rural development, and to benefit local and indigenous communities. CARB's California Tropical Forest Standard provides a rigorous methodology to assess jurisdiction-scale programs that reduce deforestation and to incentivize responsible action and investment.[92] The standard

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[87] Pacific Coast Collaborative. Homepage. *https://pacificcoastcollaborative.org/*.
[88] Under2 Coalition. Homepage. *https://www.theclimategroup.org/under2-coalition*.
[89] United States Climate Alliance (USCA). Homepage. *https://www.usclimatealliance.org/*.
[90] ZEV Alliance. Homepage. Accelerating the Adoption of Zero-Emission Vehicles. *https://zevalliance.org/*.
[91] Governors' Climate and Forests Task Force. University of Colorado Boulder: Colorado Law. *https://www.gcftf.org/*.
[92] CARB. California Tropical Forest Standard. *https://ww2.arb.ca.gov/our-work/programs/california-tropical-forest-standard*.

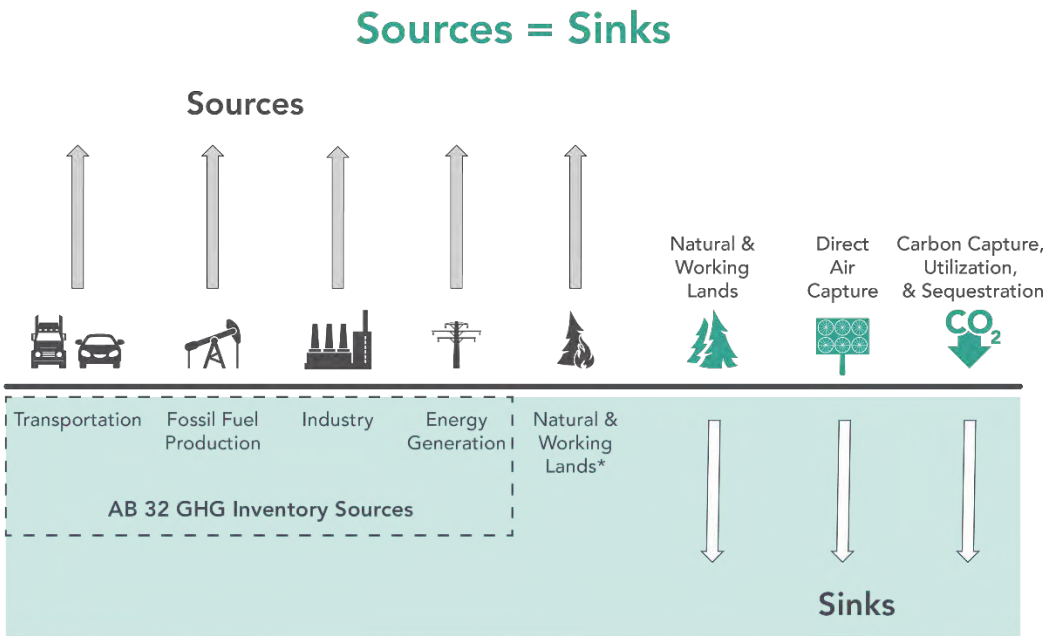
provides a strong signal to value the preservation of tropical forests over continued destructive activities such as oil exploration and extraction and ensures rigorous social and environmental safeguards for indigenous peoples and local communities.

Working Toward Carbon Neutrality

To date, California and many other regions have focused on reducing GHG emissions from the industrial, energy, and transportation sectors. As defined in statute, the state's 2020 and 2030 targets include all in-state sources of GHG emissions—and those emissions associated with imported power that is consumed in the state. By moving to a framework of carbon neutrality, the scope for accounting is expanded to include all sources and sinks. As such, carbon neutrality is achieved when the GHG fluxes are at equilibrium—when sources equal sinks. Figure 1-5 depicts the sources included in the AB 32 GHG Inventory and the new sources and sinks added in this Scoping Plan under the framework of carbon neutrality. Natural and working lands are able to sequester carbon and therefore play an increasingly important role in this framework. However, modeling for this plan shows that carbon sequestration in our natural and working lands alone will be insufficient to achieve carbon neutrality no later than 2045. Therefore, this plan also considers the role of carbon capture and sequestration, as well as biological and mechanical carbon sequestration processes that are included in the IPCC Sixth Assessment Report,[93] as necessary tools for climate change mitigation.

[93] IPCC. 2021. *Climate Change 2021: The Physical Science Basis.* https://www.ipcc.ch/report/ar6/wg1/.

Figure 1-5: Carbon neutrality: Balancing the net flux of GHG emissions from all sources and sinks



*Natural and working land emissions come from wildfires, disease, land and agricultural management practices, and others.

Supporting Healthy and Resilient Lands

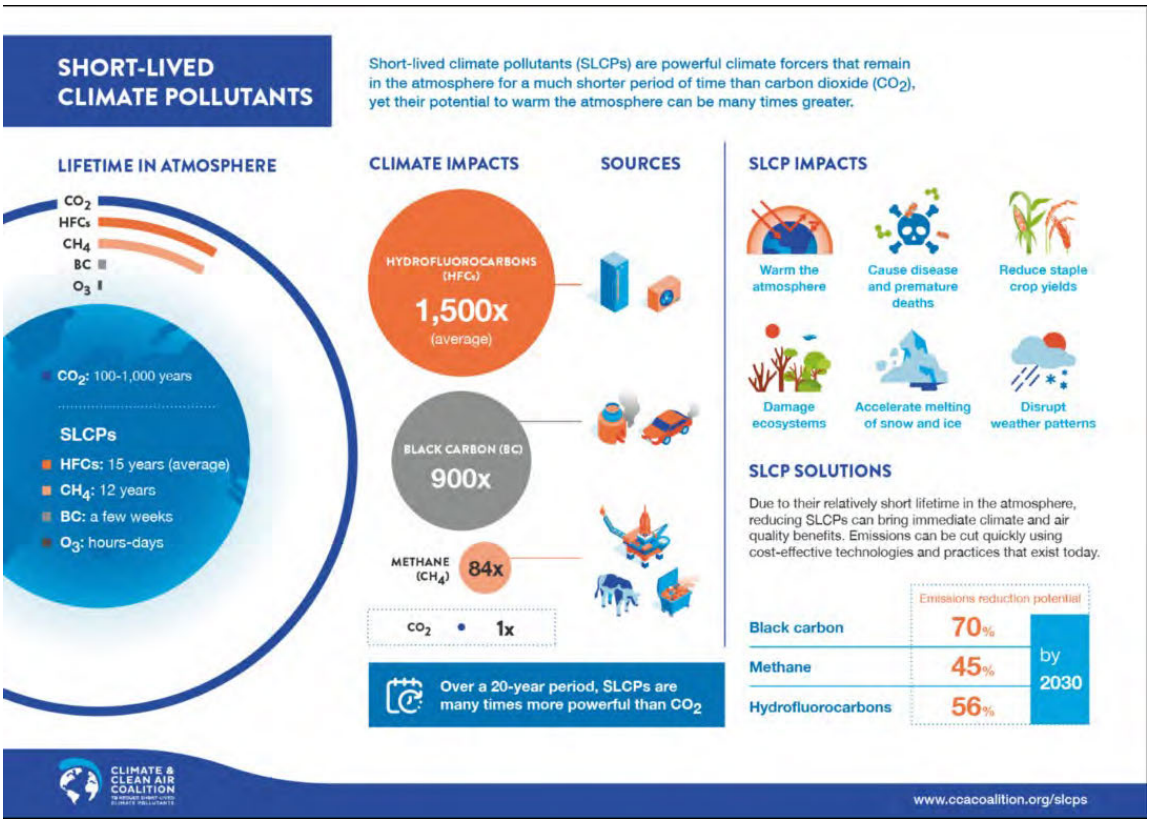
Our natural and working lands are an important piece in California's fight to achieve carbon neutrality and build resilience to the impacts of climate change. Healthy land can sequester and store atmospheric carbon dioxide in forests, grasslands, soils, and wetlands. Healthy lands can also reduce emissions of powerful short-lived climate pollutants, limit the release of future GHG emissions, protect people and nature from the impacts of climate change, and build our resilience to future climate risks. Unhealthy lands have the opposite effect—they release more GHGs than they store and are more vulnerable to future climate change impacts. Through climate smart land management that focuses on supporting healthy living systems, we can support our carbon neutrality goals, reduce emissions, advance sequestration, and support healthy and more climate-resilient lands.

Maintaining the Focus on Methane and Short-Lived Climate Pollutants

Given the urgency of climate change, the often-disproportional impacts already being felt by underserved populations across California and the world, and the need to rapidly decarbonize and avoid climate tipping points as identified in the most recent IPCC assessment, efforts to reduce short-lived climate pollutants are especially important. SLCPs include methane (CH_4), black carbon (soot), and fluorinated gases (F-gases,

including hydrofluorocarbons, or HFCs), and they are among the most harmful pollutants to both human health and the global climate. SLCPs are more potent than CO_2 in terms of their impact on climate change (and subsequently, global warming) and have a much shorter lifetime in the atmosphere than CO_2 does. That means they have an outsized impact on climate change in the near term—they are responsible for up to 45 percent of current climate forcing. It also means that targeted efforts to reduce short-lived climate pollutant emissions can provide outsized climate and health benefits, within weeks to about a decade (see Figure 1-6).

Figure 1-6: Short-lived climate pollutant impacts[94]



California has been a leader in addressing SLCP emissions. As part of the 2014 Scoping Plan,[95] CARB committed to developing a dedicated strategy to reduce SLCP emissions.

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[94] Climate and Clean Air Coalition. Short-Lived Climate Pollutants (SLCPs). https://www.ccacoalition.org/en/content/short-lived-climate-pollutants-slcps.

[95] CARB. 2014. *First Update.* https://ww2.arb.ca.gov/sites/default/files/classic/cc/scopingplan/2013_update/first_update_climate_change_scoping_plan.pdf.

The resulting SLCP Reduction Strategy,[96] adopted by CARB in 2017, implements targets codified in SB 1383 (Lara, Chapter 395, Statutes of 2016) to reduce methane and HFC emissions by 40 percent by 2030 and anthropogenic black carbon emissions by 50 percent. California worked with several other states through the U.S. Climate Alliance to establish a similar goal to reduce SLCP emissions in line with the requirements of the Paris Agreement,[97] identifying the potential to reduce SCLPs by 40 to 50 percent by 2030 across the U.S. Climate Alliance.[98]

Process for Developing the Scoping Plan

This Scoping Plan was developed in coordination with the Governor's Office and state agencies, in accordance with direction from the Chair and Members of CARB, through engagement with the Legislature, with advice from the EJ Advisory Committee, in consultation with tribes, and with open and transparent opportunities for stakeholders and the public to engage in workshops and other meetings. Appendix A (Public Process) includes details of the public workshops, and Chapter 5 includes details of the EJ Advisory Committee's role in the Scoping Plan update process.

Guidance from the Administration and Legislature

This Scoping Plan reflects existing and recent direction in the Governor's Executive Orders and Statutes. Table 1-1 provides a summary of major climate legislation and executive orders issued since the adoption of the 2017 Scoping Plan.

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[96] CARB. 2017. *Short-Lived Climate Pollutant Reduction Strategy.* https://ww2.arb.ca.gov/sites/default/files/2020-07/final_SLCP_strategy.pdf.
[97] UNFCCC. 2015. Paris Agreement. https://unfccc.int/sites/default/files/english_paris_agreement.pdf.
[98] USCA. 2018. *From SLCP Challenge to Action: A Roadmap for Reducing Short-Lived Climate Pollutants to Meet the Goals of the Paris Agreement.* http://www.usclimatealliance.org/slcp-challenge-to-action.

Table 1-1: Major climate legislation and executive orders enacted since the 2017 Scoping Plan

Bill/Executive Order	Summary
Assembly Bill 1279 (AB 1279) (Muratsuchi, Chapter 337, Statutes of 2022) *The California Climate Crisis Act*	AB 1279 establishes the policy of the state to achieve carbon neutrality as soon as possible, but no later than 2045; to maintain net negative GHG emissions thereafter; and to ensure that by 2045 statewide anthropogenic GHG emissions are reduced at least 85 percent below 1990 levels. The bill requires CARB to ensure that Scoping Plan updates identify and recommend measures to achieve carbon neutrality, and to identify and implement policies and strategies that enable CO_2 removal solutions and carbon capture, utilization, and storage (CCUS) technologies. This bill is reflected directly in this Scoping Plan.
Senate Bill 905 (SB 905) (Caballero, Chapter 359, Statutes of 2022) *Carbon Capture, Removal, Utilization, and Storage Program*	SB 905 requires CARB to create the Carbon Capture, Removal, Utilization, and Storage Program to evaluate, demonstrate, and regulate CCUS and carbon dioxide removal (CDR) projects and technology. The bill requires CARB, on or before January 1, 2025, to adopt regulations creating a unified state permitting application for approval of CCUS and CDR projects. The bill also requires the Secretary of the Natural Resources Agency to publish a framework for governing agreements for two or more tracts of land overlying the same geologic storage reservoir for the purposes of a carbon sequestration project. The Scoping Plan modeling reflects both CCUS and CDR contributions to achieve carbon neutrality.
Senate Bill 846 (SB 846) (Dodd, Chapter 239, Statutes of 2022) *Diablo Canyon Powerplant: Extension of Operations*	SB 846 extends the Diablo Canyon Power Plant's sunset date by up to five additional years for each of its two units and seeks to make the nuclear power plant eligible for federal loans. The bill requires that the California Public Utilities Commission (CPUC) not include and disallow a load-serving entity from including in their adopted resource plan, the energy, capacity, or any attribute from the Diablo Canyon power plant. The Scoping Plan explains the emissions impact of this legislation.
Senate Bill 1020 (SB 1020) (Laird,	SB 1020 adds interim renewable energy and zero carbon energy retail sales of electricity targets to California end-use customers set at 90 percent in 2035 and 95 percent in 2040.

Chapter 361, Statutes of 2022) *Clean Energy, Jobs, and Affordability Act of 2022*	It accelerates the timeline required to have 100 percent renewable energy and zero carbon energy procured to serve state agencies from the original target year of 2045 to 2035. This bill requires each state agency to individually achieve the 100 percent goal by 2035 with specified requirements. This bill requires the CPUC, California Energy Commission (CEC), and CARB, on or before December 1, 2023, and annually thereafter, to issue a joint reliability progress report that reviews system and local reliability. The bill also modifies the requirement for CARB to hold a portion of its Scoping Plan workshops in regions of the state with the most significant exposure to air pollutants by further specifying that this includes communities with minority populations or low-income communities in areas designated as being in extreme federal non-attainment. The Scoping Plan describes the implications of this legislation on emissions.
Senate Bill 1137 (SB 1137) (Gonzales, Chapter 365, Statutes of 2022) *Oil & Gas Operations: Location Restrictions: Notice of Intention: Health protection zone: Sensitive receptors*	SB 1137 prohibits the development of new oil and gas wells or infrastructure in health protection zones, as defined, except for purposes of public health and safety or other limited exceptions. The bill requires operators of existing oil and gas wells or infrastructure within health protection zones to undertake specified monitoring, public notice, and nuisance requirements. The bill requires CARB to consult and concur with the California Geologic Energy Management Division (CalGEM) on leak detection and repair plans for these facilities, adopt regulations as necessary to implement emission detection system standards, and collaborate with CalGEM on public access to emissions detection data.
Senate Bill 1075 (SB 1075) (Skinner, Chapter 363, Statutes of 2022) *Hydrogen: Green Hydrogen: Emissions of Greenhouse Gases*	SB 1075 requires CARB, by June 1, 2024, to prepare an evaluation that includes: policy recommendations regarding the use of hydrogen, and specifically the use of green hydrogen, in California; a description of strategies supporting hydrogen infrastructure, including identifying policies that promote the reduction of GHGs and short-lived climate pollutants; a description of other forms of hydrogen to achieve emission reductions; an analysis of curtailed electricity; an estimate of GHG and emission reductions that could be achieved through deployment of green hydrogen through a variety of scenarios; an analysis of the potential for opportunities to integrate hydrogen production and applications with drinking water supply treatment needs; policy recommendations for regulatory and permitting processes

	associated with transmitting and distributing hydrogen from production sites to end uses; an analysis of the life-cycle GHG emissions from various forms of hydrogen production; and an analysis of air pollution and other environmental impacts from hydrogen distribution and end uses. This bill would inform the production of hydrogen at the scale called for in this Scoping Plan.
Assembly Bill 1757 (AB 1757) (Garcia, Chapter 341, Statutes of 2022) *California Global Warming Solutions Act of 2006: Climate Goal: Natural and Working Lands*	AB 1757 requires the California Natural Resources Agency (CNRA), in collaboration with CARB, other state agencies, and an expert advisory committee, to determine a range of targets for natural carbon sequestration, and for nature-based climate solutions, that reduce GHG emissions in 2030, 2038, and 2045 by January 1, 2024. These targets must support state goals to achieve carbon neutrality and foster climate adaptation and resilience. This bill also requires CARB to develop standard methods for state agencies to consistently track GHG emissions and reductions, carbon sequestration, and additional benefits from natural and working lands over time. These methods will account for GHG emissions reductions of CO_2, methane, and nitrous oxide related to natural and working lands and the potential impacts of climate change on the ability to reduce GHG emissions and sequester carbon from natural and working lands, where feasible. This Scoping Plan describes the next steps and implications of this legislation for the natural and working lands sector.
Senate Bill 1206 (SB 1206) (Skinner, Chapter 884, Statutes of 2022) *Hydrofluorocarbon gases: sale or distribution*	SB 1206 mandates a stepped sales prohibition on newly produced high- global warming potential (GWP) HFCs to transition California's economy toward recycled and reclaimed HFCs for servicing existing HFC-based equipment. Additionally, SB 1206 also requires CARB to develop regulations to increase the adoption of very low-, i.e., GWP < 10, and no-GWP technologies in sectors that currently rely on higher-GWP HFCs.
Senate Bill 27 (SB 27) (Skinner, Chapter 237, Statutes of 2021)	SB 27 requires CNRA, in coordination with other state agencies, to establish the Natural and Working Lands Climate Smart Strategy by July 1, 2023. This bill also requires CARB to establish specified CO_2 removal targets for 2030 and beyond as part of its Scoping Plan. Under SB 27, CNRA is to establish and maintain a registry to identify projects in the state

Carbon Sequestration: State Goals: Natural and Working Lands: Registry of Projects	that drive climate action on natural and working lands and are seeking funding. CNRA also must track carbon removal and GHG emission reduction benefits derived from projects funded through the registry. This bill is reflected directly in this Scoping Plan as CO_2 removal targets for 2030 and 2045 in support of carbon neutrality.
Senate Bill 596 (SB 596) (Becker, Chapter 246, Statutes of 2021) *Greenhouse Gases: Cement Sector: Net-zero Emissions Strategy*	SB 596 requires CARB, by July 1, 2023, to develop a comprehensive strategy for the state's cement sector to achieve net-zero-emissions of GHGs associated with cement used within the state as soon as possible, but no later than December 31, 2045. The bill establishes an interim target of 40 percent below the 2019 average GHG intensity of cement by December 31, 2035. Under SB 596, CARB must: • Define a metric for GHG intensity and establish a baseline from which to measure GHG intensity reductions. • Evaluate the feasibility of the 2035 interim target (40 percent reduction in GHG intensity) by July 1, 2028. • Coordinate and consult with other state agencies. • Prioritize actions that leverage state and federal incentives. • Evaluate measures to support market demand and financial incentives to encourage the production and use of cement with low GHG intensity. The Scoping Plan modeling is designed to achieve these outcomes.
Executive Order N-82-20	Governor Newsom signed Executive Order N-82-20 in October 2020 to combat the climate and biodiversity crises by setting a statewide goal to conserve at least 30 percent of California's land and coastal waters by 2030. The Executive Order also instructed the CNRA, in consultation with other state agencies, to develop a Natural and Working Lands Climate Smart Strategy that serves as a framework to advance the state's carbon neutrality goal and build climate resilience. In addition to setting a statewide conservation goal, the Executive Order directed CARB to update the target for natural and working lands in support of carbon neutrality as part of this Scoping Plan, and to take into consideration the NWL Climate Smart Strategy.

	Executive Order N-82-20 also calls on the CNRA, in consultation with other state agencies, to establish the California Biodiversity Collaborative (Collaborative). The Collaborative shall be made up of governmental partners, California Native American tribes, experts, business and community leaders, and other stakeholders from across the state. State agencies will consult the Collaborative on efforts to: • Establish a baseline assessment of California's biodiversity that builds upon existing data and can be updated over time. • Analyze and project the impact of climate change and other stressors in California's biodiversity. • Inventory current biodiversity efforts across all sectors and highlight opportunities for additional action to preserve and enhance biodiversity. CNRA also is tasked with advancing efforts to conserve biodiversity through various actions, such as streamlining the state's process to approve and facilitate projects related to environmental restoration and land management. The California Department of Food and Agriculture (CDFA) is directed to advance efforts to conserve biodiversity through measures such as reinvigorating populations of pollinator insects, which restore biodiversity and improve agricultural production. The Natural and Working Lands Climate Smart Strategy informs this Scoping Plan.
Executive Order N-79-20	Governor Newsom signed Executive Order N-79-20 in September 2020 to establish targets for the transportation sector to support the state in its goal to achieve carbon neutrality by 2045. The targets established in this Executive Order are: • 100 percent of in-state sales of new passenger cars and trucks will be zero-emission by 2035. • 100 percent of medium- and heavy-duty vehicles will be zero-emission by 2045 for all operations where feasible, and by 2035 for drayage trucks. • 100 percent of off-road vehicles and equipment will be zero-emission by 2035 where feasible. The Executive Order also tasked CARB to develop and propose regulations that require increasing volumes of zero-electric passenger vehicles, medium- and heavy-duty

	vehicles, drayage trucks, and off-road vehicles toward their corresponding targets of 100 percent zero-emission by 2035 or 2045, as listed above. The Scoping Plan modeling reflects achieving these targets.
Executive Order N-19-19	Governor Newsom signed Executive Order N-19-19 in September 2019 to direct state government to redouble its efforts to reduce GHG emissions and mitigate the impacts of climate change while building a sustainable, inclusive economy. This Executive Order instructs the Department of Finance to create a Climate Investment Framework that: • Includes a proactive strategy for the state's pension funds that reflects the increased risks to the economy and physical environment due to climate change. • Provides a timeline and criteria to shift investments to companies and industry sectors with greater growth potential based on their focus of reducing carbon emissions and adapting to the impacts of climate change. • Aligns with the fiduciary responsibilities of the California Public Employees' Retirement System, California State Teachers' Retirement System, and the University of California Retirement Program. Executive Order N-19-19 directs the State Transportation Agency to leverage more than $5 billion in annual state transportation spending to help reverse the trend of increased fuel consumption and reduce GHG emissions associated with the transportation sector. It also calls on the Department of General Services to leverage its management and ownership of the state's 19 million square feet in managed buildings, 51,000 vehicles, and other physical assets and goods to minimize state government's carbon footprint. Finally, it tasks CARB with accelerating progress toward California's goal of five million ZEV sales by 2030 by: • Developing new criteria for clean vehicle incentive programs to encourage manufacturers to produce clean, affordable cars. • Proposing new strategies to increase demand in the primary and secondary markets for ZEVs. • Considering strengthening existing regulations or adopting new ones to achieve the necessary GHG reductions from within the transportation sector.

	The Scoping Plan modeling reflects efforts to accelerate ZEV deployment.
Senate Bill 576 (SB 576) (Umberg, Chapter 374, Statutes of 2019) *Coastal Resources: Climate Ready Program and Coastal Climate Change Adaptation, Infrastructure and Readiness Program*	Sea level rise, combined with storm-driven waves, poses a direct risk to the state's coastal resources, including public and private real property and infrastructure. Rising marine waters threaten sensitive coastal areas, habitats, the survival of threatened and endangered species, beaches, other recreation areas, and urban waterfronts. SB 576 mandates that the Ocean Protection Council develop and implement a coastal climate adaptation, infrastructure, and readiness program to improve the climate change resiliency of California's coastal communities, infrastructure, and habitat. This bill also instructs the State Coastal Conservancy to administer the Climate Ready Program, which addresses the impacts and potential impacts of climate change on resources within the conservancy's jurisdiction.
Assembly Bill 65 (AB 65) (Petrie-Norris, Chapter 347, Statutes of 2019) *Coastal Protection: Climate Adaption: Project Prioritization: Natural Infrastructure: Local General Plans*	This bill requires the State Coastal Conservancy, when it allocates any funding appropriated pursuant to the California Drought, Water, Parks, Climate, Coastal Protection, and Outdoor Access For All Act of 2018, to prioritize projects that use natural infrastructure in coastal communities to help adapt to climate change. The bill requires the conservancy to provide information to the Office of Planning and Research on any projects funded pursuant to the above provision to be considered for inclusion into the clearinghouse for climate adaption information. The bill authorizes the conservancy to provide technical assistance to coastal communities to better assist them with their projects that use natural infrastructure.
Executive Order B-55-18	Governor Brown signed Executive Order B-55-18 in September 2018 to establish a statewide goal to achieve carbon neutrality as soon as possible, and no later than 2045, and to achieve and maintain net negative emissions thereafter. Policies and programs undertaken to achieve this goal shall: • Seek to improve air quality and support the health and economic resiliency of urban and rural communities, particularly low-income and disadvantaged communities. • Be implemented in a manner that supports climate adaptation and biodiversity, including protection of the state's water supply, water quality, and native plants and animals.

	This Executive Order also calls for CARB to: • Develop a framework for implementation and accounting that tracks progress toward this goal. • Ensure future Scoping Plans identify and recommend measures to achieve the carbon neutrality goal. This Scoping Plan is designed to achieve carbon neutrality no later than 2045 and the modeling includes technology and fuel transitions to achieve that outcome.
Senate Bill 100 (SB 100) (De León, Chapter 312, Statutes of 2018) *California Renewables Portfolio Standard Program: emissions of greenhouse gases*	SB 100 mandates that the CPUC, CEC, and CARB plan for 100 percent of total retail sales of electricity in California to come from eligible renewable energy resources and zero-carbon resources by December 31, 2045. This bill also updates the state's Renewables Portfolio Standard (RPS) to include the following interim targets: • 44% of retail sales procured from eligible renewable sources by December 31, 2024. • 52% of retail sales procured from eligible renewable sources by December 31, 2027. • 60% of retail sales procured from eligible renewable sources by December 31, 2030. Under SB 100, the CPUC, CEC, and CARB shall use programs under existing laws to achieve 100 percent clean electricity. The statute requires these agencies to issue a joint policy report on SB 100 every four years. The first of these reports was issued in 2021. This Scoping Plan reflects the SB 100 Core Scenario resource mix with a few minor updates.
Assembly Bill 2127 (AB 2127) (Ting, Chapter 365, Statutes of 2018) *Electric Vehicle Charging Infrastructure: Assessment*	This bill requires the CEC, working with CARB and the CPUC, to prepare and biennially update a statewide assessment of the electric vehicle charging infrastructure needed to support the levels of electric vehicle adoption required for the state to meet its goals of putting at least 5 million zero-emission vehicles on California roads by 2030 and of reducing emissions of GHGs to 40% below 1990 levels by 2030. The bill requires the CEC to regularly seek data and input from stakeholders relating to electric vehicle charging infrastructure. This bill supports the deployment of ZEVs as modeled in this Scoping Plan.

Senate Bill 30 (SB 30) (Lara, Chapter 614, Statutes of 2018) *Insurance: Climate Change*	This bill requires the Insurance Commissioner to convene a working group to identify, assess, and recommend risk transfer market mechanisms that, among other things, promote investment in natural infrastructure to reduce the risks of climate change related to catastrophic events, create incentives for investment in natural infrastructure to reduce risks to communities, and provide mitigation incentives for private investment in natural lands to lessen exposure and reduce climate risks to public safety, property, utilities, and infrastructure. The bill requires the policies recommended to address specified questions.
Assembly Bill 2061 (AB 2061) (Frazier, Chapter 580, Statutes of 2018) *Near-zero-emission and Zero-emission Vehicles*	Existing state and federal law sets specified limits on the total gross weight imposed on the highway by a vehicle with any group of two or more consecutive axles. Under existing federal law, the maximum gross vehicle weight of that vehicle may not exceed 82,000 pounds. AB 2061 authorizes a near-zero-emission vehicle or a zero-emission vehicle to exceed the weight limits on the power unit by up to 2,000 pounds. This bill supports the deployment of cleaner trucks as modeled in this Scoping Plan.

Consideration of Relevant State Plans and Regulations

Development of this Scoping Plan also included careful consideration of, and coordination with, other state agency plans and regulations, including the SB 100 Joint Agency Report,[99] the 2022 State Strategy for the State Implementation Plan,[100] Climate Action Plan for Transportation Infrastructure,[101] AB 74 Studies on Vehicle Emissions and Fuel Demand and Supply,[102,103,104] Short-Lived Climate Pollutant Strategy (SLCP Strategy),[105]

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[99] CPUC, CEC, and CARB. 2021. *SB 100 Joint Agency Report*. https://www.energy.ca.gov/sb100.
[100] CARB. January 31, 2022. Draft 2022 State Strategy for the State Implementation Plan. https://ww2.arb.ca.gov/sites/default/files/2022-01/Draft_2022_State_SIP_Strategy.pdf.
[101] CalSTA. 2021. *Climate Action Plan*. https://calsta.ca.gov/subject-areas/climate-action-plan.
[102] CalEPA. 2021. Carbon Neutrality Studies. https://calepa.ca.gov/climate/carbon-neutrality-studies/.
[103] Brown, A. L., et. al. 2021. *Driving California's Transportation Emissions.* https://escholarship.org/uc/item/3np3p2t0.
[104] Deschenes, O. 2021. *Enhancing equity*. https://zenodo.org/record/4707966#.YKPiaKhKi73.
[105] CARB. Short-Lived Climate Pollutants. https://ww2.arb.ca.gov/our-work/programs/slcp.

CARB's Achieving Carbon Neutrality Report,[106] Climate Smart Strategy,[107] and draft Natural and Working Lands Implementation Plan,[108] among others.

Input from Partners and Stakeholders

CARB also collaborated with other state agencies, held consultations with tribes, and solicited comments and feedback from affected stakeholders, including labor organizations and the public. The process to update the Scoping Plan began with kickoff workshops in early June 2021,[109] followed by over a dozen public workshops, including engagement with tribes,[110] and featured a series of EJ Advisory Committee and environmental justice community meetings.[111] The June 2021 workshop and several others were a joint agency effort, as there are many agencies with direct authority or jurisdiction over different sectors of the economy. Consultation with agencies also included bi-weekly, monthly, and weekly meetings.

During the summer of 2022 CARB held three community listening sessions, hosted by the CARB Chair and Board, in communities around the state, along with one virtual community listening session and one tribal listening session specifically for tribes. Many tribes provided written feedback, which was incorporated into this Scoping Plan. In addition, CARB respects tribal sovereignty and also engaged in a consultation campaign with tribes, which resulted in government-to-government consultations, and this Scoping Plan is reflective of this process.[112]

Emissions Data That Inform the Scoping Plan

Greenhouse Gas Emissions

AB 32 includes which GHGs are to be regulated, reduced, and included in the state's targets and goals. That list includes seven GHGs: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), sulfur hexafluoride (SF_6), hydrofluorocarbons (HFCs),

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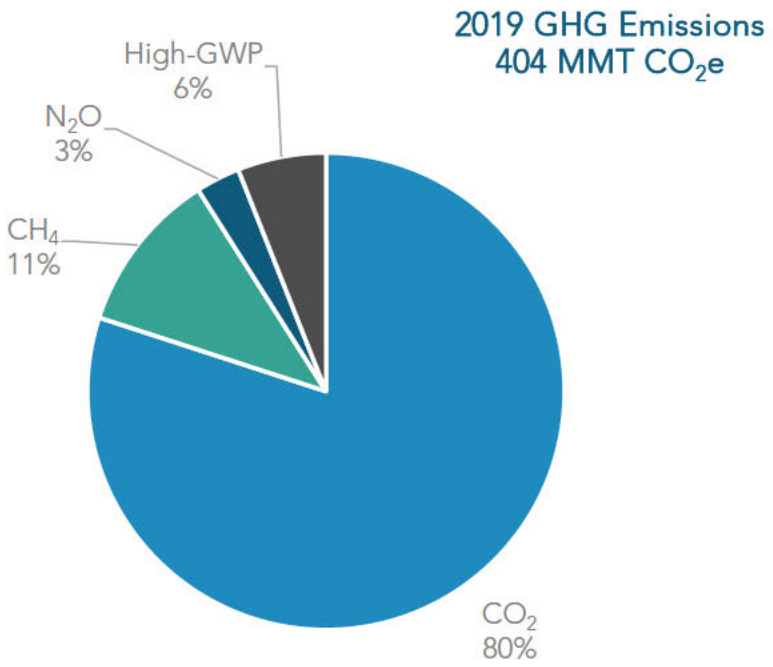
[106] Energy and Environmental Economics, Inc. 2020. *Achieving Carbon Neutrality.* https://ww2.arb.ca.gov/sites/default/files/2020-10/e3_cn_final_report_oct2020_0.pdf.
[107] CNRA. 2022. Natural and Working Lands Climate Smart Strategy. https://resources.ca.gov/Initiatives/Expanding-Nature-Based-Solutions.
[108] CARB. 2019. *Draft California 2030 Natural and Working Lands Climate Change Implementation Plan.* https://ww2.arb.ca.gov/resources/documents/nwl-implementation-draft.
[109] Appendix A (Public Process).
[110] CARB. Scoping Plan Meetings & Workshops. https://ww2.arb.ca.gov/our-work/programs/ab-32-climate-change-scoping-plan/scoping-plan-meetings-workshops.
[111] CARB. Environmental Justice Advisory Committee Meetings and Events. https://ww2.arb.ca.gov/environmental-justice-advisory-committee-meetings-and-events.
[112] CARB. 2018. Tribal Consultation Policy. October. https://www.arb.ca.gov/regact/nonreg/2018/california_air_resources_board_tribal_consultation_policy.pdf.

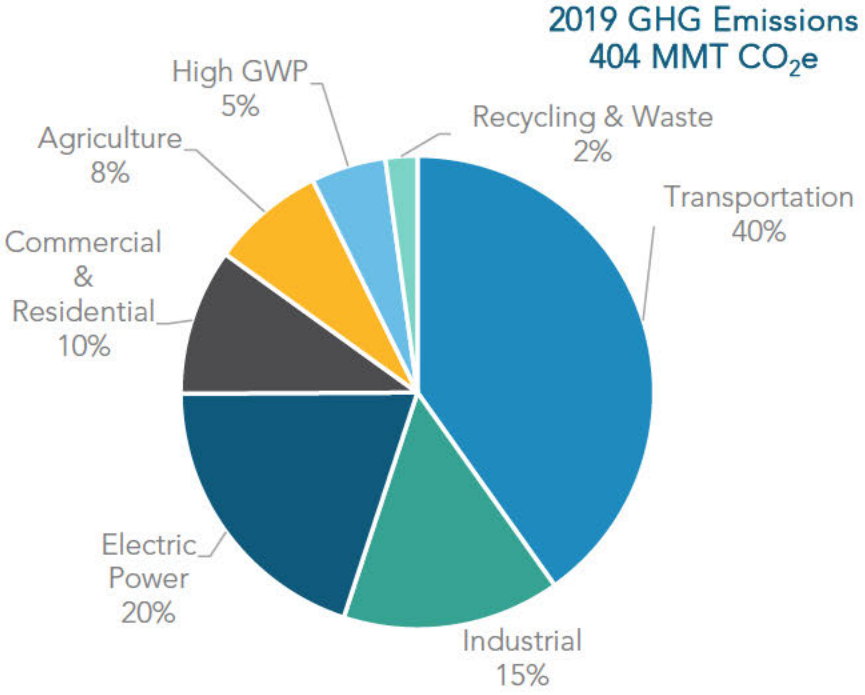
perfluorocarbons (PFCs), and nitrogen trifluoride (NF_3). Carbon dioxide is the primary GHG emitted in California, accounting for 83 percent of the total GHG emissions in 2019, as shown in Figure 1-7 below. Figure 1-8 illustrates that transportation (primarily on-road travel) is the single largest source of CO_2 emissions in the state. Upstream transportation emissions from the refinery and oil and gas sectors are categorized as CO_2 emissions from industrial sources and constitute about 50 percent of the industrial source emissions. When including these emissions, the transportation sector accounts for approximately half of statewide GHG emissions. Other significant sources of CO_2 include electricity production, industrial sources like refineries and cement plants, and residential sources like fossil gas. Figures 1-7 and 1-8 show state GHG emission contributions by GHG and sector based on the 2020 Greenhouse Gas Emission Inventory; GHG emissions for 2019 are shown because 2020 was an outlier due to the global pandemic. Emissions in Figure 1-8 are depicted by Scoping Plan sector, which includes separate categories for high-global warming potential (GWP) and recycling/waste emissions that are otherwise typically included within other economic sectors.

Figure 1-7: 2019 State GHG emission contributions by GHG[113]



[113] CARB. 2022. *California Greenhouse Gas Emissions for 2000 to 2020: Trends of Emissions and Other Indicators.* https://ww2.arb.ca.gov/sites/default/files/classic/cc/inventory/2000-2020_ghg_inventory_trends.pdf.

Figure 1-8: 2019 State GHG emission contributions by Scoping Plan sector[114]



The scope of the AB 32 GHG Inventory encompasses emission sources within the state's borders, as well as imported electricity consumed in the state. This construct for the inventory is consistent with IPCC practices to allow for comparison of statewide GHG emissions with those at the national level and with other international GHG inventories. Statewide GHG emissions calculations use many data sources, including data from other state and federal agencies. However, a significant source of data comes from reports submitted to CARB through the Regulation for the Mandatory Reporting of GHG Emissions (MRR). The MRR requires facilities and entities with more than 10,000 metric tons of carbon dioxide equivalent ($MTCO_2e$) of combustion and process emissions, all facilities belonging to certain industries, and all electric power entities to submit an annual GHG emissions data report directly to CARB. Furthermore, this regulation requires that reports from entities that emit more than 25,000 $MTCO_2e$ be verified by a CARB-

[114] The High GWP sector includes high global warming potential gas emissions from releases of ozone depleting substance (ODS) substitutes, SF_6 emissions from the electricity transmission and distribution system, and gases that are emitted in the semiconductor manufacturing process. ODS substitutes, which are primarily HFCs, are used in refrigeration and air conditioning equipment, solvent cleaning, foam production, fire retardants, and aerosols.

accredited third-party verification body. More information on MRR emissions reports can be found at CARB's Mandatory Greenhouse Gas Emissions Reporting website.[115]

All data sources used to develop the GHG Emission Inventory are listed in CARB's inventory supporting documentation.[116]

Natural and Working Lands

For natural and working lands, the 2018 ecosystem carbon inventory (NWL Inventory)[117] shows there are approximately 5,340 million metric tons (MMT) of carbon in the carbon pools[118] (reservoirs of carbon that have the ability to both take in and release carbon) that CARB has quantified (see Figure 1-9). For purposes of comparison, 5,340 MMT of ecosystem carbon stock is equivalent to 19,600 MMT of atmospheric CO_2. Forests and shrublands contain the majority of California's carbon stock because they cover the majority of California's landscape and have the highest carbon density of any land cover type. All other land categories combined comprise over 35 percent of California's total acreage, but only 15 percent of carbon stocks. Roughly half of the 5,340 MMT of carbon resides in soils and half in plant biomass.

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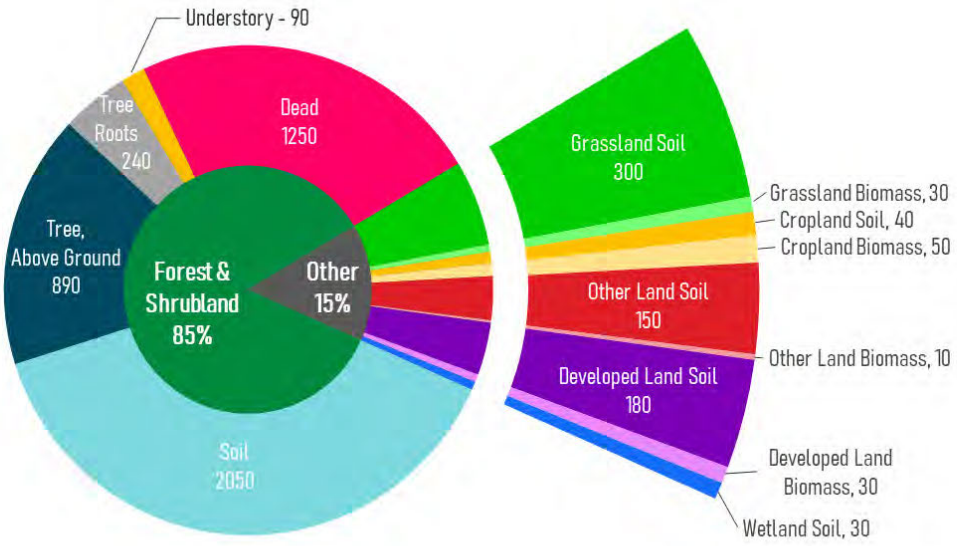
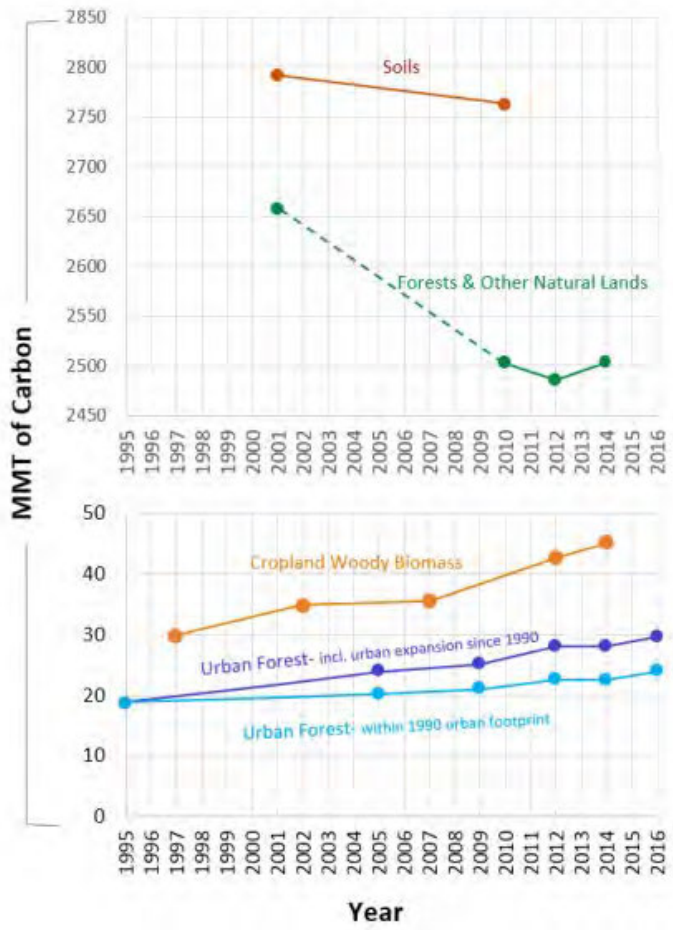
[115] CARB. Mandatory Greenhouse Gas Emissions Reporting. *https://ww2.arb.ca.gov/our-work/programs/mandatory-greenhouse-gas-emissions-reporting*.
[116] CARB. Current California GHG Emission Inventory Data. *www.arb.ca.gov/cc/inventory/data/data.htm*.
[117] CARB. 2018. *An Inventory of Ecosystem Carbon in California's Natural and Working Lands.* *https://ww3.arb.ca.gov/cc/inventory/pubs/nwl_inventory.pdf*.
[118] "Carbon pools" are Above-Ground Live Biomass (boles, stems, and foliage in shrubs, trees, grasses, and herbaceous vegetation), Below-Ground Live Biomass (roots in shrubs, trees, grasses, and herbaceous vegetation), Dead Organic Matter (standing or downed dead wood and litter), Harvested Wood Products (all wood and bark material that leaves harvest sites regardless of whether it is eventually incorporated into merchandisable products), and Soil Organic Matter (organic carbon in the top 30 centimeters of soil).

Figure 1-9: Carbon stocks in natural and working lands (MMT carbon)



In addition to providing an estimate of the ecosystem carbon that exists on California's landscape, the NWL Inventory also shows how those carbon stocks are changing (see Figure 1-10). The inventory attributes stock change to human activity, such as land use change, or to disturbances, such as wildfire. CARB's inventory shows these lands were a source of GHG emissions from 2001 to 2011, releasing more carbon than they stored, and then they returned to be a slight carbon sink from 2012 to 2014. These trends highlight the interannual and interdecadal variability of lands and their ability to be both a source and a sink of carbon.

Figure 1-10: Changes in carbon stock by landscape type



For natural and working lands, California's inventory is also based on IPCC methods for tracking ecosystem carbon over time, providing for comparability with other national and subnational inventories and carbon accounting. As such, the NWL Inventory is an important tool for tracking both carbon stock changes in California over time and the impacts that interventions such as those identified in this Scoping Plan, actions identified in the Climate Smart Land Strategy, and others have on NWL carbon stocks.

All data sources used to develop the NWL Inventory are listed in the technical support documentation at CARB's California Natural & Working Lands Inventory website.[119]

[119] CARB. California Natural & Working Lands Inventory. https://ww2.arb.ca.gov/nwl-inventory.

Black Carbon

In addition, CARB has developed a statewide emission inventory for black carbon in support of the SLCP Strategy. The inventory is reported in two categories: non-forestry (anthropogenic) sources and forestry sources.[120] The black carbon inventory is calculated using existing $PM_{2.5}$ emission inventories combined with speciation profiles that define the fraction of $PM_{2.5}$ that is black carbon. The black carbon inventory helps support implementation of the SLCP Strategy, but it is not part of California's GHG Inventory that tracks progress toward the state's climate targets under AB 32 or SB 32. The state's major anthropogenic sources of black carbon include off-road transportation, on-road transportation, residential wood burning, fuel combustion, and industrial processes. CARB estimated 2017 black carbon emissions to be approximately 8 $MTCO_2e$.[121] The majority of anthropogenic sources come from transportation—specifically, heavy-duty vehicles. The share of black carbon emissions from transportation is dropping rapidly and is expected to continue to do so between now and 2030 as a result of California's air quality programs. The remaining black carbon emissions will come largely from woodstoves/fireplaces, off-road applications, and industrial/commercial combustion. The forestry category includes non-agricultural prescribed burning and wildfire emissions.

Tracking Life-Cycle and Out-of-State Emissions

In recent years there has been increased interest in the embedded carbon in products, also known as *life-cycle emissions.* A life-cycle accounting framework refers to all of the GHG emissions generated from the sourcing, production, and transportation of products to an endpoint. In doing such assessments for a product, emissions may be associated with sourced materials and production activity outside a jurisdiction's borders. While life-cycle emissions can provide a more comprehensive picture of the emissions associated with the goods we consume and ongoing demand, life-cycle inventories are inconsistent with IPCC standards, as they would result in double counting of emissions across jurisdictions. Other countries and regions do produce their own inventory reports consistent with IPCC methods and are taking action to reduce emissions within their jurisdictions. In addition, jurisdictions often lack legal authority to regulate sources outside of their borders. Finally, it is difficult to obtain accurate data for sources and production activities outside of a region's border that would impact the accuracy of such an inventory. For these reasons, the inventory used in the Scoping Plan does not use a life-cycle

[120] SB 1383. https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201520160SB1383.
[121] This is a preliminary estimate developed for this Scoping Plan. Official Black Carbon emissions estimates are provided in the SLCP inventory here: https://ww2.arb.ca.gov/ghg-slcp-inventory.

approach and remains consistent with international accounting standards and consistent with how other countries and regions track emissions within their jurisdictions.

However, GHG mitigation action may cross geographic borders as part of subnational and international collaboration, or as a natural result of implementation of regional policies. In addition to the state's existing GHG inventory, CARB will develop an accounting framework that reflects the benefits of our policies accruing outside of the state. This accounting framework will be important to better understand the true impact of the state's policies on what is emitted into the atmosphere. For example, the LCFS incentivizes GHG reductions along the entire supply chain for the production and delivery of transportation fuel imported for use in the state. However, our inventory only captures the change in emissions from the tailpipe of when that fuel is used in California and does not capture any GHG reductions that occur in the production process if the fuel is produced out of state.

Natural and working lands forestry actions are another example, where California's policies are inspiring forest management actions in other states that result in increased permanent carbon sequestration. California's NWL inventory does not capture the increased carbon stocks resulting from forestry projects happening outside of California, and the CO_2 removals resulting from these projects are not applied in either CARB's NWL inventory or CARB's AB 32 GHG Emissions Inventory. For GHG reductions outside of the state to be attributed to our programs, those reductions must be real, quantifiable, verifiable, and permanent.

It also will be important to avoid any double counting (including claims to those reductions by other jurisdictions) and to transparently indicate whether any extra-jurisdictional emissions reductions might be included in another region's inventory. CARB is collaborating with other jurisdictions to ensure GHG accounting rules are consistent with international best practices, as robust accounting rules instill confidence in the reductions claimed and maintain support for joint action across jurisdictions. The policy goals of consistency and transparency are critical as we work together with other jurisdictions on our parallel paths to achieve our GHG targets with real benefits to the atmosphere.

Tracking Progress

Historically, the AB 32 GHG Inventory has been the primary metric to track progress toward achieving climate targets.[122] However, we must now deploy clean technology at unprecedented rates. The emissions modeling underpinning this Scoping Plan and

[122] Starting with the 2022 Edition of the AB 32 GHG inventory, the inventory development now relies more directly on the annually reported and third-party verified emissions from the Regulation for the Mandatory Reporting of Greenhouse Gas Emissions.

targets for clean technology in statute can serve as leading indicators across the economy on how our actions compare to the pace of action needed to be on track to achieve carbon neutrality. The California Climate Dashboard[123] was launched in 2022 and provides high-level metrics for clean energy production and technology deployment. Statistics such as the deployment of zero emission vehicles and clean electricity generation are just some of the examples of metrics across the economy that can be tracked, in addition to GHG emissions, to understand if the state is on track to meet its climate goals. A key indicator to track will be building of new energy infrastructure and deployment of clean technology as evaluated in the uncertainty analysis in Chapter 2. CARB will coordinate with state agencies to establish and make public similar metrics across all economic sectors to help provide transparency on the state's progress in deploying clean technology at the pace and scale needed to achieve carbon neutrality no later than 2045.

[123] CalEPA. California Climate Dashboard. *https://calepa.ca.gov/climate-dashboard/*.

Chapter 2: The Scoping Plan Scenario

This chapter describes the Scoping Plan Scenario, which for the first time includes sources in both the AB 32 GHG Inventory and Natural and Working Lands (NWL). It begins with a short description of the alternatives evaluated. Four scenarios for the AB 32 GHG Inventory and NWL were considered separately and helped to inform the Scoping Plan Scenario. Each of the alternatives were considered in terms of the important criteria and priorities that the state's comprehensive climate action must deliver, including the need for GHG reductions that are not only technologically feasible and cost-effective, but also can deliver health and economic benefits for the state. All the scenarios were set against what is called the *Reference Scenario*—that is, what the GHG emissions would look like if we did nothing at all beyond the existing policies that are required and already in place to achieve the 2030 target of at least 40 percent below 1990 levels, or those expected with no new actions in the NWL sector. For this Scoping Plan, two sets of modeling tools were used to evaluate the AB 32 GHG Inventory and NWL sectors because no single model can assess both AB 32 sectors and NWL together. As a result, two different sets of scenarios were developed for each sector type. While this chapter breaks out discussion separately for the two sector types, the Scoping Plan Scenario reflects the combined actions across both sectors by choosing an alternative from each sector type. The modeling provides point estimates; however, that does not imply precision. As discussed in the uncertainty section, several types of uncertainties are associated with any outcomes projected by the modeling results. There will be ranges of estimates associated with each point that are not shown in the graphs or results.

Scenarios for the AB 32 GHG Inventory Sectors

The Reference Scenario for the AB 32 GHG Inventory sectors shows continuing but modest GHG reductions beyond 2030 that level off toward mid-century. The comprehensive analysis of all four alternatives indicates that the Scoping Plan Scenario is the best choice to achieve California's climate and clean air goals while balancing the legislative direction on prioritizing direct emissions reductions, reducing anthropogenic emissions by at least 85 percent by 2045, being technologically feasible, and being cost-effective. It also protects public health, provides a solid foundation for continued economic growth, and drastically reduces the state's dependence on fossil fuel combustion and does not disproportionately impact disadvantaged communities. Each of the alternative scenarios was the product of a process of development informed by public input, the

governor,[124] CARB, legislative direction, and input by the EJ Advisory Committee.[125,126] Future updates to the Scoping Plan may consider new clean technologies and fuels beyond those included in this Scoping Plan.

The four scenarios evaluated shared many similarities. They each embodied the following characteristics:

- Drastic reduction in fossil fuel dependence, with some remaining in-state demand for fossil fuels for aviation, marine, and locomotion applications, and for fossil gas for buildings and industry
- Ambitious deployment of efficient non-combustion technologies such as zero emission vehicles and heat pumps
- Rapid growth in the production and distribution of clean energy such as zero carbon electricity and hydrogen
- Progressive phasedown of fossil fuel production and distribution activities as part of the transition to clean energy
- Remaining emissions of fugitive SLCPs such as refrigerants and fugitive methane
- Strong consumer adoption of clean technology and fuel options
- Removal of remaining CO_2 emissions to achieve carbon neutrality
- Some reliance on carbon capture and sequestration (CCS)

While the four scenarios had a lot in common, they also had some differences:

- Year in which carbon neutrality is achieved (2035 or 2045)
- Rate of deployment of clean technology and production and distribution of zero carbon energy
- Remaining amount of demand for fossil energy in the year carbon neutrality is achieved
- Constraints on technology and fuels deployed in certain sectors
- Consumer adoption rates of clean technologies and fuels
- Degree of reliance on CO_2 removal
- Degree of reliance on CCS

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[124] Newsom, Gavin. July 22, 2022. Letter from Governor Newsom to CARB Chair Liane Randolph. Retrieved from *https://www.gov.ca.gov/wp-content/uploads/2022/07/07.22.2022-Governors-Letter-to-CARB.pdf*.

[125] EJ Advisory Committee. December 2, 2021. EJ Advisory Committee Responses for the CARB Scenario Inputs. *https://ww2.arb.ca.gov/sites/default/files/2021-12/EJAC%20Final%20Responses%20to%20CARB%20Scenario%20Inputs_12_2_21.pdf*.

[126] CARB. January 25, 2022. Update on PATHWAYS Scenario Modeling Assumptions. *https://ww2.arb.ca.gov/sites/default/files/2022-01/Scenario%20Slides%20for%20Jan25%20EJAC%20Mtg_01242022.pdf*.

The summary below provides an overview of the alternatives designed and considered for the energy and industrial sectors in this update. Full details of each scenario considered can be found in the *Draft 2022 Scoping Plan Update*

Scoping Plan Scenario (modeling scenario Alternative 3 from the Draft): carbon neutrality by 2045, deploy a broad portfolio of existing and emerging fossil fuel alternatives and clean technologies, and align with statutes, Executive Orders, Board direction, and direction from the governor

Alternative 1: carbon neutrality by 2035, nearly complete phaseout of all combustion, limited reliance on carbon capture and sequestration and engineered carbon removal, and restricted applications for biomass-derived fuels

Alternative 2: carbon neutrality by 2035 and aggressive deployment of a full suite of technology and energy options, including engineered carbon removal

Alternative 4: carbon neutrality by 2045, deployment of a broad portfolio of existing and emerging fossil fuel alternatives, slower deployment and adoption rates than the Scoping Plan Scenario, and a higher reliance on CO_2 removal

Other considerations for the AB 32 GHG Inventory sectors include the following:

- To what extent does an alternative meet the statewide targets and any sector targets, and also deliver clean air benefits (especially in the near term) to address ongoing healthy air disparities, prioritize reductions for mobile and large stationary sources, and emphasize continued investment in disadvantaged communities?
- Does an alternative support California in building on efforts to collaborate with other jurisdictions and include exportable policies based on robust science?
- Does an alternative provide for compliance options and a cost-effective approach to reduce GHG emissions?
- Does the alternative present a realistic and ambitious path forward consistent with statute and science, and support economic opportunities, particularly in anticipated growth sectors?

Scenarios for Natural and Working Lands

For the natural and working lands sector, the Reference Scenario shows that NWL will continue to emit GHGs and lose carbon stocks into the future as the combined effects of past unhealthy management practices and climate change impact our lands. Relative to the Reference Scenario, the four NWL scenarios represent different scales of land management on seven landscapes (forests, shrublands/chaparral, grasslands, croplands, developed lands, wetlands, and sparsely vegetated lands) to support carbon neutrality.

The analysis of the four NWL scenarios shows that the Scoping Plan Scenario is the preferred choice because it prioritizes sustainable land management to sequester carbon over the long term, GHG and air pollution reductions, ecosystem health and resilience, and implementation and technological feasibility and cost-effectiveness. The Scoping Plan Scenario reduces catastrophic wildfire risk to the state; increases the health and resilience of California's forests, shrublands, and grasslands; increases soil health; and protects, restores, and enhances California's natural and working lands for future generations. The Scoping Plan Scenario takes into consideration the priority landscapes and nature-based strategies identified in California's Climate Smart Strategy[127] and reflects the state's priorities to manage lands in ways that support the multiple benefits they provide. The Scoping Plan Scenario, as well as each of the alternative NWL scenarios, were informed by input from other agencies, the public, and the EJ Advisory Committee. Additional landscapes and land management activities will be added and evaluated in future Scoping Plan updates and in response to AB 1757.

Each of the NWL scenarios have several similarities, including the following:

- Prioritizing NWL management actions on forests, shrublands, grasslands, croplands, developed lands, wetlands, and sparsely vegetated lands. These actions can reduce GHG emissions from these lands, protect ecosystems against future climate change, protect communities, and enhance the ecosystem benefits they provide to nature and society.
- Exploring the potential impacts of different levels of NWL management actions that are designed to achieve the objective associated with each scenario.
- Analyzing the carbon impacts of land management actions, climate change, wildfire, and water use on California's diverse natural and working lands through 2045.

There are also differences across the four NWL scenarios. These include:

- The level of NWL management actions taken on each landscape, such as varying the acres of healthy soils practices for croplands.
- The types of NWL management actions taken on each landscape, such as prescribed burning or thinning for forests, grasslands, and shrublands.

[127] CNRA. 2022. Natural and Working Lands Climate Smart Strategy. *https://resources.ca.gov/-/media/CNRA-Website/Files/Initiatives/Expanding-Nature-Based-Solutions/CNRA-Report-2022---Final_Accessible_Compressed.pdf*.

The summary below provides an overview of the alternatives designed and considered for the NWL sectors in this Scoping Plan. Full details of each scenario considered can be found in the *Draft 2022 Scoping Plan Update*.

Scoping Plan Scenario (NWL Alternative 3 from the Draft): land management activities that prioritize restoration and enhancement of ecosystem functions to improve resilience to climate change impacts, including more stable carbon stocks

NWL Alternative 1: land management activities that prioritize short term carbon stocks in our forests and through increased climate smart agricultural practices on croplands

NWL Alternative 2: land management activities representative of California's current commitments and plans

NWL Alternative 4: land management activities that prioritize reducing catastrophic wildfires in forests, shrublands, and grasslands

Evaluation of Scoping Plan Alternatives

CARB staff solicited feedback from topical experts, affected stakeholders, and the EJ Advisory Committee, including a tribal representative, at public meetings to assemble input assumptions for four carbon neutrality scenarios to model using PATHWAYS. Revisions to the Draft Scoping Plan were informed by direction in statute, the Governor's Executive Orders, public comments, and the recommendations of the EJ Advisory Committee. The three alternative scenarios were designed to explore the potential speed, magnitude, and impacts of transitioning California's energy demand away from fossil fuels. The modeling assumptions listed below identify the primary fossil fuel alternative that is commercially available and technically feasible for widespread use by 2045 for each sector. CARB assumes that any energy demand that remains after the alternative technology or fuel is applied—such as on-road internal combustion engines, industrial processes, and gas use in existing buildings that have not yet decarbonized—will continue to be met by fossil fuels, resulting in residual GHG emissions.

NWL Scoping Plan Alternatives

For the NWL sectors, staff significantly expanded the scale of the scientific analysis for NWL from previous Scoping Plan efforts. CARB staff utilized modeling tools for this expanded analysis to assess both the carbon and other ecological, public health, and economic outcomes of management actions on forests, shrublands, grasslands, croplands, developed lands, wetlands, and sparsely vegetated lands. CARB staff aligned the scenarios with both the landscape types and actions identified in other efforts called for in Governor Newsom's Executive Order N-82-20 (e.g., California's Climate Smart Strategy and Pathways to 30x30). As part of this Scoping Plan, CARB staff modeled as many of the management actions identified in the Natural and Working Lands Climate

Smart Strategy as were feasible. The management actions that were included in the model were selected because of the State of California's previous work to quantify these actions' impacts. It was not feasible to model every land management strategy for NWL, and so it is possible that larger volumes of sequestration (e.g., in soils or in oceans) could result from additional non-modeled activities. California's Natural and Working Lands Climate Smart Strategy includes a more comprehensive listing of priority nature-based solutions and management actions. It is important to note that the absence of a particular management action or its climate benefit in the modeling is not an indication of its importance or potential contributions toward meeting the target or toward supporting the carbon neutrality target for California.

Forests: Management strategies were modeled for forests: biological/chemical/ herbaceous treatments (e.g., herbicide application), clearcut, various timber harvests (e.g., variable retention, seed tree / shelterwood, selection harvesting), mastication, other mechanical treatments (e.g., piling of dead material, understory thinning), prescribed burning, and thinning. Avoided land conversion to another land use was also included in the modeling. Wildfire was modeled and is responsive to management strategies and climate conditions.

Shrublands and chaparral: Management strategies were modeled for shrublands and chaparral: biological/chemical/herbaceous treatments, prescribed burning, mechanical treatment (e.g., mastication, crushing, mowing, piling), and avoided conversion from shrubland to another land use. Wildfire was modeled and is responsive to management strategies and climate conditions.

Grasslands: Management strategies were modeled for grasslands: biological/chemical/herbaceous treatments, prescribed burning, and avoided land conversion from grasslands to another land use. Wildfire was modeled and is responsive to management strategies and climate conditions.

Croplands: Management strategies were modeled for row crops: cover cropping, no till, reduced till, compost amendment, transition to organic[128] farming, avoided conversion of annual crop agricultural land through easements, establishing riparian forest buffers, alley cropping, establishing windbreaks/shelterbelts, establishing tree and shrubs in croplands, and establishing hedgerows. For perennial crops, windbreaks/shelterbelts, hedgerows, conversion from annual crops to perennial crops, and avoided conversion to other land uses were modeled.

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[128] Note: N_2O reductions from decreases in synthetic fertilizer application in organic farming were not modeled.

Developed lands: Management strategies were modeled for developed lands: Increasing tree canopy cover through planting trees and improved management of existing trees, and removing vegetation surrounding structures in accordance with the CAL FIRE Defensible Space PRC 4291.

Wetlands: Management strategies were modeled for wetlands: Restoring wetlands through submerging cultivated land in the Sacramento-San Joaquin Delta and avoided land conversion in the Sacramento-San Joaquin Delta.

Sparsely vegetated lands: Management strategies were modeled for sparsely vegetated lands: Avoided conversion of sparsely vegetated lands to another land use.

Scoping Plan Scenario

The Scoping Plan Scenario achieves GHG emission reductions that exceed the levels expected based on existing policies represented in the Reference Scenario, keeping California on track to achieve the SB 32 GHG reduction target for 2030 and become carbon neutral no later than 2045. Actions that reduce GHG emissions and transition AB 32 GHG Inventory sources away from fossil fuel combustion affect each economic sector. Actions that lead to improved carbon stocks affect each landscape.

AB 32 GHG Inventory Sectors

The AB 32 GHG Inventory Sector Reference scenario is the forecasted statewide GHG emissions through mid-century, with existing policies and programs but without any further action to reduce GHGs beyond those needed to achieve the 2030 limit. The Reference Scenario was developed based on other projections of business-as-usual conditions. Sources of data and policies included are:

- California Energy Demand Forecast[129]
- The two transportation carbon neutrality studies required by AB 74[130]
- The Mobile Source Strategy[131]
- SB 100 60 percent Renewables Portfolio Standard
- A Low Carbon Fuel Standard carbon intensity reduction target of 20 percent

Policies that are under study or design, such the Advanced Clean Fleets regulation, are not included. The Reference Scenario reflects current trends and expected performance of policies identified in the 2017 Scoping Plan—some of which are performing better (such as the RPS and LCFS) and others that may not meet expectations (such as vehicle miles traveled [VMT] reductions and methane capture). Figure 2-1 provides the modeling results for a Reference Scenario for the AB 32 GHG Inventory sectors compared to the Scoping Plan Scenario.

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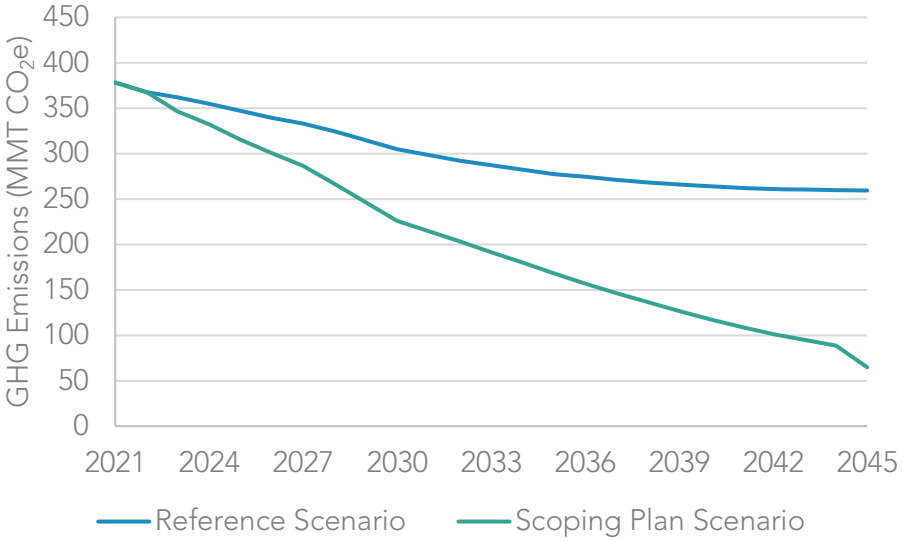
[129] California Energy Commission (CEC). 2020. *2019 Integrated Energy Policy Report.* https://www.energy.ca.gov/data-reports/reports/integrated-energy-policy-report/2019-integrated-energy-policy-report.

[130] Brown et al. 2021. *Driving California's Transportation Emissions.* https://escholarship.org/uc/item/3np3p2t0 and Deschenes et al. 2021. *Enhancing equity.* https://zenodo.org/record/4707966#.Yl72RNrMKUn.

[131] CARB. 2021. 2020 *Mobile Source Strategy.* https://ww2.arb.ca.gov/sites/default/files/2021-12/2020_Mobile_Source_Strategy.pdf.

Figure 2-1: Reference and Scoping Plan Scenario GHG emissions[132]



The Scoping Plan Scenario is summarized in Table 2-1. The table shows the types of technologies and energy needed to drastically reduce GHG emissions from the AB 32 Inventory sectors. It also includes references to relevant statutes and Executive Orders, although it is not comprehensive of all existing new authorities for directing or supporting the actions described. Each action is expected to both reduce GHGs and help improve air quality, primarily by transitioning away from combustion of fossil fuels. The Scoping Plan Scenario achieves the AB 1279 target of 85 percent below 1990 levels by 2045 and identifies a need to accelerate the 2030 target to 48 percent below 1990 levels.

[132] The drop in emissions in 2045 reflects both the need to achieve an 85% reduction below 1990 levels in anthropogenic emissions per AB 1279 and Governor Newsom's request for a 100 MMT CO2e carbon removal and capture target in 2045. This was modeled by extending CCS to electric sector emissions.

Table 2-1: Actions for the Scoping Plan Scenario: AB 32 GHG Inventory sectors

Sector	Action	Statutes, Executive Orders, Other Direction, Outcome
GHG Emissions Reductions Relative to the SB 32 Target[133]	40% below 1990 levels by 2030	SB 32: Reduce statewide GHG emissions. AB 197: direct emissions reductions for sources covered by the AB 32 Inventory
Smart Growth / Vehicle Miles Traveled (VMT)	VMT per capita reduced 25% below 2019 levels by 2030, and 30% below 2019 levels by 2045	SB 375: Reduce demand for fossil transportation fuels and GHGs, and improve air quality. In response to Board direction and EJ Advisory Committee recommendations
Light-duty Vehicle (LDV) Zero Emission Vehicles (ZEVs)	100% of LDV sales are ZEV by 2035	EO N-79-20: Reduce demand for fossil transportation fuels and GHGs, and improve air quality. AB 197: direct emissions reductions for sources covered by the AB 32 Inventory 2035 target aligns with the EJ Advisory Committee recommendation.

[133] While the SB 32 GHG emissions reduction target is not an Action that is analyzed independently, it is included in this table for reference.

Sector	Action	Statutes, Executive Orders, Other Direction, Outcome
Truck ZEVs	100% of medium-duty (MDV)/HDV sales are ZEV by 2040 (AB 74 University of California Institute of Transportation Studies [ITS] report)	EO N-79-20: Reduce demand for fossil transportation fuels and GHGs, and improve air quality. AB 197: direct emissions reductions for sources covered by the AB 32 Inventory
Aviation	20% of aviation fuel demand is met by electricity (batteries) or hydrogen (fuel cells) in 2045. Sustainable aviation fuel meets most or the rest of the aviation fuel demand that has not already transitioned to hydrogen or batteries.	Reduce demand for petroleum aviation fuel and reduce GHGs. AB 197: direct emissions reductions for sources covered by the AB 32 Inventory In response to Governor Newsom's July 2022 letter to CARB Chair Liane Randolph
Ocean-going Vessels (OGV)	2020 OGV At-Berth regulation fully implemented, with most OGVs utilizing shore power by 2027. 25% of OGVs utilize hydrogen fuel cell electric technology by 2045.	Reduce demand for petroleum fuels and GHGs, and improve air quality. AB 197: direct emissions reductions for sources covered by the AB 32 Inventory
Port Operations	100% of cargo handling equipment is zero-emission by 2037. 100% of drayage trucks are zero emission by 2035.	Executive Order N-79-20: Reduce demand for petroleum fuels and GHGs, and improve air quality. AB 197: direct emissions reductions for sources covered by the AB 32 Inventory

Sector	Action	Statutes, Executive Orders, Other Direction, Outcome
Freight and Passenger Rail	100% of passenger and other locomotive sales are ZEV by 2030. 100% of line haul locomotive sales are ZEV by 2035. Line haul and passenger rail rely primarily on hydrogen fuel cell technology, and others primarily utilize electricity.	Reduce demand for petroleum fuels and GHGs, and improve air quality. AB 197: direct emissions reductions for sources covered by the AB 32 Inventory
Oil and Gas Extraction	Reduce oil and gas extraction operations in line with petroleum demand by 2045.	Reduce GHGs and improve air quality. AB 197: direct emissions reductions for sources covered by the AB 32 Inventory
Petroleum Refining	CCS on majority of operations by 2030, beginning in 2028 Production reduced in line with petroleum demand.	Reduce GHGs and improve air quality. AB 197: direct emissions reductions for sources covered by the AB 32 Inventory

Sector	Action	Statutes, Executive Orders, Other Direction, Outcome
Electricity Generation	Sector GHG target of 38 million metric tons of carbon dioxide equivalent ($MMTCO_2e$) in 2030 and 30 $MMTCO_2e$ in 2035 Retail sales load coverage[134] 20 gigawatts (GW) of offshore wind by 2045 Meet increased demand for electrification without new fossil gas-fired resources.	SB 350 and SB 100: Reduce GHGs and improve air quality. AB 197: direct emissions reductions for sources covered by the AB 32 Inventory In response to Governor Newsom's July 2022 letter, Board direction, and EJ Advisory Committee recommendation
New Residential and Commercial Buildings	All electric appliances beginning 2026 (residential) and 2029 (commercial), contributing to 6 million heat pumps installed statewide by 2030	Reduce demand for fossil gas and GHGs, and improve ambient and indoor air quality. AB 197: direct emissions reductions for sources covered by the AB 32 Inventory In response to Governor Newsom's July 2022 letter

[134] SB 100 speaks only to retail sales and state agency procurement of electricity. The *2021 SB 100 Joint Agency Report* reflects the agency authors' understanding that other loads—wholesale or non-retail sales and losses from storage and transmission and distribution lines—are not subject to the law.

Sector	Action	Statutes, Executive Orders, Other Direction, Outcome
Existing Residential Buildings	80% of appliance sales are electric by 2030 and 100% of appliance sales are electric by 2035. Appliances are replaced at end of life such that by 2030 there are 3 million all-electric and electric-ready homes—and by 2035, 7 million homes—as well as contributing to 6 million heat pumps installed statewide by 2030.	Reduce demand for fossil gas and GHGs, and improve ambient and indoor air quality. AB 197: direct emissions reductions for sources covered by the AB 32 Inventory In response to Governor Newsom's July 2022 letter
Existing Commercial Buildings	80% of appliance sales are electric by 2030, and 100% of appliance sales are electric by 2045. Appliances are replaced at end of life, contributing to 6 million heat pumps installed statewide by 2030.	Reduce demand for fossil gas and GHGs, and improve ambient and indoor air quality. AB 197: direct emissions reductions for sources covered by the AB 32 Inventory In response to Governor Newsom's July 2022 letter
Food Products	7.5% of energy demand electrified directly and/or indirectly by 2030; 75% by 2045	Reduce demand for fossil gas and GHGs, and improve air quality. AB 197: direct emissions reductions for sources covered by the AB 32 Inventory

Sector	Action	Statutes, Executive Orders, Other Direction, Outcome
Construction Equipment	25% of energy demand electrified by 2030 and 75% electrified by 2045	Reduce demand for fossil energy and GHGs, and improve air quality. AB 197: direct emissions reductions for sources covered by the AB 32 Inventory
Chemicals and Allied Products; Pulp and Paper	Electrify 0% of boilers by 2030 and 100% of boilers by 2045. Hydrogen for 25% of process heat by 2035 and 100% by 2045 Electrify 100% of other energy demand by 2045.	Reduce demand for fossil energy and GHGs, and improve air quality. AB 197: direct emissions reductions for sources covered by the AB 32 Inventory
Stone, Clay, Glass, and Cement	CCS on 40% of operations by 2035 and on all facilities by 2045 Process emissions reduced through alternative materials and CCS	SB 596: Reduce demand for fossil energy, process emissions, and GHGs, and improve air quality. AB 197: direct emissions reductions for sources covered by the AB 32 Inventory
Other Industrial Manufacturing	0% energy demand electrified by 2030 and 50% by 2045	Reduce demand for fossil energy and GHGs, and improve air quality. AB 197: direct emissions reductions for sources covered by the AB 32 Inventory

Sector	Action	Statutes, Executive Orders, Other Direction, Outcome
Combined Heat and Power	Facilities retire by 2040.	Reduce demand for fossil energy and GHGs, and improve air quality. AB 197: direct emissions reductions for sources covered by the AB 32 Inventory
Agriculture Energy Use	25% energy demand electrified by 2030 and 75% by 2045	Reduce demand for fossil energy and GHGs, and improve air quality. AB 197: direct emissions reductions
Low Carbon Fuels for Transportation	Biomass supply is used to produce conventional and advanced biofuels, as well as hydrogen.	Reduce demand for petroleum fuel and GHGs, and improve air quality. AB 197: direct emissions reductions for sources covered by the AB 32 Inventory
Low Carbon Fuels for Buildings and Industry	In 2030s biomethane[135] blended in pipeline Renewable hydrogen blended in fossil gas pipeline at 7% energy (~20% by volume), ramping up between 2030 and 2040 In 2030s, dedicated hydrogen pipelines constructed to serve certain industrial clusters	Reduce demand for fossil energy and GHGs, and improve air quality. AB 197: direct emissions reductions for sources covered by the AB 32 Inventory

[135] *Biomethane* is also known as renewable natural gas (RNG).

Sector	Action	Statutes, Executive Orders, Other Direction, Outcome
Non-combustion Methane Emissions	Increase landfill and dairy digester methane capture. Some alternative manure management deployed for smaller dairies Moderate adoption of enteric strategies by 2030 Divert 75% of organic waste from landfills by 2025. Oil and gas fugitive methane emissions reduced 50% by 2030 and further reductions as infrastructure components retire in line with reduced fossil gas demand	SB 1383: Reduce short-lived climate pollutants.
High GWP Potential Emissions	Low GWP refrigerants introduced as building electrification increases, mitigating HFC emissions	SB 1383: Reduce short-lived climate pollutants.

Natural and Working Lands

The Reference Scenario for NWL represents the amount of land management that occurred between 2001 and 2014, and projects the outcomes from maintaining the 2001–2014 levels of land management until 2045. The management and land use practices that occur within the Reference Scenario were derived from empirical data used by staff. For forests, shrublands/chaparral, and grasslands, the Reference Scenario constitutes approximately 250,000 acres of annual statewide treatments. For croplands, the Reference Scenario represents no healthy soil practices because during this period the healthy soil program did not yet exist. For land use change within all land types that consider land use change, historical rates of land conversion from 2001–2014 also were taken from empirical data and modeled into the future for the Reference Scenario.

Table 2-2 summarizes the Scoping Plan Scenario. The table also includes references to relevant statutes and Executive Orders where available.

Table 2-2: Actions for the Scoping Plan Scenario: NWL sectors

Sector	Action	Statutes, Executive Orders, Outcome
Natural and Working Lands	Conserve 30% of the state's NWL and coastal waters by 2030. Implement near- and long-term actions to accelerate natural removal of carbon and build climate resilience in our forests, wetlands, urban greenspaces, agricultural soils, and land conservation activities in ways that serve all communities—and in particular low-income, disadvantaged, and vulnerable communities.	EO N-82-20 and SB 27: CARB to include an NWL target in the Scoping Plan. AB 1757: Establish targets for carbon sequestration and nature-based climate solutions. SB 1386: NWL are an important strategy in meeting GHG reduction goals.

Sector	Action	Statutes, Executive Orders, Outcome
Forests and Shrublands	At least 2.3 million acres[136] treated statewide annually in forests, shrublands/chaparral, and grasslands, comprised of regionally specific management strategies that include prescribed fire, thinning, harvesting, and other management actions. No land conversion of forests, shrublands/chaparral, or grasslands.	Restore health and resilience to overstocked forests and prevent carbon losses from severe wildfire, disease, and pests. Improve air quality and reduce health costs related to wildfire emissions. Improve water quantity and quality and improve rural economies. Provide forest biomass for resource utilization. EO B-52-18: CARB to increase the opportunity for using prescribed fire. AB 1504 (Skinner, Chapter 534, Statutes of 2010): CARB to recognize the role forests play in carbon sequestration and climate mitigation.

[136] The 2.3 million acre target is what the Scoping Plan modeling shows would be needed to realize the carbon stock target called for in this Scoping Plan by 2045.

Sector	Action	Statutes, Executive Orders, Outcome
Grasslands	At least 2.3 million acres[137] treated includes increased management of grasslands interspersed in forests to reduce fuels surrounding communities using management strategies appropriate for grasslands. No land conversion of forests, shrublands/chaparral, or grasslands.	Help to achieve climate targets, improve air quality, and reduce health costs.
Croplands	Implement climate smart practices for annual and perennial crops on ~80,000 acres annually. Land easements/ conservation on annual crops at ~5,500 acres annually. Increase organic agriculture to 20% of all cultivated acres by 2045 (~65,000 acres annually).	Reduce short-lived climate pollutants. Increase soil water holding capacity. Increase organic farming and reduce pesticide use. SB 859: Recognizes the ability of healthy soils practices to reduce GHG emissions from agricultural lands. Target increased in response to Governor Newsom's direction to prioritize sustainable land management.

[137] The 2.3 million acre target is what the Scoping Plan modeling shows would be needed to realize the carbon stock target called for in this Scoping Plan by 2045.

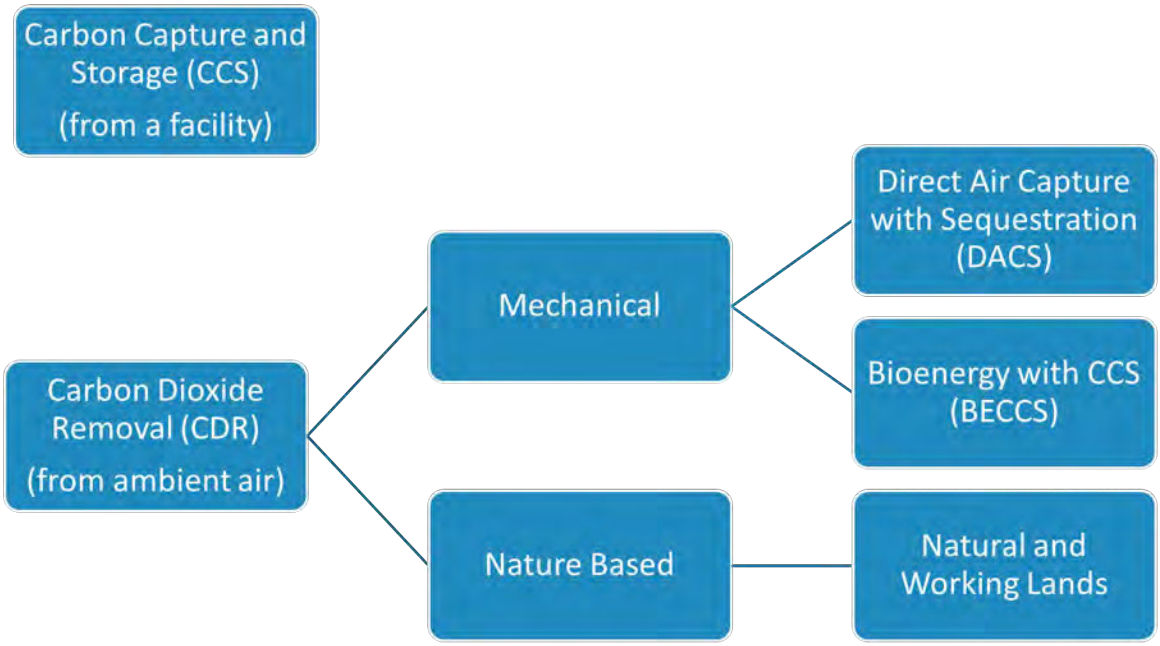
Sector	Action	Statutes, Executive Orders, Outcome
Developed Lands	Increase urban forestry investment by 200% above current levels and utilize tree watering that is 30% less sensitive to drought. Establish defensible space that accounts for property boundaries.	Increase urban tree canopy and shade cover. Reduce heat island effects and support water infrastructure. Reduce fire risk via defensible space. AB 2251 (Calderon, Chapter 186, Statutes of 2022): Increase urban tree canopy 10% by 2035. Target increased in response to AB 2251 and Governor Newsom's direction on CO_2 removal targets in his July 2022 letter.
Wetlands	Restore 60,000 acres of Delta wetlands.	Increase carbon sequestration and reduce short-lived climate pollutants. Helps to reverse land subsidence while improving flood protection and providing critical habitat.
Sparsely Vegetated Lands	Land conversion at 50% of the Reference Scenario land conversion rate.	Reduce the rate of land conversion to more GHG-intensive land uses.

Strategies for Carbon Removal and Sequestration

To achieve carbon neutrality, any remaining emissions must be compensated for using carbon removal and sequestration tools. The following discussion presents more detail

on the options available to capture and sequester carbon. Carbon removal and sequestration will be an essential tool to achieve carbon neutrality, and the modeling clearly shows there is no path to carbon neutrality without carbon removal and sequestration. Governor Newsom also recognized the importance of CO_2 removal strategies and directed CARB to establish CO_2 removal and carbon capture targets of 20 $MMTCO_2$ and 100 $MMTCO_2$ by 2030 and 2045, respectively, as well as signing 2022 legislation on carbon removal and sequestration, including: AB 1279, SB 905, SB 1137, and AB 1757. Carbon removal and sequestration can take different forms. Figure 2-2 illustrates the types of carbon removal and sequestration included in this Scoping Plan. There are numerous other carbon removal options undergoing research, development, and pilot deployment. As these options mature and new approaches emerge, they can be considered in future Scoping Plan updates.

Figure 2-2: Forms of carbon removal and sequestration considered in this Scoping Plan



The Role of Carbon Capture and Sequestration

Carbon capture and sequestration (CCS) will be a necessary tool to reduce GHG emissions and mitigate climate change while minimizing leakage and minimizing emissions where no technological alternatives may exist. CCS is a process by which large amounts of CO_2 are captured, compressed, transported, and sequestered. CCS projects are paired with a source of emissions, as the CCS project captures CO_2 as it leaves a facility's smokestack. CCS projects are often paired with large GHG-emitting facilities such as energy, manufacturing, or fuel production facilities. The sequestration component

of CCS includes CO_2 injection into geologic formations (such as depleted oil and gas reservoirs and saline formations), as well as use in industrial materials (e.g., concrete). CCS is distinct from biological sequestration, which is typically accomplished through NWL management and conservation practices that enhance the storage of carbon or reduce CO_2 emissions with nature-based approaches. CCS is also distinct from mechanical CO_2 removal technologies, where CO_2 is removed directly from the atmosphere using mechanical and/or chemical processes.

CARB adopted a CCS Protocol in 2018 as part of amendments to the Low Carbon Fuel Standard.[138] At this time, no CCS projects have been implemented or have generated any credits under that protocol. However, CCS projects have been implemented elsewhere since the 1970s, largely on coal-fired power plants, with over two dozen projects operational around the world. Over 100 are at the stages of advanced or early development and are expanding beyond coal-fired plants to fossil gas, fuel production, and electricity generation facilities.[139] CCS projects are in development for addressing emissions from fuel, gas, energy production, and chemical production. As of November 2019, more than half of global large-scale CCS facilities (representing approximately 22 $MMTCO_2$/yr in capacity[140]) were in the U.S., mostly as a result of sustained governmental support for these technologies.[141] This support includes the federal 45Q tax credit for CCS[142,143] and research and deployment grants from federal agencies.[144,145] California's deep sedimentary rock formations in the Central Valley represent world-class

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[138] CARB. 2022. Carbon Capture & Sequestration. *https://ww2.arb.ca.gov/our-work/programs/carbon-capture-sequestration*.

[139] Global CCS Institute. 2021. *Global Status of CCS 2021.* *https://www.globalccsinstitute.com/wp-content/uploads/2021/11/Global-Status-of-CCS-2021-Global-CCS-Institute-1121.pdf*.

[140] IHS Markit. August 2021. Carbon Removal Potential: An Overview. *https://ww2.arb.ca.gov/sites/default/files/2021-08/ihsmarkit_presentation_sp_engineeredcarbonremoval_august2021.pdf*.

[141] Beck, Lee. 2019. *Carbon capture and storage in the USA: The role of US innovation leadership in climate-technology commercialization.* *https://academic.oup.com/ce/article/4/1/2/5686277*.

[142] Congressional Research Service. 2021. Carbon Storage Requirements in the 45Q Tax Credit. IF11639. *https://crsreports.congress.gov/product/pdf/IF/IF11639*.

[143] The Inflation Reduction Act of August 2022 expands and enhances the 45 Q tax credit for CCS. Pub.L. No. 117-169 (August 16, 2022).

[144] U.S. Department of Energy. 2020. U.S. Department of Energy Announces $131 Million for CCUS Technologies. *https://www.energy.gov/articles/us-department-energy-announces-131-million-ccus-technologies*.

[145] U.S. Department of Energy. 2021. Funding Opportunity Announcement 2515, Carbon Capture R&D for Natural Gas and Industrial Point Sources, and Front-End Engineering Design Studies for Carbon Capture Systems at Industrial Facilities and Natural Gas Plants. *https://www.energy.gov/fecm/articles/funding-opportunity-announcement-2515-carbon-capture-rd-natural-gas-and-industrial*.

CO_2 storage sites that would meet the highest standards, with storage capacities of at least 17 billion tons of CO_2.[146,147]

In this Scoping Plan, CCS is included to address emissions from limited sectors, including electricity generation, cement production facilities, and refineries, to ensure anthropogenic emissions are reduced by at least 85 percent below 1990 levels in 2045, as directed in AB 1279. While the modeling outputs show CCS not being applied to the electricity sector until 2045, CCS could be implemented earlier on the electricity sector with a similar ramp up over time as that for refineries and cement plants. An earlier application of CCS in the electricity sector would yield additional reductions in years prior to 2045. In addition, CCS can support hydrogen production until such time as there is sufficient renewable power for electrolysis and an abundant water source.

Cement plants have emissions associated with combustion and process-related activities. Combustion emissions account for approximately 40 percent of the total emissions at cement plants. The remaining emissions are related to process-related activities. Due to the high heat content needed to produce cement, there is currently no technically feasible alternative to combustion. SB 596 calls for a 40 percent reduction in GHG intensity in cement emissions from 2019 levels by 2035, and then net zero emissions by 2045. To meet in-state demand, the state relies on cement both produced in state and imported. There are seven cement plants operating in California.[148] To minimize emissions leakage and address emissions from cement plants, the Scoping Plan Scenario includes CCS for cement plants. Additional reductions will need to be pursued and considered as part of implementation of SB 596, which calls for CARB to develop a comprehensive strategy by July 1, 2023, for the state's cement sector to achieve net-zero emissions of GHGs associated with cement used within the state as soon as possible, but no later than December 31, 2045. This effort began in the summer of 2022 and included sector specific workshops.

Even with implementation of EO N-79-20, and despite all of the ambitious efforts in the Scoping Plan Scenario, there will remain some demand for petroleum fuels for legacy vehicles on road applications, and in aviation, rail, and marine applications. Petroleum refineries will need to implement technology to decarbonize their operations and reduce their emissions. This Scoping Plan also assumes CCS at petroleum refineries as one of those potential strategies. Currently, there are seventeen petroleum refineries operating

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[146] For comparison purposes, California's emitted 418.2 million metric tons of CO_2e in 2019.
[147] Lawrence Livermore National Laboratory. 2020. *Getting to Neutral: Options for Negative Carbon Emissions in California.* Revision 1. https://www-gs.llnl.gov/content/assets/docs/energy/Getting_to_Neutral.pdf.
[148] CARB. Mandatory GHG Reporting – Reported Emissions. https://ww2.arb.ca.gov/mrr-data

in the state.[149] On the supply side, the modeling assumes all in-state demand is met through some very limited refining activities in California. Figure 2-3 shows the emissions from the refining sector with and without CCS. If CCS is not deployed, the emissions would be directly emitted into the atmosphere, and CO_2 removal by NWL or direct air capture would need to increase to compensate for the sector's emissions.

Refineries can have a variety of point sources that emit CO_2—such as steam methane reformers for producing hydrogen, combined heat and power units, and catalytic crackers—that are best suited for CCS. Each configuration of a refinery can be unique to its footprint, onsite operations, and the types of crude oils processed. There are newer technologies with smaller footprints[150] that can be deployed in modular configurations to capture CO_2 in space-constrained and multiple-point-source facilities such as refineries. CCS can provide a path to reducing GHG emissions from these facilities to meet petroleum demand while avoiding leakage and until such time as some refineries can be transitioned to produce clean energy to support the transition away from fossil fuels.

While the Scoping Plan modeled deployment of CCS on refineries and identifies significant emissions reductions that can be achieved, the refineries in California are large and complex. The actual deployment of CCS at these facilities as modeled in the Scoping Plan is uncertain. It will be important to closely monitor the evolution of CCS deployment in the refinery sector and, in the next Scoping Plan update, to evaluate the progress toward use in this sector to determine whether the projected reductions will be achieved.

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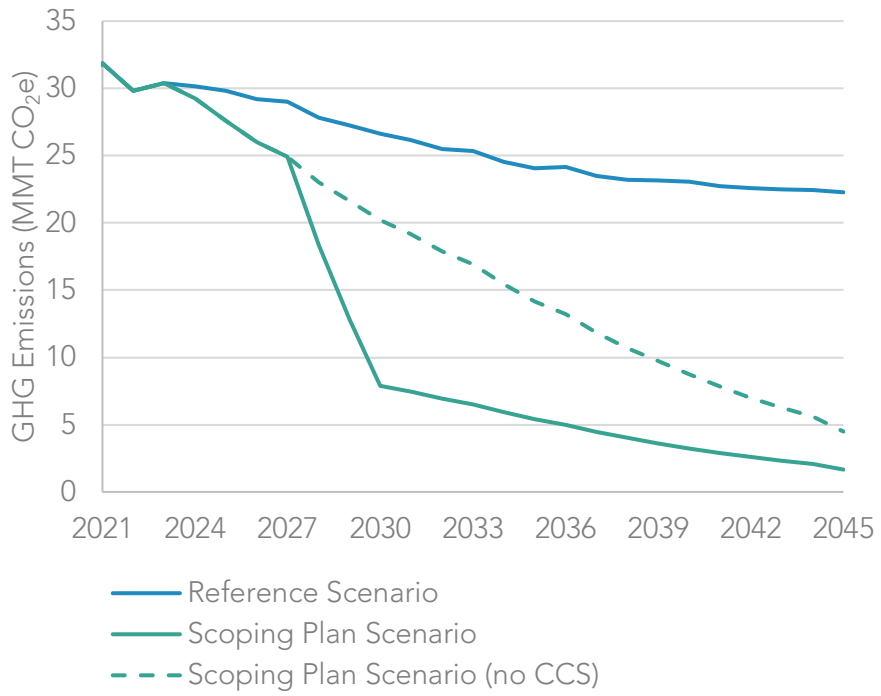
[149] CARB. Mandatory GHG Reporting. *https://ww2.arb.ca.gov/mrr-data*.
[150] Carbon Clean. Modular Carbon Capture Systems for Industry. https://www.carbonclean.com/modular-systems?hsLang=en.

Figure 2-3: Petroleum refining emissions with and without carbon capture and sequestration



This Scoping Plan also calls for accelerating the transition from combustion of fossil fuels to hydrogen. Hydrogen can be produced through electrolysis with renewable electricity or through steam methane reformation of biomethane. There is a high degree of uncertainty around the availability of solar to support both electrification of existing sectors and the production of hydrogen through electrolysis. Producing hydrogen required under the Scoping Plan Scenario with electrolysis would require about 10 gigawatts (GW)[151] of additional solar capacity. If steam methane reformation is paired with CCS, the hydrogen produced could potentially be low carbon. Additionally, the biomethane used to generate hydrogen could be sourced from gasification of forest or agricultural waste resulting from forest management and other NWL management practices, which could also lead to net negative carbon outcomes. Steam methane reformation paired with CCS can thus ensure a rapid transition to hydrogen and increase hydrogen availability until such time as

[151] The Draft Scoping Plan included an estimate for solar capacity (40 GW) to support only electrolysis to produce all hydrogen in the Proposed Scenario. The Scoping Plan now includes steam methane reformation of biomethane and biomass gasification with CCS to produce hydrogen, along with electrolysis from off-grid solar. See Appendix H (AB 32 GHG Inventory Sector Modeling) for additional details.

electrolysis with renewables can meet the ongoing need, assuming there is also sufficient water supply. Additional background and next steps for CCS can be found in Chapter 4.

The EJ Advisory Committee has raised multiple concerns related to the inclusion of CCS and mechanical CDR in the Scoping Plan. Concerns range from potential negative health and air quality impacts in communities from operation of facilities utilizing CCS that continue to emit other emissions, to safety concerns related to potential leaks, to the viability of the current technology. Additionally, the EJ Advisory Committee has policy concerns about the strategy and wants to ensure that engineered carbon removal is not used as a substitute for strategies to achieve emissions reductions onsite and that it does not result in delays in phasing out fossil fuel use. Given these and other concerns and the importance of building public awareness, CARB recognizes the need for a multi-stakeholder process including other state, federal, and local agencies; tribes; independent experts; and community residents to further understand and address community concerns related to CCS. CARB hosted a CCS Symposium with U.S. EPA Region 9 and the Stanford Doerr School of Sustainability to discuss some of these critical issues with community members and other participants. As CARB begins the process of implementing SB 905 in 2023, that will provide an opportunity for further engagement.

In the context of CCS deployment, the Council of Environmental Quality (CEQ) also highlighted the need to further assess and quantify potential impacts on local criteria air pollutants and other emissions resulting from carbon capture retrofits at industrial facilities in response to concerns regarding potential cumulative emissions from single and/or multiple sources.[152] An October 2020 Stanford report[153] discussed how the potential post-combustion capture for CO_2 could also reduce emissions of criteria air pollutant emissions from certain facilities. Exploring these potential outcomes will be important to ensure deployment of CCS does not exacerbate air pollution impacts in communities and maximizes any air pollution benefits. The need for these types of evaluations is also included in SB 905.

The Role of Natural and Working Lands Emissions and Sequestration

California's NWL assessments highlight the importance of increasing the pace and scale of NWL actions to ensure that our ecosystems are better equipped to withstand future climate change so they continue to provide the benefits that nature and society depend

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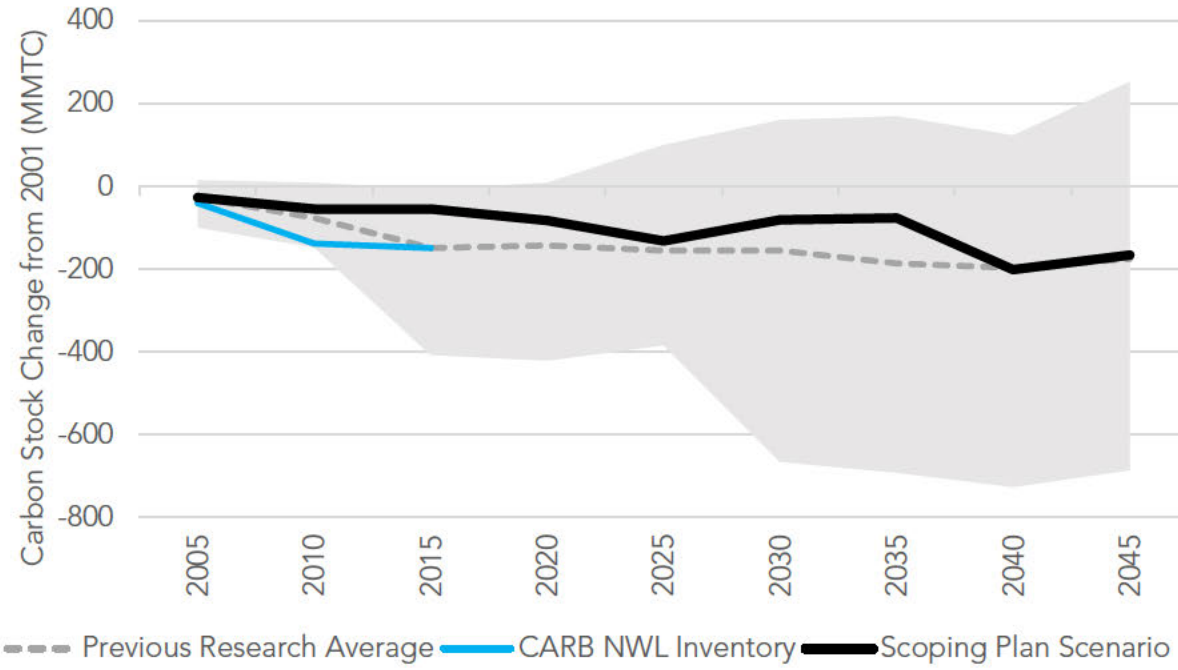
[152] Carbon Capture, Utilization, and Sequestration Guidance. 87 Fed. Reg. 8808 (Feb. 16, 2022), *2022-03205.pdf (govinfo.gov)*.

[153] Stanford Center for Carbon Storage. 2020. *An Action Plan for Carbon Capture and Storage in California: Opportunities, Challenges, and Solutions.* October. *https://sccs.stanford.edu/ccs-in-ca/full-report-form?msclkid=6f9177f6c57811ecbebc473e75203b21*.

upon for survival. As climate change increases the likelihood of extreme wildfires, drought, heat, and other impacts, carbon stocks in California's NWL will face increased risks and impacts. We know from previous climate change and Scoping Plan work[154] that lands can be a net source of GHG emissions or a net sink, and that the magnitude of carbon stock changes and GHG emissions and sequestration from NWL are dependent on the effects of climate change and land management. The expanded modeling conducted for this Scoping Plan shows that NWL are projected to be a net source of emissions through 2045 and indicates a probable decrease of carbon stocks into the future. This projection is further corroborated by previous, independent research that has reached the same conclusion, showing a range of varying levels of carbon stock loss. Figure 2-4 shows the modeling results of the Scoping Plan Scenario overlaid with the NWL inventory and findings from independent research.

Figure 2-4: Comparison of the Scoping Plan Scenario (NWL) with existing research



The modeling indicates that immediate and aggressive climate action can reduce the environmental impacts that would occur in the absence of this action. The results of the modeling demonstrate that regular NWL management over the next two decades can

[154] CARB. 2019. January 2019. *Draft California 2030 Natural and Working Lands Climate Change Implementation Plan*. https://ww2.arb.ca.gov/sites/default/files/2020-10/draft-nwl-ip-040419.pdf.

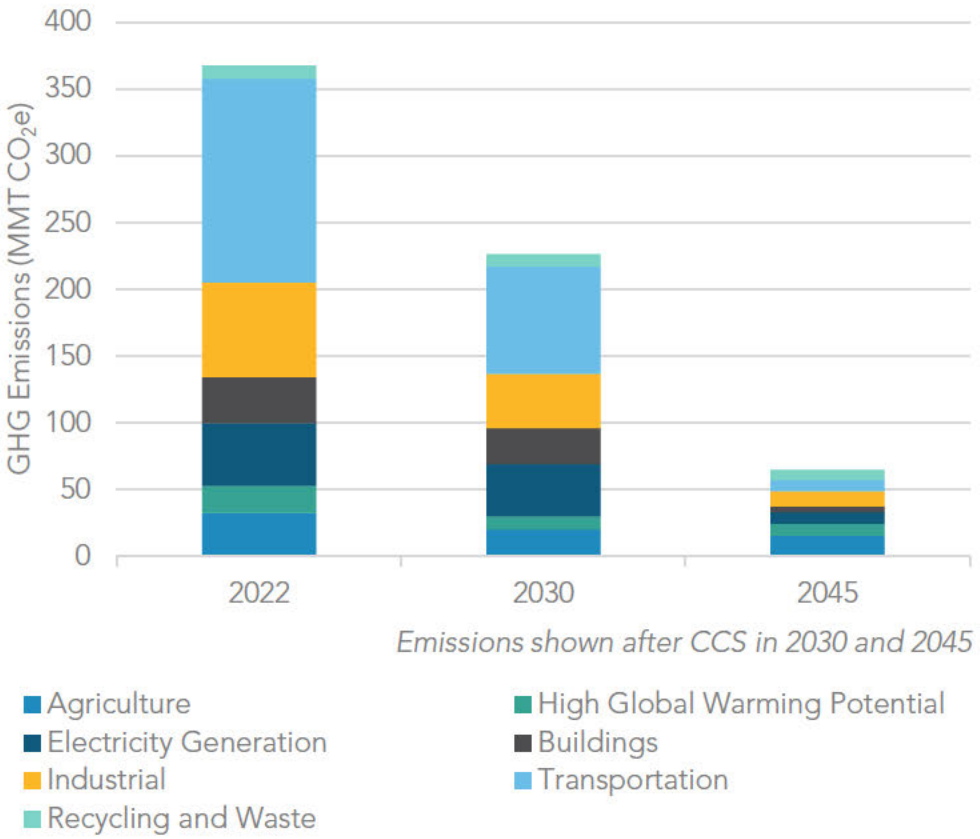
increase carbon stocks from the Reference Scenario trajectory, reduce GHG emissions from lands, and improve ecosystem and public health. This effort is the most comprehensive scientific effort taken by any government to include NWL within its overall climate strategy. Even so, we know that uncertainty exists about future climate and economic forces and the impacts they may have on our ecosystems, so it is important that the state take decisive and aggressive action to improve and diversify ecosystem structures and management.

The effects of climate change, including increased drought, wildfire, and extreme heat, play a significant role in determining the future of California's carbon stocks. And while management actions will help to reduce the impact that climate change will have on California, it is clear from the analysis that NWL sinks and sources are highly variable from year to year, and short time frames do not adequately demonstrate the impact that climate and management are having on ecosystems. For the purposes of climate planning, therefore, it is best to focus on carbon stock changes over longer periods rather than focusing on sequestration or emissions on shorter time frames. The Scoping Plan Scenario is estimated to result in additional NWL emissions of 7 million metric tons of carbon dioxide equivalent ($MMTCO_2e$) annually from 2025–2045. The Reference Scenario is estimated to result in annual emissions of 9 $MMTCO_2e$ over the same time period, and so the Scoping Plan Scenario slows the rate of emissions and provides an approximate 2 $MMTCO_2e$ in additional annual sequestration relative to the Reference Scenario. Because NWL are projected to be a net emissions source, the annual NWL emissions of approximately 7 $MMTCO_2e$ from the Scoping Plan Scenario will need to be compensated by additional CO_2 removal approaches to ensure California can achieve carbon neutrality by 2045.

The Role for Carbon Dioxide Removal (Direct Air Capture)

Even if anthropogenic emissions are reduced to at least 85 percent below 1990 levels by 2045 as called for by AB 1279, there will still be residual emissions in the AB 32 GHG Inventory sectors in 2045 that must be addressed in order to achieve the California's carbon neutrality target. Figure 2-5 includes the emissions by sector for the AB 32 GHG Inventory Sectors in 2022, 2030, and 2045 for the Scoping Plan Scenario.

Figure 2-5: Residual emissions in 2022, 2030, and 2045 for the Scoping Plan Scenario[155]



To achieve carbon neutrality, mechanical CDR will therefore need to be deployed. Because NWL management is not estimated to be a significant carbon removal path in the near term, additional CDR options will be needed. *Mechanical CDR* refers to a range of technologies that capture and concentrate ambient CO_2. Direct air capture (DAC) is one available option that is under development today and could be widely deployed. Note that, unlike CCS, DAC technologies are not designed to be attached to a specific source or smokestack. These technologies include chemical scrubbing processes that capture CO_2 through absorption or adsorption separation processes. Another carbon removal

[155] The High GWP sector includes high global warming potential gas emissions from releases of ozone depleting substance (ODS) substitutes, SF_6 emissions from the electricity transmission and distribution system, and gases that are emitted in the semiconductor manufacturing process. ODS substitutes, which are primarily hydrofluorocarbons (HFCs), are used in refrigeration and air conditioning equipment, solvent cleaning, foam production, fire retardants, and aerosols.

option that involves rapid mineralization of CO_2 at the Earth's surface is called *mineral carbonation.*[156] As is the case with CCS, mechanical CDR technologies will need governmental or other incentive support to overcome technology and market barriers. In the United States, the U.S. Department of Energy announced financing specifically for DAC in March 2020[157] and March 2021.[158] Additionally, almost $9 billion in CCS support was included in the $ 1 trillion Infrastructure Investment and Jobs Act of 2021.[159] This includes funding to establish four DAC hubs. The Inflation Reduction Act of 2022[160] increases the value of the 45Q tax credit to USD 85 per metric ton of CO_2 captured and stored in geologic formations from some industrial applications and USD 180 per metric ton for DAC with storage in geologic formations. In 2021, there were approximately 19 DAC facilities globally.[161]

Ultimately, the role for mechanical CDR will depend on the success of reducing emissions directly at the source in the AB 32 GHG Inventory sectors and the ability of the NWL to sequester carbon. However, mechanical CDR also provides an opportunity to not just achieve carbon neutrality, but also remove legacy GHG emissions from the atmosphere. As such, increased deployment of DAC can help achieve net negative emissions. This would further help avoid the most damaging impacts of climate change. While the federal incentives for DAC provide some support for this technology, the only California program that recognizes this technology is the LCFS program. Permitting must also happen across different levels of government and across multiple state agencies. Energy availability must also be addressed if DAC is to be implemented in remote areas. Additional information and next steps on DAC can be found in Chapter 4.

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[156] The National Academies Press. 2018. Direct Air Capture and Mineral Carbonation Approaches for Carbon Dioxide Removal and Reliable Sequestration: Proceedings of a Workshop–in Brief. *https://nap.nationalacademies.org/catalog/25132/direct-air-capture-and-mineral-carbonation-approaches-for-carbon-dioxide-removal-and-reliable-sequestration#:~:text=National%20Academies%20of%20Sciences%2C%20Engineering%2C%20and%20Medicine%3B%20Division,concentrate%20carbon%20dioxide%20%28CO%202%29%20from%20ambient%20air*.

[157] U.S. Department of Energy. 2020. Department of Energy to Provide $22 Million for Research on Capturing Carbon Dioxide from Air. *https://www.energy.gov/articles/department-energy-provide-22-million-research-capturing-carbon-dioxide-air*.

[158] U.S. Department of Energy. 2021. DOE Invests $24 Million to Advance Transformational Air Pollution Capture. *https://www.energy.gov/articles/doe-invests-24-million-advance-transformational-air-pollution-capture*.

[159] Pub.L. No. 117-58 (November 15, 2021). *https://www.congress.gov/bill/117th-congress/house-bill/3684/text*.

[160] Pub.L. No. 117-169 (August 16, 2022). *https://www.congress.gov/bill/117th-congress/house-bill/5376/text*.

[161] International Energy Agency (IEA). 2022. Direct Air Capture – Analysis. *https://www.iea.org/reports/direct-air-capture*.

Carbon Dioxide Removal and Capture Targets for 2030 and 2045

Recognizing the importance of CO_2 removal, Governor Newsom and the Legislature identified the need for targets to send policy and regulatory signals to pilot, deploy, and scale action for those efforts. Governor Newsom requested that CARB set a CO_2 removal and capture target of 20 MMT for 2030 and 100 MMT for 2045, first prioritizing sequestration in NWL. And while this Scoping Plan prioritizes and recommends significant increased climate-smart action on all NWL to support carbon neutrality and healthy and resilient lands, the modeling indicates that, across all NWL, lands will be a net source of emissions when accounting for both carbon sequestration and GHG (CO_2, CH_4, and N_2O) emissions from lands.

Some landscapes, however, are projected to have a net increase in carbon stocks under the Scoping Plan Scenario between 2025 and 2045 relative to the reference case, indicating that NWL actions can help California achieve Governor Newsom's CO_2 removal targets. Carbon stocks in urban forests and grasslands are projected to increase relative to historical levels from implementation of the 2022 Scoping Plan. To support the governor's CO_2 removal targets, CARB estimates that lands would contribute an average of 1.5 MMT of CO_2 removals each year between 2025 and 2045. Any carbon sequestration contributions from lands need to reflect both long-term storage and an overall net increase in carbon stocks over time to ensure these NWL actions are contributing toward California's achievement and maintenance of carbon neutrality over time.

CARB will work to update and revise these estimates as part of implementation of AB 1757, which was signed by the governor in September 2022 and requires that CARB and the California Natural Resources Agency (CNRA) work with an expert advisory committee to determine an ambitious range of carbon sequestration targets by January 1, 2024, for the years 2030, 2038, and 2045.

For the AB 32 GHG Inventory sectors, the Scoping Plan Scenario modeling indicates that the scenario would meet or exceed the 2030 SB 32 target through GHG reduction policies without the need for CDR. CDR will, however, be necessary to increase ambition for an accelerated 2030 target and in increasing amounts over the following decades to achieve carbon neutrality by 2045.[162] Given the likelihood of NWL to be a net source of emissions, and the need for CDR to compensate for residual emissions to achieve carbon neutrality

[162] The modeled scenarios assume that residual emissions will be compensated using DAC technologies by including the direct cost in terms of dollars per ton CO_2 removed. The energy source for DAC is not modeled, but renewable electricity and/or hydrogen produced from electrolysis are zero carbon options consistent with the carbon neutrality targets in this Scoping Plan.

by 2045, California will need increasing deployment of mechanical CDR over the coming decades. In the immediate future, scaling nature-based CDR approaches also can help to provide some CO_2 removal quickly while mechanical CDR is scaled up between now and 2045. Table 2-3 provides estimates of CO_2 removal and capture needed in 2030[163] and 2045.

[163] As identified in Chapter 1, SB 27 (Skinner, Chapter 237, Statues of 2021) directed CARB to "establish carbon dioxide removal targets for 2030 and beyond" as part of this Scoping Plan. CARB is establishing these targets to satisfy both the requirements of SB 27 and the directive from Governor Newsom to establish CO_2 removal targets for 2030 and 2045.

Table 2-3: GHG emissions and removals needed to achieve carbon neutrality and meet the 20 $MMTCO_2$ removal and capture target in 2030 and the 100 $MMTCO_2$ removal and capture target in 2045.[164]

	2030 ($MMTCO_2e$)	2045 ($MMTCO_2e$)
GHG Emissions	233	72
AB 32 GHG Inventory Sector Emissions	226	65
Net NWL GHG Emissions Across All Landscapes (annual average from 2025–2045)	7	7
Carbon Capture and Sequestration (CCS): Avoided GHG Emissions from Industry and Electric Sectors	(13)	(25)
Carbon Dioxide Removal (CDR) including natural and working lands carbon sequestration,[165] Direct Air Capture, and Bioenergy with CCS (BECCS).	(7)	(75)
Net Emissions (GHG Emissions + CDR)	226	(3)

In 2030, the CO_2 removal and capture target is 20 MMT, but because the SB 32 target only encompasses the AB 32 GHG Inventory sectors, only CCS that reduces GHG emissions on AB 32 sources count toward achieving more ambitious GHG emission reductions in 2030. In 2045, the CO_2 removal and capture must compensate for any residual emissions from the AB 32 Inventory sectors and NWL emissions to support achieving carbon neutrality while also totaling at least 100 MMT. It is important to note that NWL, particularly forests, need a natural wildfire cycle to remain healthy. While the modeling projected wildfires, and implementing the Scoping Plan will result in a reduction in future wildfire emissions, getting to zero wildfires in the sector is not the goal, nor the

[164] Modeled estimates from the Scoping Plan Scenario indicate the relative quantity of emissions and removals to achieve carbon neutrality and meet carbon removal and capture targets. These estimates are not intended to imply precision, as the required policies are yet to be implemented and all models have some uncertainty in their forecasts.

[165] For the purposes of quantifying how to achieve the governor's 20 MMT and 100 MMT CO_2 removal and capture target, CARB included 1.5 $MMTCO_2e$ sequestration from NWL, which is the sequestration from urban forests. This is included as CO_2 removal because it is this sequestration that CARB can consider as having some permanence. Permanence is necessary for incorporating NWL into carbon neutrality. The net NWL emissions of 7 $MMTCO_2e$, identified in the second row of Table 2-3, includes *all* emissions and sinks from all NWL landscapes, which is inclusive of the 1.5 $MMTCO_2e$ sequestration. CARB will develop an accounting framework to accommodate NWL carbon stocks.

right approach to a sustainable forestry sector. In contrast in 2045, the reductions from programs and policies are estimated to reduce emissions by 169 $MMTCO_2e$ from business as usual.

The 2030 target for engineered CDR also provides a near term milestone for California and can serve as an important marker for progress in deploying CDR to support California's carbon neutrality goal. Preliminary estimates indicate that, globally, capacity from already announced projects will range from about 2 million metric tons per year ($MMTCO_2/y$) to 8 $MMTCO_2/y$ from bioenergy paired with CCS, and from about 2,000 metric tons per year ($MTCO_2/y$) to 1 $MMTCO_2/y$ from DACs by 2027,[166] which indicates that California's 2030 target is an ambitious, but achievable, goal.

Scenario Uncertainty

Greenhouse Gas Emissions Modeling

Several types of uncertainty are important to understand in both forecasting future emissions and estimating the benefits of emission reduction actions. In developing this Scoping Plan we forecasted a reference scenario and estimated the GHG emissions outcome of the AB 32 GHG Inventory sectors using the PATHWAYS[167] model. Inherent in the reference scenario modeling is the expectation that many of the existing programs will continue in their current form, and that the expected drivers for GHG emissions, such as energy demand, population growth, and economic growth, will match our current projections.

However, there is also the expectation that each of the policies included and implemented to achieve the 2030 target in the 2017 Scoping Plan will deliver their exact outcomes. It is unlikely the future will precisely match our projections, and this will lead to uncertainty in the forecast. For example, we never could have foreseen and forecasted economic and emissions impacts related to the extended disruptions from the COVID-19 pandemic. Thus, the single "reference" or "forecast" line should be understood to represent one possible future in a range of possible predictions. For this Scoping Plan, PATHWAYS utilized inputs that reflect technically feasible levels of deployment or adoption of low- or zero-carbon fuels and technologies. Each of the input assumptions provided to PATHWAYS has some uncertainty, which also contributes to uncertainty in the resulting reference scenario.

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[166] IHS Markit. August 2021. Carbon Removal Potential. *https://ww2.arb.ca.gov/sites/default/files/2021-08/ihsmarkit_presentation_sp_engineeredcarbonremoval_august2021.pdf*.
[167] See Appendix H (AB 32 GHG Inventory Sector Modeling).

Similarly, for the NWL modeling, CARB used a mix of individual modeling tools[168] to estimate the carbon and other ecological, public health, and economic outcomes. The Reference scenario assumes that the level of land management actions that occurred between 2001 and 2014 for forests, shrublands, grasslands, croplands, developed lands, wetlands, and sparsely vegetated lands continues into the future. Alternative scenarios assessed the effect of increasing levels of management actions from the reference scenario beginning in 2025. There is a great deal of uncertainty about exactly how lands are currently managed, and a larger uncertainty about how they may be managed in the future. For NWL, it is unlikely that the future will precisely match the carbon stock outcomes CARB has projected, particularly given the uncertainties around current and future land management and the effects climate change will have on our lands. For any modeling exercise these uncertainties exist; however, this modeling effort brings together the best available science, data, and models to quantify the impact our actions may have on the landscape under an unknown future.

Implementation

As this Scoping Plan is designed to chart a path to achieving carbon neutrality, additional work will be required to fully design and implement any policies and actions identified in this plan. During the subsequent development of policies, the Legislature, CARB, and other state agencies will learn more about the technologies and their costs, as well as how each industry works, as a more comprehensive evaluation is conducted in coordination with stakeholders, including community engagement. Significant areas of uncertainty include permitting wait times[169] and local ordinances that might limit or slow the build-out of utility scale renewables.[170,171] In another example, times to reach commercial operations for solar projects after securing an interconnection agreement also have increased in recent years, to 3.5 to 5.5 years.[172]

The level of natural and working lands climate action identified in this Scoping Plan is ambitious. Achieving the level of action needed to result in the quantified carbon,

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[168] See Appendix I (Natural and Working Lands Technical Support Document).
[169] CEC. 2021. *SB 100 Joint Agency Report.* https://www.energy.ca.gov/sb100#anchor_report.
[170] Roth, Sammy. 2019. "California's San Bernardino County slams the brakes on big solar projects." *Los Angeles Times.* https://www.latimes.com/business/la-fi-san-bernardino-solar-renewable-energy-20190228-story.html?fbclid=IwAR2qHGq3bahHme6SFErLsnyFi9UPIfBHIhvnOh3dU3OM7kUTMcEqYfN3pQA.
[171] Chediak, Mark. 2021. "California NIMBYs Threaten Biden's Clean Energy Goals." *BNN Bloomberg.* https://www.bnnbloomberg.ca/california-nimbys-threaten-biden-s-clean-energy-goals-1.1634351?msclkid=668c9ae9c11311ec92e34035ea157ad4.
[172] Rand, Joseph, et al. 2022. Queued Up: Characteristics of Power Plants Seeking Transmission Interconnection as of the End of 2021. Power Point Presentation. Lawrence Berkeley National Laboratory. https://emp.lbl.gov/sites/default/files/queued_up_2021_04-13-2022.pdf.

emissions, health, and economic outcomes within this Scoping Plan requires coordination, investment, and partnerships across all levels of government and sectors of the economy. It is possible that not all of the actions at the identified level will begin in 2025. This uncertainty will result in diminished levels of beneficial outcomes quantified in the Scoping Plan Scenario. The levels of NWL action identified in this Scoping Plan represent CARB's assessment of the pace and scale of action needed to achieve the carbon stock targets and CO_2 removal targets identified in this Scoping Plan.

The Scoping Plan Scenario identifies that 2.3 million acres of forests, shrubland, and grassland management annually would achieve substantial levels of fire emissions reductions and the concomitant health and economics benefits. Currently, 1 million acres of forest treatment annually is the joint federal and state government goal (500,000 acres each). This target of one million acres annually by 2025 is for the purposes of increasing forest health and wildfire resilience in the near term, whereas the 2.3 million acre target is what the Scoping Plan modeling shows would be needed to realize the carbon stock target called for in this Scoping Plan by 2045. By identifying 2.3 million acres of climate action annually in forests, shrublands, and grasslands, this Scoping Plan emphasizes the importance of that 1 million acre annual goal as a milestone on the way to even more action and improved fire and air quality outcomes. The modeling indicates that substantial improvements to statewide fire emissions will occur at levels of action greater than 1 million acres per year. If these levels of action do not occur starting in 2025, the Scoping Plan has quantified climate benefits that will still occur, but to a lesser extent. In terms of fire emissions, compared to the Reference Scenario, 2.3 million acres of forest, shrubland and grassland management will result in a 10% reduction in wildfire emissions. At 1 million acres per year, this decreases to a 2.5% reduction. If 1 million acres per year is also not accomplished, then the emissions and health benefits are even lower.

Climate action in other NWL sectors also generates many co-benefits. Climate action identified in this Scoping Plan is aimed at not only fighting climate change but also improving air quality and public health. The climate action identified in the agricultural sector, for example, should result in decreased pesticide and synthetic fertilizer use. This decrease of synthetic chemical use in agriculture across California also should result in improved public health, especially for communities that work and live in and around agricultural lands. However, as with the forestry sector, the benefits of climate action in agricultural lands and in any other land are dependent on how much implementation takes place. Ramping up increased healthy soils practices and increasing organic agriculture in California will require continued and sustained implementation by private industry and public agencies. For example, achieving the carbon stock outcomes for the annual crops called for in this Scoping Plan would require deployment and maintenance of healthy soils practices on 80,000 additional acres of croplands in California every year between 2025 and 2045. For context, CDFA's Healthy Soils Program, which is an incentive program

supporting healthy soils practices, took almost four years of sustained funding to achieve approximately 50,000 acres total under healthy soils practices.[173]

Given the uncertainty around the modeling assumptions, and performance uncertainty as specific policies are fully designed and implemented, estimates associated with the Scoping Plan Scenario are certain to be different than what is ultimately implemented. One way to mitigate for this is to develop policies that can adapt and increase certainty in GHG emissions reductions. Periodic reviews of progress toward achieving the 2030 target and longer term deeper decarbonization, as well as performance of specific policies, also provide opportunities for the state to consider any changes to ensure we remain on course to achieve the 2030 target and carbon neutrality. The need for this periodic review process was anticipated in AB 32, as it calls for updates to the Scoping Plan at least once every five years. For this Scoping Plan, the metrics provided on the rate of deployment of clean fuels and technologies, along with the annual AB 32 GHG Inventory, provide additional information that can be used to assess progress on sectors and aggregate emissions. This is also true of CARB's NWL carbon inventory. An uncertainty analysis for achieving an accelerated 2030 target is provided toward the end of this chapter.

Targeted Evaluations for the Scoping Plan: Oil and Gas Extraction and Refining

To achieve California's air quality and climate goals, we must end our dependence on petroleum. This will not happen overnight. There are about 28 million combustion engine heavy- and light-duty trucks and passenger vehicles in California, and these are almost always replaced at their end of life. The ZEV Executive Order (EO N-79-20) calls for 100 percent new ZEV car sales beginning in 2035 and a 100 percent ZEV medium- and heavy-duty fleet sales by 2045 where feasible. The result is an ongoing, albeit shrinking, pool of vehicles that will continue to require petroleum fuels. To avoid leakage, as called for in AB 32, and to meet that remaining demand for petroleum fuel, a complete phaseout of oil and gas extraction and refining is not possible by 2045. This Scoping Plan assumes a phasedown in both oil and gas extraction as well as petroleum refining in line with the reduction in demand for in-state on-road petroleum fuel demand. Since the transportation sector is the largest source of GHG emissions and harmful local air pollution, we must continue to research and invest in efforts to deploy zero emissions technologies and clean fuels, and to reduce VMT. An assessment of ongoing progress and efforts to reduce

[173] California Department of Food and Agriculture. 2021. *Incentives Program 2017–2020 Summary by the Numbers.* https://www.cdfa.ca.gov/oefi/healthysoils/docs/HSP_Incentives_program_level_data_funded_projects.pdf.

demand for petroleum fuels and of opportunities to phase down oil and gas extraction and refining will be included in the next Scoping Plan update.

In addition to supplying in-state demand, California is a net exporter of gasoline, diesel, and jet fuel. California pipelines supply the Nevada and Arizona regions[174] with approximately 87 million barrels gasoline equivalent of refined products annually.[175] California pipelines deliver approximately 85% of Nevada's and 40% of Arizona's refined product. Most finished fuels flowing from California to Nevada and Arizona are currently produced by California refineries. To manage the phasedown of oil and gas extraction and petroleum refining in California, exports of finished fuels must be considered and factored into that process, in addition to the declining in-state demand. The authorities and considerations related to supply and demand of petroleum fuels span federal, state, and local agencies. If supply of fossil fuels is to decline along with demand, a multi-agency discussion is needed to systematically evaluate and plan for the transition to ensure that it is equitable.

This inter-agency work should also consider related topics, such as the following:

- Direct and indirect job and economic impacts
- Demand for other liquid fuel types such as renewable fuels, and expected volumes
- Legal considerations
- Public health benefits
- Demand and supply strategies for petroleum fuels, including how to avoid short term supply constraints that may impact low-income consumers

Some of these topics were also discussed as part of two studies[176] supported by the California Environmental Protection Agency, which can serve as a starting point for a working group to analyze these questions and develop policy recommendations.

Oil and Gas Extraction

On April 23, 2021,[177] Governor Newsom directed CARB to evaluate the phaseout of oil and gas extraction no later than 2045 as part of this Scoping Plan. As noted above, this Scoping Plan still has some California demand for finished fossil fuels (gasoline, diesel,

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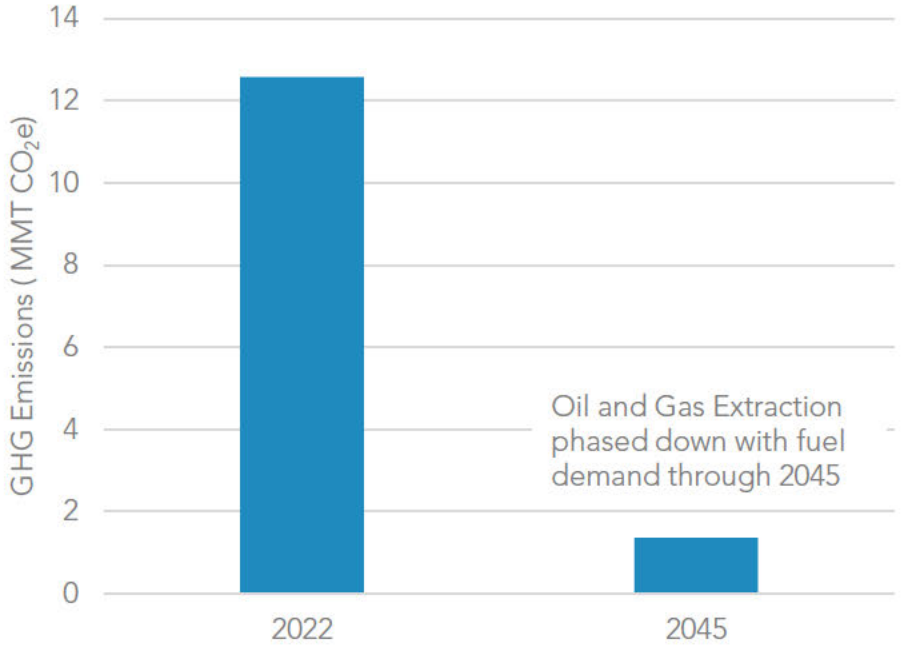
[174] CEC. August 2021. A Primer on California's Pipeline Infrastructure. *Petroleum Watch.* https://www.energy.ca.gov/sites/default/files/2021-08/August_Petroleum_Watch_ADA.pdf.
[175] CEC. March 2020. *Petroleum Watch.* https://www.energy.ca.gov/sites/default/files/2020-03/March_2020_Petroleum_Watch.pdf.
[176] CalEPA. 2021. Carbon Neutrality Studies: https://calepa.ca.gov/climate/carbon-neutrality-studies/.
[177] Governor Newsom. April 23, 2021. Governor Newsom Takes Action to Phase Out Oil Extraction in California. Press Release. https://www.gov.ca.gov/2021/04/23/governor-newsom-takes-action-to-phase-out-oil-extraction-in-california/.

and jet fuel) in 2045. This demand is primarily for transportation, including for sectors that are directly regulated by the state and some that are subject to federal jurisdiction, such as interstate locomotives, marine, and aviation. As discussed more fully below, while significant GHG reductions from oil and gas extraction could be achieved as demand for fossil fuels is reduced due to strategies in this Scoping Plan, it is not feasible to phase out oil and gas production fully by 2045 given this remaining demand.

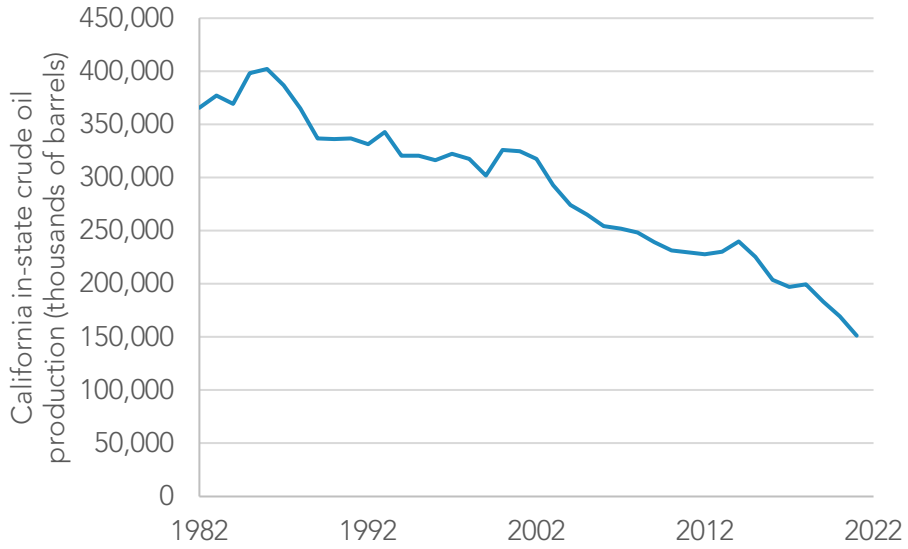
In the Scoping Plan Scenario, with successful deployment of zero carbon fuels and non-combustion technology to phase down petroleum demand, GHG emissions from oil and gas extraction could be reduced by approximately 89 percent in 2045 from 2022 levels if extraction decreases in line with in-state finished fuel demand. If in-state extraction were to be phased out fully, the future petroleum demand by in-state refineries would be met through increased crude imports to the state relative to the Scoping Plan Scenario. AB 32 defines leakage as, "a reduction in emissions in greenhouse gases within the state that is offset by an increase in emissions of greenhouse gases outside the state." AB 32 also requires any actions undertaken to reduce GHGs to "minimize leakage." Increases in imported crude could result in increased activity outside California to extract and transport crude into California. Therefore, our analysis indicates that a full phaseout of in-state extraction could result in GHG emissions leakage and in-state impacts to crude oil imported into the state. Figure 2-6 compares the 2022 emissions from this sector with the modeled results when the sector is phased down with in-state petroleum demand.

Figure 2-6: Oil and gas extraction sector GHG emissions in 2022 and 2045 when activity is phased down with in-state fuel demand



According to California Energy Commission (CEC) data used in Figure 2-7, the total oil extracted in California peaked at 402 million barrels in 1986. Since then, California crude oil production has decreased by an average of 6 million barrels per year, to about 200 million barrels in 2020. This steadily decreasing production of crude in California is expected to continue as the state's oil fields deplete.

Figure 2-7: California in-state crude oil production[178]



A UC Santa Barbara report estimated that, under business-as-usual conditions, California oil field production would decrease to 97 million barrels in 2045.[179] The business-as-usual model assumed no additional regulations limiting oil extraction in California.

Any crude oil demand by California refineries not met by California crude oil will be met by marine imports of Alaskan and foreign crude.[180] As shown in Figure 2-8, approximately 99 percent of crude imports into California are delivered by marine transportation. The

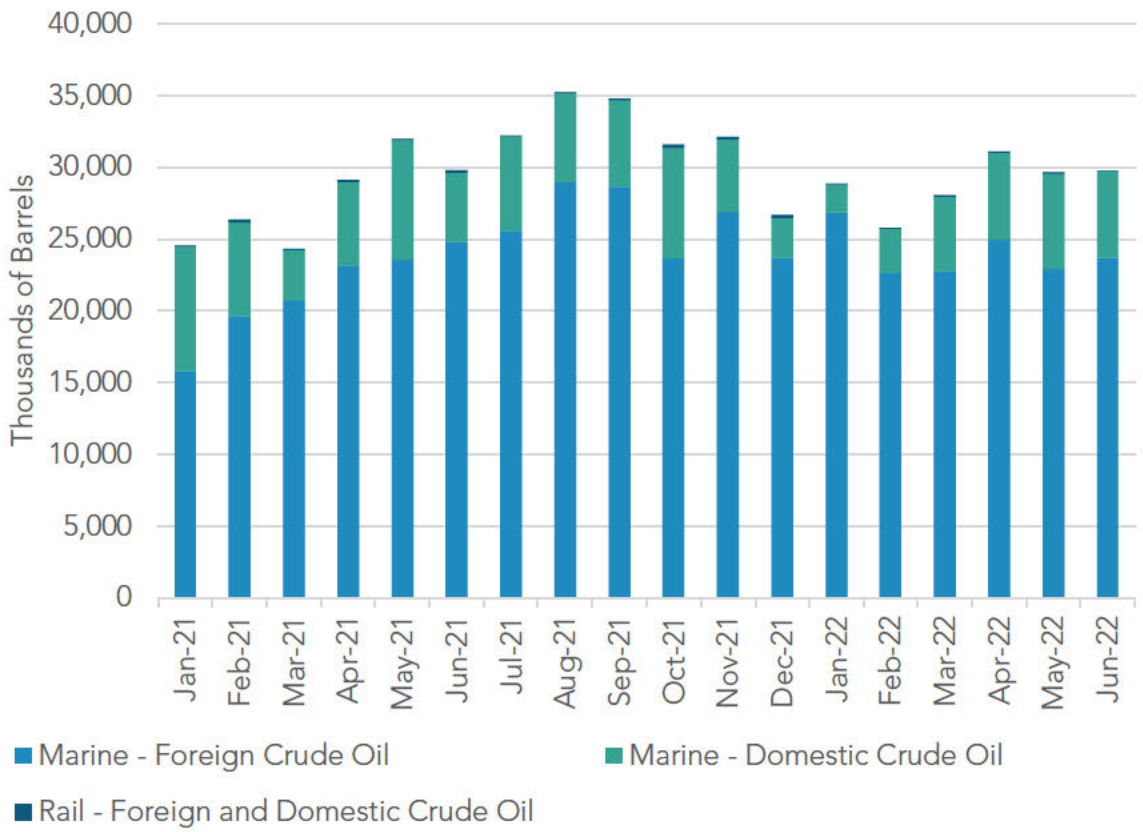
[178] CEC. No date. Oil Supply Sources to California Refineries. Accessed April 21, 2022. https://www.energy.ca.gov/data-reports/energy-almanac/californias-petroleum-market/oil-supply-sources-california-refineries.

[179] University of California, Santa Barbara. 2021. Enhancing Equity While Eliminating Emissions in California's Supply of Transportation Fuels.

[180] CEC. 2020. *Petroleum Watch: How Petroleum Products Move.* March. https://www.energy.ca.gov/sites/default/files/2020-03/March_2020_Petroleum_Watch.pdf, and CEC. 2020. *Petroleum Watch: What Types of Crude Oil Do California Refineries Process?* February. https://www.energy.ca.gov/sites/default/files/2020-02/2020-02_Petroleum_Watch_ADA_0.pdf.

remaining imports occur by rail.[181] There are no pipelines that bring crude oil into California from out of state.[182]

Figure 2-8: Crude oil imports by transportation type[183]



Crude oil delivered by marine tankers is delivered to onshore storage tanks and subsequently to refineries via pipeline. Most crude oil produced in California is delivered to California refineries by pipeline. Using historical trends, any increases in imported crude above historic levels would result in increased deliveries through the marine ports. This increased activity could require more infrastructure to store and move larger volumes of crude to the refineries in state.

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[181] CEC. June 2021. Crude Oil Imports by Transportation Type. Accessed March 16, 2022. https://www.energy.ca.gov/data-reports/energy-almanac/californias-petroleum-market/crude-oil-imports-source.

[182] CEC. 2020. *Petroleum Watch: How Petroleum Products Move*. March. https://www.energy.ca.gov/sites/default/files/2020-03/March_2020_Petroleum_Watch.pdf.

[183] CEC. June 2021. Crude Oil Imports. https://www.energy.ca.gov/data-reports/energy-almanac/californias-petroleum-market/crude-oil-imports-source.

California refineries import a variety of crude oils to meet refinery needs. California petroleum refineries are generally designed to process relatively heavy crude relative to other U.S. refineries. In 2018, crude inputs to California refineries had an average American Petroleum Institute (API) gravity of 26.18 and an average sulfur content of 1.64 percent. Processing significantly lighter or heavier crude blends would require significant changes to a refinery.[184] Most crude imported from Alaska and the Middle East is relatively light (API gravity > 30) compared to California crude (API gravity < 20).[185] If California crude production is insufficient to meet the demand at California refineries, then California refineries will need access to a similarly heavy source of crude so that the average API gravity of crude remains within their established operating window. South American crude oil imports into California are the heaviest relative to other regions, and therefore they may be the most likely to replace decreased California crude oil supply.[186]

In summary, the modeling indicates that demand for petroleum will persist due to legacy fleets that will not be replaced until end of life. The modeling also shows what the GHG emissions reductions would be if oil and gas extraction activities were phased down in line with the reduction of in-state petroleum demand. Trend data shows that oil and gas extraction already has been on the decline and will continue to decline. It is possible to anticipate the likely regions and types of crude that would be imported to meet in-state petroleum demand if in-state extraction was fully phased out by 2045. Importantly, activity at the ports would increase, and new infrastructure would be needed to store and deliver crude to in-state refineries. And while GHG emissions from this sector would go to zero in our AB 32 GHG Inventory with a full phaseout, emissions related to the production and transport of crude to California might increase elsewhere, resulting in emissions leakage.

As the state continues to reduce demand for petroleum, efforts to protect public health for communities located near oil and gas extraction sites must also continue. In October 2021, Governor Newsom directed action to prevent new oil drilling near communities and

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[184] CEC. 2020. *Petroleum Watch: What Types of Crude?* February. https://www.energy.ca.gov/sites/default/files/2020-02/2020-02_Petroleum_Watch_ADA_0.pdf.
[185] CEC. 2020. *Petroleum Watch: What Types of Crude?* February. https://www.energy.ca.gov/sites/default/files/2020-02/2020-02_Petroleum_Watch_ADA_0.pdf.
[186] CEC. 2020. *Petroleum Watch: What Types of Crude?* February. https://www.energy.ca.gov/sites/default/files/2020-02/2020-02_Petroleum_Watch_ADA_0.pdf.

expand health protections.[187,188] In 2022, the Legislature passed, and the governor signed, SB 1137 to protect communities from existing and any new oil and gas extraction activities through 3,200 foot setbacks.

Petroleum Refining

In the Scoping Plan Scenario CARB modeled a phasedown of refining activity in line with petroleum demand. Meeting petroleum demand means sufficient availability of finished fuel (gasoline, diesel, and jet fuel). Crude is processed at in-state refineries to produce finished fuel. In response to stakeholder requests,[189] this evaluation focuses on the Scoping Plan Scenario, but with an evaluation of a complete phasedown of refinery operations in state.

The Scoping Plan Scenario results in California petroleum refining emissions of 4.5 $MMTCO_2e$ in 2045; a reduction of approximately 85 percent relative to 2022 levels, which is in line with the decline in in-state finished fuel demand.[190] Emissions from refining can be reduced further through the application of CCS technology, as shown in Figure 2-9. If in-state refining is phased down to zero and the demand for the finished fuels produced by that refining persists, imported finished fuels may be needed to meet the remaining in-state demand.[191] The current data shows unmet demand for liquid petroleum transportation fuels would most likely be met by marine imports. A CEC report notes, "The only way for California to receive large amounts of crude and refined products is by marine."[192]

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[187] Office of Governor Gavin Newsom. 2021. California Moves to Prevent New Oil Drilling Near Communities, Expand Health Protections. *https://www.gov.ca.gov/2021/10/21/california-moves-to-prevent-new-oil-drilling-near-communities-expand-health-protections-2/?msclkid=6c0da86bc58e11ecb81cf596d4d8a735*.

[188] California Department of Conservation Geologic Energy Management Division. October 2021. Draft Rule for Protection of Communities and Workers from Health and Safety Impacts from Oil and Gas Production Operations. *https://www.conservation.ca.gov/calgem/Pages/Public-Health.aspx?msclkid=45660232cf2511ecb1c56119097e3b0c*.

[189] California Environmental Justice Alliance. October 22, 2021. Comment on 2022 Scoping Plan Update - Scenario Inputs Technical Workshop. *https://www.arb.ca.gov/lists/com-attach/68-sp22-inputs-ws-WzhdPII5AjACW1Qx.pdf*.

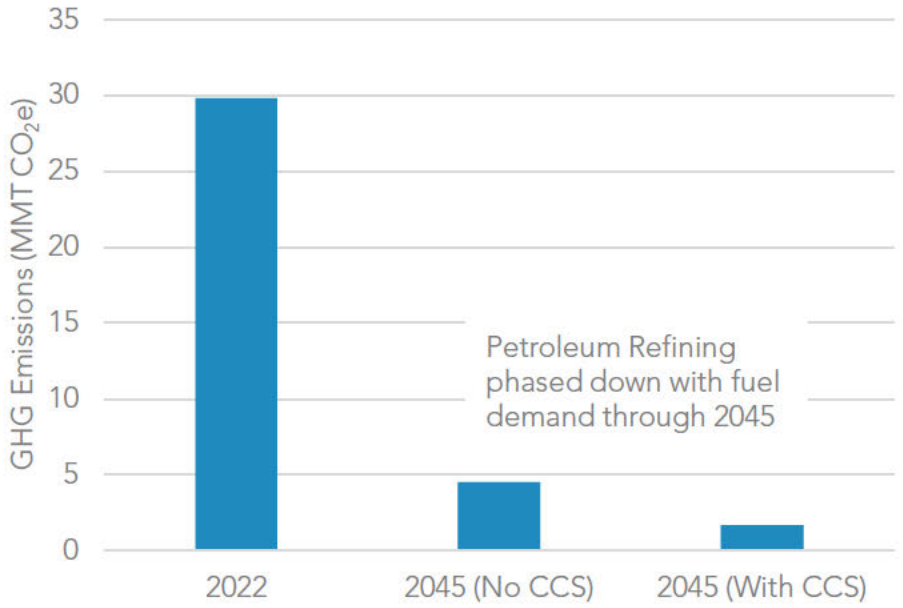
[190] This reduction in demand does not assume any need for ongoing operations to support exports to neighboring states.

[191] If demand assumes an ongoing need to support exports to neighboring states, the residual demand would require a five-fold increase in finished fuel imports.

[192] CEC. 2020. *Petroleum Watch: How Petroleum Products Move.* March. *https://www.energy.ca.gov/sites/default/files/2020-03/March_2020_Petroleum_Watch.pdf*.

There are currently no pipelines capable of bringing refined products to the state, and rail imports of refined products have historically made up less than 1 percent of all imports.[193] Significant increases in marine imports would likely require significant reconfiguring, retrofitting, or replacement of crude pipelines and storage tanks at current marine terminals, and possible reconfiguring of existing finished fuel infrastructure to account for changes in volumes and locations of supply points.

Figure 2-9: Petroleum refining sector GHG emissions in 2022 and 2045 (with and without CCS) when activity is phased down with fuel demand



If California's finished fuel demand is not met by continued refining activity in California, the state would need to import finished fuels to meet the ongoing demand. This would likely result in a two- to five-fold increase in the number of finished fuel ship deliveries to marine terminals. Marine tankers delivering refined products are often much smaller than crude oil tankers, so changes in fuel use and emissions cannot be easily estimated from the change in both the type and the number of ship deliveries.[194]

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[193] CEC. 2020. *Petroleum Watch: How Petroleum Products Move*. March. https://www.energy.ca.gov/sites/default/files/2020-03/March_2020_Petroleum_Watch.pdf.
[194] Personal communication with CEC staff, March 2022; U.S EIA. 2017. *World Oil Transit Chokepoints*. 3. https://www.eia.gov/beta/international/regions-topics.php?RegionTopicID=WOTC.

If refining ceased in California, the rail and marine deliveries currently needed to support both refining processes and the export of waste products, such as petroleum coke, would cease.

In summary, the modeling indicates that demand for petroleum will persist through 2045. The modeling also shows what the GHG emissions reductions would be if refining activities were phased down in line with the reduction in in-state petroleum demand. CCS can further reduce emissions for this sector. Importantly, activity at the ports would increase, and new infrastructure would be needed to store and deliver finished fuel across the state, if in-state refining were fully phased down by 2045. And while GHG emissions from this sector would go to zero in our AB 32 GHG Inventory with a full phaseout, emissions related to the refining and transport of finished fuel to California might increase elsewhere, resulting in emissions leakage.

Progress Toward Achieving the Accelerated 2030 Target

The 2017 Scoping Plan laid out a path to achieving the SB 32 target of at least a 40 percent reduction of GHG emissions below 1990 levels by 2030 that focused on reducing emissions in the state and was technologically feasible and cost-effective, reflecting statutory direction. Many of the programs to achieve the 2030 target increased in stringency beginning January 1, 2021. However, the 2030 target must be increased to help achieve the deeper reductions needed to meet the state's statutory carbon neutrality target specified in AB 1279 and Executive Order B-55-18.

Starting in 2020 and extending into 2022, the COVID-19 pandemic impacts reverberated across the globe in a multitude of ways, including the devastating loss of millions of lives. The pandemic also had a significant impact on GHG emissions by virtue of its impact on global economies and lifestyle changes for Californians, with extended work and school disruptions. Thus, assessing our progress toward meeting our SB 32 target is confounded by the unprecedented nature of the pandemic. Nevertheless, an assessment of progress toward the 2030 target is critical, in particular the accelerated 2030 target called for in this Scoping Plan, since achieving the accelerated 2030 target would make the state well positioned to achieve its carbon neutrality goals and bring critical near-term air quality benefits to address historical and ongoing disparities in access to healthy air. Because there is only one year of data available for this decade, the analysis takes a prospective look using projected emissions over the remainder of this decade.

Estimating GHG emissions in 2030 requires projecting the effect of policies or measures that are currently deployed and undergoing implementation. Table 2-4 shows three distinct estimates of GHG emissions in 2030 that were created at different times and used different modeling approaches.

Table 2-4: Estimates of 2030 GHG emissions

Scenario Description	2030 GHG Emissions ($MMTCO_2e$)
2017 Scoping Plan: the projected outcome from implementing policies identified in the 2017 Scoping Plan that was approved by the CARB Board in December 2017.	320
Reference Scenario: the assessment of current trends and expected performance of policies identified in the 2017 Scoping Plan, as of February 2022, using the PATHWAYS model (E3).	305
Reference Scenario (Rhodium): the analysis of projected emissions from 2021 to 2030 from state and federal policies implemented as of July 2022, including the estimated impact of the Inflation Reduction Act and Advanced Clean Cars II using RHG-NEMS and other Rhodium Taking Stock 2022 methods (https://rhg.com/wp-content/uploads/2022/07/Taking-Stock-2022_US-Emissions-Outlook.pdf).	324

These three estimates of 2030 GHG emissions differ, which is expected. The estimates reflect different outcomes of the current and future impact of policies and measures. They also vary due to fundamental differences in the way these models work. For example, PATHWAYS is an economy-wide, scenario-based GHG accounting tool that tracks energy demands and supplies in line with scenario assumptions and is benchmarked to historical values. RHG-NEMS optimizes both the supply and demand sides of the energy system while factoring in consumer constraints and dynamic economic and energy systemwide feedback. Importantly, while these point estimates give the appearance of certainty and accuracy, there is significant uncertainty in future emissions projections that is documented thoroughly in each of the three emissions scenarios described above. No model can predict the future given unforeseen factors such as notable economic swings and implementation delays for programs. However, the range of emissions estimates provides a useful indication of possible outcomes from successful implementation of policies and measures.

An important source of uncertainty is the impact of delayed implementation of policy measures and market actions. The successful rate of deployment of clean technology and fuels—including consumer adoption patterns, economic recovery from the pandemic, and the permitting and build-out of necessary new assets and reuse of existing assets to produce and deliver clean energy—is essential to reach GHG emission reduction targets. Any delays will only increase GHG emissions in 2030.

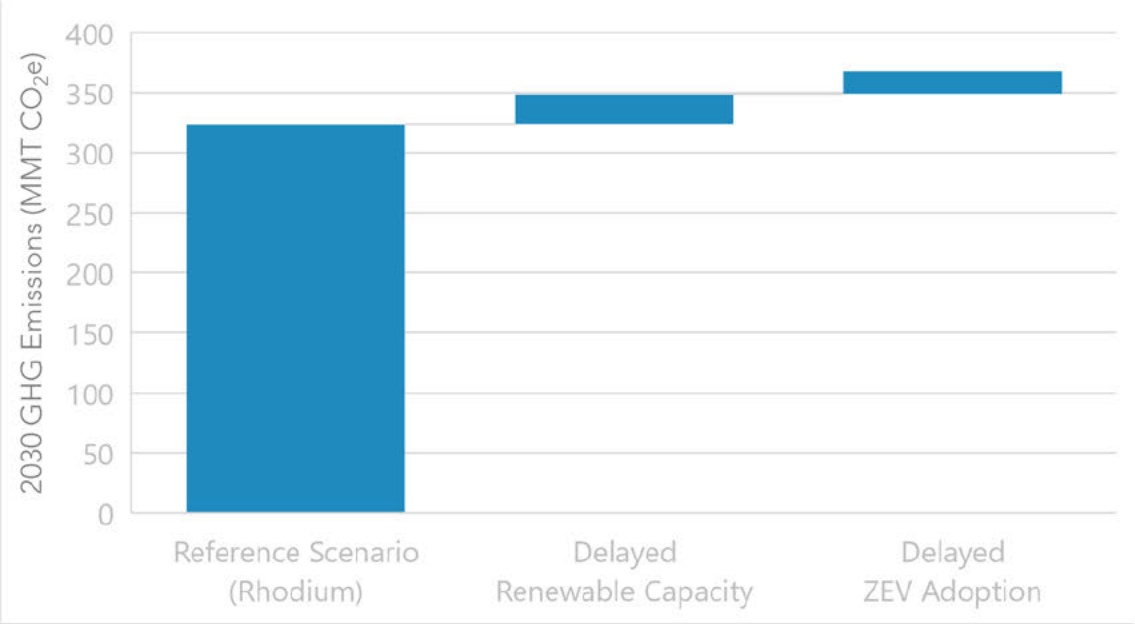
It is important to note that incentives, carbon pricing, and regulations all can result in similar types of responses including, but not limited to:

- Build-out of clean energy and infrastructure
- Deployment of clean technology
- Reduced demand for fossil energy
- Efficiency improvements

As such, the uncertainty analysis discussion focuses on implementation (technology and infrastructure deployment), and not any specific programs or policies. It is successful implementation that must ultimately happen for emissions reductions to be realized.

The uncertainty analysis described in Appendix J (Uncertainty Analysis) quantifies the impact of delayed permitting and building of renewable generation and transmission in the power sector and delayed adoption of ZEVs across all vehicle fleets in the transportation sector. The Reference Scenario (Rhodium) estimates emissions in 2030 to be 324 MMTCO2e. A five-year delay in renewable capacity would increase emissions by 8 percent in 2030 (25 MMTCO2e) relative to the Reference Scenario. If similar delays in clean energy production and deployment occur in other sectors, a larger increase in emissions relative to the reference scenario would be expected, jeopardizing the state's ability to achieve the 2030 target. Similarly, a delay in consumer adoption of zero emission vehicles (LDV, MDV, HDV) would increase emissions by 6 percent in 2030 (19 MMTCO2e) relative to the Reference Scenario. Delays in transitioning to electric equipment and appliances in homes and businesses would also lead to increased emissions in 2030. Figure 2-10 illustrates the impact on projected emissions in 2030 associated with delayed renewable capacity and delayed transportation vehicle electrification.

Figure 2-10: Impact of delayed implementation on 2030 GHG emissions[195]



Appendix J (Uncertainty Analysis) includes additional details on the assumptions and model used for the uncertainty analysis and the risks to achieve the emissions reductions from 2022 to 2030 that are anticipated in the Scoping Plan Reference Scenario. While the analysis focuses on renewable capacity and transportation, the analysis identifies a common set of themes that can impact emissions reductions across economic sectors, including permitting, technology availability, and consumer adoption. The impact of delayed emissions reductions will vary by sector and by the specific policy at risk of delay.

We give these quantitative examples of the impact implementation delays can have on GHG reductions, but almost every economic sector will have the need for permitting to enable at least a 40 percent reduction below 1990 levels. If we consider the increased ambition of the Scoping Plan Scenario, which identifies an accelerated 2030 target, the same types of uncertainty manifest themselves in successful implementation of the Scoping Plan Scenario, with the added need for CCS and CDR and a need to grow other energy sectors such as hydrogen.

[195] The implementation delay scenarios were modeled separately and do not necessarily reflect the combined impact of delayed renewable capacity and transportation vehicle electrification.

Cap-and-Trade Program Update

Since the adoption of the first Scoping Plan in 2008, carbon pricing in the form of a Cap-and-Trade Program has been part of the portfolio to achieve the state's GHG reduction targets, and it will remain critical as we work toward carbon neutrality. This section provides an update on the program and its role in achieving the 2030 target.

The Cap-and-Trade Program first came into effect in 2012, under AB 32, and included declining allowance caps through 2020. In 2017, AB 398[196] was passed by a supermajority in the Legislature and included prescriptive direction on the design of the program from 2021 through 2030. The AB 398 Cap-and-Trade Program came into effect on January 1, 2021, and it included the following changes:

- Doubling of stringency with an annual cap decline of 4 percent per year from 2021–2030
- AB 398 price ceiling
- AB 398 redesigned allowance price containment reserve with two tiers
- AB 398 100 percent leakage assistance factor for industry
- AB 398 lower offset limits: Usage limit cut from 8 percent to 4 percent, and half of offsets must provide direct benefits to California

The reduction in the role of offsets in the program was in recognition of ongoing concerns raised by environmental justice advocates regarding the ability of companies to use offsets for compliance instead of investing in actions on site to reduce GHG emissions that could also potentially reduce criteria or toxic emissions.[197,198] Note that data show the relationship between facility emissions of GHGs and co-pollutants is highly variable by sector and pollutant.[199] Changes to the allowance price containment reserve and the addition of the price ceiling were included to ensure protections against price spikes in the program, while the changes to the leakage assistance factors were to ensure the maximum protection against leakage in the program. The original design of the program included an auction floor price that increases by 5 percent plus inflation each year, and

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[196] Assembly Bill 398 (Garcia, Chapter 135, Stats. of 2017). California Global Warming Solutions Act of 2006: market-based compliance mechanisms: fire prevention fees: sales and use tax manufacturing exemption. https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201720180AB398.

[197] OEHHA. 2022. *Impacts of Greenhouse Gas Emission Limits Within Disadvantaged Communities*. https://oehha.ca.gov/media/downloads/environmental-justice/impactsofghgpoliciesreport020322.pdf.

[198] The OEHHA report also found that companies that use the most offsets often own the facilities that contribute to local $PM_{2.5}$ exposure. However, there was no causal relationship found to indicate that implementation of the Cap-and-Trade Program was contributing to increases in local air pollution. Also see: CARB. FAQ Cap-and-Trade Program. https://ww2.arb.ca.gov/resources/documents/faq-cap-and-trade-program.

[199] OEHHA. 2022. *Impacts of Greenhouse Gas Emission Limits Within Disadvantaged Communities*. https://oehha.ca.gov/media/downloads/environmental-justice/impactsofghgpoliciesreport020322.pdf.

that escalation factor is retained in the post-2020 program and is also applied to the allowance price containment reserve and price ceiling. These features, combined with the self-ratcheting mechanism for unsold allowances at auctions,[200] help to ensure the program is able to handle periods of high and low demand for allowances while continuing to ensure a steadily increasing price signal for regulated entities to invest in GHG reduction technologies.

As a result of achieving the 2020 target several years earlier than mandated by law, there are unused allowances in circulation. CARB estimated the amount to be approximately 310 million allowances after the conclusion of the third compliance period (2018–2020).[201] AB 398 had also called for a similar analysis, which was completed in 2018.[202] This bank represents approximately 5 percent of the total number of vintage 2013–2030 allowances issued within the joint market. This bank of allowances can only remain banked if year-over-year the covered emissions are declining by 14 MMT. If the annual decline in actual emissions is less than 14 MMT, regulated entities will need to use the banked allowances to cover their compliance obligations. It is likely that the existing bank of 310 million allowances will be needed over the early part of this decade and will be exhausted by the end of the decade. During the same period, prices for allowances will continue to increase at least 5 percent plus inflation year-over-year, sending a steadily increasing price signal to spur investment in onsite reductions for covered entities.

With the passage of AB 1279, the state has a statutory target to achieve carbon neutrality no later than 2045. This Scoping Plan demonstrates that planning on a longer time frame for the new carbon neutrality target means we must accelerate our near-term ambition for 2030 in order to be on track to achieve our longer-term target. CARB will use the modeling for this Scoping Plan to assess what changes may be warranted to the Cap-and-Trade or other programs to ensure we are on track to achieve an accelerated 2030 target. Since the original adoption of the Cap-and-Trade regulation, the program has been amended eight times through a robust public process. Moreover, then-California Environmental Protection Agency Secretary Jared Blumenfeld testified at a Senate hearing in 2022 that CARB will report back to the Legislature by the end of 2023 on the status of the allowance supply with any suggestions on legislative changes to ensure the number of allowances

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[200] The self-ratcheting mechanism temporarily removes unsold allowances from the market until either sufficient demand manifests for two consecutive auctions and they are incrementally reintroduced at future auctions, or they are permanently removed from general circulation if demand remains low.
[201] CARB. 2022. BR 18-51 Cap-and-Trade Allowance Report. Attachment A. https://ww2.arb.ca.gov/sites/default/files/cap-and-trade/Allowance%20Report_Reso18_51.pdf.
[202] CARB. 2018. Staff Report: Initial Statement of Reasons: Proposed Amendments to the Cap on Greenhouse Gas Emissions and Market-Based Compliance Mechanisms Regulation. September 4. https://www.arb.ca.gov/regact/2018/capandtrade18/ct18398.pdf?_ga=2.134288305.1735610122.1664813952-1100516233.1657841496.

is appropriate to help the state achieve its 2030 target of at least 40% below 1990 levels. As part of that status update, CARB will also provide information on any potential program changes that may be needed to allowance supply to help achieve an accelerated target for 2030 identified in this Scoping Plan as necessary to achieve carbon neutrality no later than 2045. Engaging in this process in 2023 will allow for the consideration of this Scoping Plan, inclusion of additional data points for the second year of operation of the AB 398-designed program (which only came into force in January 2021), and an opportunity to hold public workshops.

It is also worth noting that the COVID-19 pandemic had significant impacts on economic activity in California and elsewhere.[203] Emissions were significantly lower in 2020 due to the impacts of the global pandemic. There is an expectation that emissions will increase as the economy recovers and behaviors continue to shift from the impacts of the ongoing pandemic. As a result, 2020 should be regarded as an outlier in the emissions trends. This scenario of increasing emissions is similar to what happened in the first compliance period for Cap-and-Trade, where the state economy was recovering from the Great Recession and does not correlate to a problem with the structure of this program or other programs that cover emissions related to the manufacturing or transportation sectors. In any assessment of this and other programs, it is essential to consider external factors such as economic activity and availability of zero carbon energy such as hydropower, among others.

To better understand the role of the Cap-and-Trade Program in achieving the 2030 target, Table 2-5 compares the 2030 GHG emissions estimates from the three reference scenarios described in Table 2-4. The 2017 Scoping Plan projection is from the PATHWAYS model for the Scoping Plan Scenario approved by the Board in late 2017. It excludes the contribution of the Cap-and-Trade Program, without any consideration of uncertainty factors (i.e., a characterization of the uncertainty that a given GHG reduction measure included in the 2017 Scoping Plan will actually achieve the GHG reductions it is projected to deliver). The Reference Scenario represents what GHG emissions would look like if we did nothing beyond the existing policies that are required and already in place to achieve the 2030 target; this scenario is based on the recent PATHWAYS modeling, excluding the contribution of the Cap-and-Trade Program, and without any consideration of uncertainty factors. It indicates that GHG emissions will be lower over this decade than originally projected when the 2017 Scoping Plan was approved. The

[203] CARB. November 4, 2021. Mandatory Greenhouse Gas Reporting - 2020 Emissions Year Frequently Asked Questions. *https://www.arb.ca.gov/cc/reporting/ghg-rep/reported-data/2020mrrfaqs.pdf?_ga=2.264251343.1760432228.1650736660-1644197524.1577749754*.

Reference Scenario (Rhodium) which also does not include uncertainty bounds, is the modeling used for the uncertainty analysis above.

Importantly, PATHWAYS is not able to explicitly model a carbon pricing policy, and therefore the Cap-and-Trade Program is not represented in the 2017 Scoping Plan or the Reference Scenario. Carbon pricing is included in RHG-NEMS, which reflects state and federal policies included in the U.S. Energy Information Administration (EIA) Annual Energy Outlook 2022 and the National Energy Systems Model (NEMS), which is the basis for RHG-NEMS.[204]

As detailed in EIA's documentation, California's Cap-and-Trade Program is represented through increased energy prices, which flow across economic sectors.[205] However, many of the emissions covered by the California Cap-and-Trade Program are not energy- and fuel-related emissions. Given that, the energy systems model RHG-NEMS was used to model the impact of California Cap-and-Trade on the energy system. However, RHG-NEMS does not explicitly model the entire program, which includes non-energy related emissions from the industrial, agricultural, waste, and transportation sectors.

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[204] U.S. EIA. 2022. *Summary of Legislation and Regulations Included in the Annual Energy Outlook 2022.* March. *https://www.eia.gov/outlooks/aeo/assumptions/pdf/summary.pdf*.
[205] U.S. EIA. 2022. Electricity Market Module. *https://www.eia.gov/outlooks/aeo/assumptions/pdf/electricity.pdf*.

Table 2-5: Comparison of 2017 Scoping Plan and two Reference Scenarios

	2030 GHG Emissions ($MMTCO_2e$) (2017 Scoping Plan)	2030 GHG Emissions ($MMTCO_2e$) (Reference Scenario)	2030 GHG Emissions ($MMTCO_2e$) (Reference Scenario-Rhodium)
Reference Scenarios	320	305	324
Gap to Accelerated 2030 Target under the Scoping Plan Scenario (226)[206]	94	79	98

Under the Scoping Plan Scenario, in 2030 California emissions are anticipated to be 48% below 1990 levels. This represents an acceleration of the current SB 32 target of a 40% reduction below 1990 levels. Table 2-5 includes the gap between the different reference scenarios and the accelerated 2030 target achieved under the Scoping Plan Scenario. It also shows that depending on the modeling, there are a range of potential emissions levels in 2030 prior to accounting for the full impact of the Cap-and-Trade Program on emissions. That range is from 305 to 324 $MMTCO_2e$ in 2030. That represents a 19 $MMTCO_2e$ spread, or about 8.4 percent of the accelerated 2030 target of 226 $MMTCO_2e$. Importantly, none of these scenarios includes all of the actions identified in the Scoping Plan Scenario for this Scoping Plan; many of those actions, such as SB 596, CCS, and a more stringent LCFS program, will only begin to happen in this decade, and their contributions toward meeting the accelerated 2030 target are therefore not included in the reference scenarios. The actual emissions for the remainder of this decade will therefore likely be lower than in each of the scenarios in Table 2-5 once policies and regulations are in place to support an accelerated 2030 target. However, the degree of this difference between actual and projected emissions will differ across the modeled reference scenarios.

[206] Table 3 from the 2017 Scoping Plan included a range of 34 to 79 $MMTCO_2e$ for reductions needed from the Cap-and-Trade Program to achieve a 2030 target of 40 percent below 1990 levels.

Regardless of the uncertainty and differences in the models, it is clear additional GHG reductions must happen over this decade to achieve an accelerated 2030 target. This will require an evaluation of all major programs to assess the need to increase their stringency between now and 2030. As the actual reductions from non-Cap-and-Trade Program measures increase, California will be less reliant on the Cap-and-Trade Program to "fill the gap" to meet an accelerated 2030 reduction target. For example, CARB is developing a proposal to increase the stringency of the LCFS program for 2030, the recently adopted Advanced Clean Cars II regulation is more stringent than modeled for the 2030 40 percent target in the 2017 Scoping Plan, and SB 596 requires specific reductions in the cement sector over this decade and beyond. However, we also know we are not on track to achieve the VMT reduction called for in the 2017 Scoping Plan and will need to double down to achieve the even more ambitious target called for in the Scoping Plan Scenario. Also, we will need additional actions over the coming years to reduce short-lived climate pollutants to meet the emission reductions called for in SB 1383.

Collectively, any additional legislation or prescriptive policies for sectors, delays in successful implementation of non-Cap-and-Trade programs and policies, increases in incentive program funding, and delays in economic recovery from the pandemic will continue to affect the role the Cap-and-Trade Program will need to play over this decade to meet the state's GHG reduction obligations. In summary, the Cap-and-Trade Program must continue to be able to scale across a range of possibilities. With passage of AB 1279 and the need to accelerate the 2030 target, CARB will initiate a public process to utilize the modeling results from this Scoping Plan, specifically the Scoping Plan Scenario, to evaluate and potentially propose changes to the design of the Program, including the annual caps. This process will ensure that the Program supports an increased ambition for 2030 while retaining the ability to scale as other factors, such as changing economic conditions and implementation of non Cap-and-Trade programs, impact the actual emissions at the sources covered by the Program. Any changes to the Program must continue to support a well-designed system that continues to send a steadily increasing price signal, minimizes for leakage, reduces emissions in the covered sectors toward the state's targets, is cost-effective and technologically feasible, and avoids energy rate spikes. Importantly, the Program should support air quality benefits, especially in overly burdened communities, and not exacerbate existing air quality disparities.

Chapter 3: Economic and Health Evaluations

This chapter provides two approaches for quantifying the economic and health outcomes of the Scoping Plan Scenario. One approach is to consider the combined impact of all measures[207] in a scenario. The other approach is required by AB 197, where each measure within a scenario is evaluated independently. In addition to these two evaluation approaches, this chapter also includes a discussion of the Public Health implications for the Scoping Plan Scenario, an overview of the Climate Vulnerability Metric, and the Environmental Analysis conducted in accord with the California Environmental Quality Act (CEQA).

It is important to note that all of the analyses in this chapter use a variety of data sources, but because the modeling is economy-wide at the state level, none of them produce community specific detail outputs. The AB 32 GHG Inventory Sector analysis relies on PATHWAYS data at the state level that is proportionally applied across all regions of the state to translate changes in state level fuel combustion to local level changes. The NWL analysis similarly utilizes a variety of data sources and a suite of models that produce data that are scaled up to the statewide level. All of the models, except the Wildland Urban Interface (WUI) defensible space model, which is conducted at the county level, create aspatial projections that are not applicable at the community level.

Economic Analysis

As part of the process to develop this Scoping Plan, alternative scenarios that transition energy needs away from fossil fuels and achieve carbon neutrality no later than 2045 were developed. Alternative scenarios that assess the impact of different land management strategies on carbon stocks in NWL were also developed. These alternatives are described in Appendix C (AB 197 Measure Analysis). The following sections describe the Scoping Plan Scenario in terms of direct cost, the economy, employment, and health outcomes.[208]

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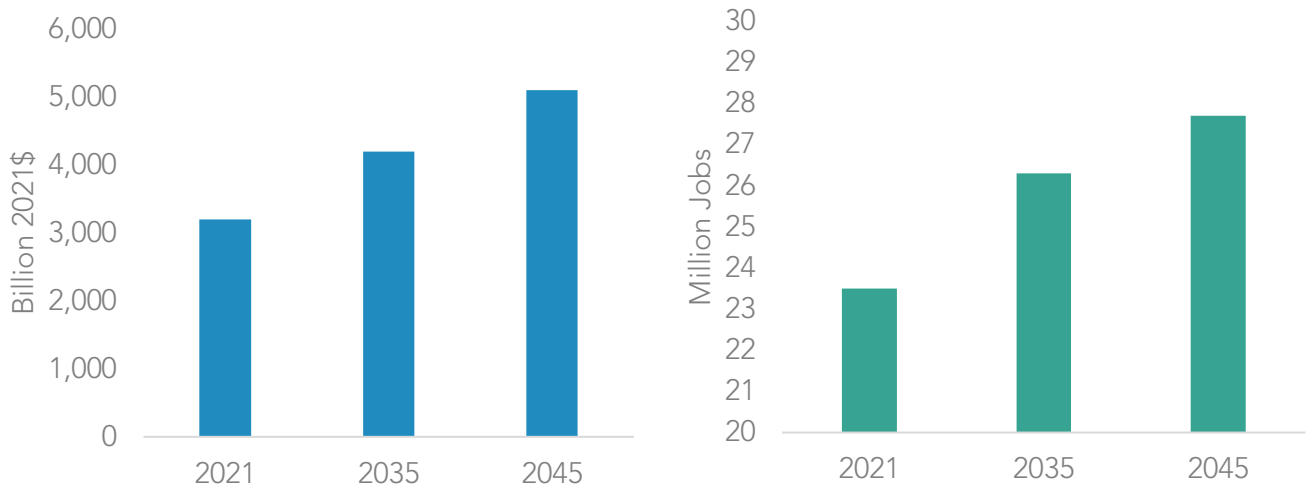
[207] AB 197 calls for the evaluation of "measures." This Scoping Plan treats each action and its variants on stringency as measures for the purposes of this chapter. Appendix C (AB 197 Measure Analysis) lists the measures and corresponding modeling assumptions for each alternative and the Scoping Plan Scenario. The modeling assumptions for the Scoping Plan Scenario are summarized in Table 2-1.

[208] For the Draft 2022 Scoping Plan Update, achieving carbon neutrality in 2035 and 2045 was evaluated. The AB 32 GHG Inventory sector direct cost, the economy, employment, and health outcomes were assessed in those years. Similarly, the Scoping Plan Scenario assessments that are presented in this chapter were made for years 2035 and 2045.

The California economy is growing, and it is projected to continue to grow about 2 percent each year, from $3.2 trillion in 2021 to $5.1 trillion in 2045, as shown in Figure 3-1. Similarly, employment in California is anticipated to grow 0.7 percent per year, from 23.5 million jobs in 2021 to 27.7 million jobs in 2045. It is in this context, termed the *Reference Scenario,* that CARB evaluates the Scoping Plan Scenario in terms of its impact on economic growth and employment. The projections shown in Figure 3-1 were produced by CARB to evaluate the incremental impact of regulations.

Figure 3-1: Projected California gross state product (left) and employment growth (right) from 2021 to 2035 and 2045



Source: California Air Resources Board

Transitioning away from fossil fuels to alternatives and increasing action on NWL will affect employment opportunities, household spending, businesses, and other economic aspects of our lives. Sectors expected to see growth include renewable electricity and hydrogen production, while other sectors may shrink. The deployment of clean technology may require higher upfront costs for things like heat pumps and induction stoves, but those could be offset by energy efficiency savings. Employment and economic development in NWL-related industries and sectors are expected to increase as land management actions increase, especially for the Forestry sector (in which a significant increase is called for under the Scoping Plan Scenario). The net impact of these actions on employment and jobs is presented in this chapter.

Estimated Direct Costs

One key metric is the direct cost, or net investment, reflecting any savings that result from actions. Similar approaches were used to estimate direct costs for the AB 32 GHG Inventory sectors and for the NWL, as described in this section.

AB 32 GHG Inventory Sectors

Transitioning away from fossil fuels requires investment in new equipment and infrastructure throughout the economy. It involves developing the capacity to produce fuels and electricity from renewable sources rather than producing fossil energy. This transition also takes time. One approach is to eliminate combustion of fossil fuels by replacing all equipment in a specified year. Another approach is to establish a future point at which all sales of new equipment rely on alternative energy sources and allow the transition to occur over time as equipment is replaced upon its end of life.

To evaluate the investment required through 2045, the PATHWAYS model was used to represent equipment stock and its turnover to non-fossil fuel alternatives over time. The annualized, incremental cost of infrastructure in excess of the annualized cost of the Reference Scenario[209] was computed for each year from 2022 through 2045. These costs were computed by first taking the absolute cost in each year—which includes both new equipment investment and also expenditures on energy, operations, and maintenance in each year—and then levelizing the costs (in the same way car or house payments are annualized or spread out over time) to arrive at an annualized cost. Fuel savings, and resulting cost savings, associated with changing energy demand—from gasoline to electricity for vehicles, for example—are included as a result of this methodology. Carbon dioxide removal includes DAC technology powered primarily by off-grid solar, BECCS to produce hydrogen or other fuels, and NWL sequestration, as discussed in Chapter 2.[210]

Figure 3-2 shows the stock investment cost, fuel/efficiency savings, and CDR cost. The Scoping Plan Scenario allows end-of-life transition of equipment. The cost of investing in new equipment is partially offset by savings associated with efficiency gains and reduced demand for fuels like gasoline. This is particularly relevant in the transportation sector, which leads to the majority of savings in 2045 in the Scoping Plan Scenario, which models near complete electrification of transport relying only on end-of-life replacement of vehicles. Appendix H (AB 32 GHG Inventory Sector Modeling) includes additional detail on direct costs in each sector and how costs change over time.

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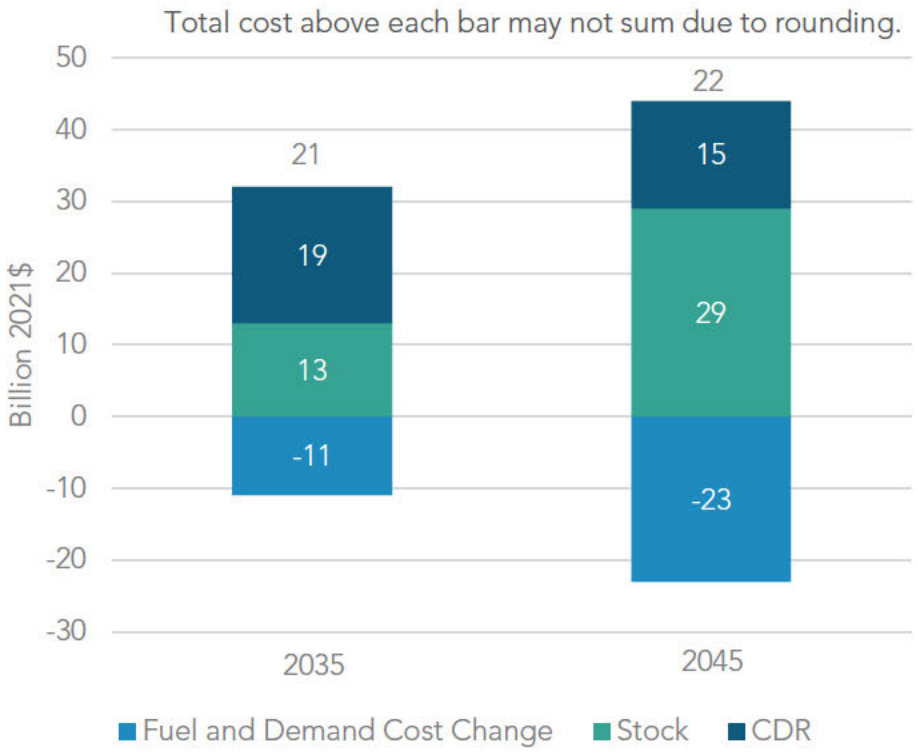
[209] The Reference Scenario described in Chapter 2 and in Appendix H (AB 32 GHG Inventory Sector Modeling) was the basis for the direct cost comparison.

[210] The energy source for DAC is not modeled, but renewable electricity and/or hydrogen produced from electrolysis are zero-carbon options consistent with the carbon neutrality targets in this Scoping Plan. The economic analysis associated the investment in DAC with the solar industry for consistency with the carbon neutrality targets.

Figure 3-2: Cost and savings relative to the growing California economy for the Scoping Plan Scenario in 2035 and 2045 (AB 32 GHG Inventory sectors)



Natural and Working Lands

For NWL, the direct costs of each management strategy were estimated using available academic literature, monitoring and reporting data, survey data, and cost data from existing subsidy programs on the per acre cost of implementing the management strategy. These cost data, in combination with the acreage of each management strategy under the scenarios, provided estimates of the overall direct cost to either the government or the private sector. The direct costs are independent of the policy lever used to implement the action and do not include many important benefits and externalities of the actions. They are assumed to be constant for each scenario and into the future. Avoided or secondary costs, such as those from reductions in wildfire suppression expenses, are not included. Appendix I (NWL Technical Support Document) includes additional direct cost details.

Table 3-1 includes the direct cost estimates for the Scoping Plan Scenario compared to the Reference Scenario.[211] Direct costs for the NWL sector are expected to be significant due to the ambitious level of action for each land type.

Table 3-1: Cost and savings relative to a growing California economy for the Scoping Plan Scenario (NWL)

Measure	Scoping Plan Scenario: Average Direct Annual Cost, 2025–2045 (millions $/year)
Forests / Shrublands / Grasslands	1,780
Annual Croplands	284
Perennial Croplands	4
Urban Forest	4,230
Wildland Urban Interface (WUI)	114
Wetlands	28
Sparsely Vegetated Lands	4
Totals	6,460
Note: Table values may not add to total due to rounding.	

CARB estimates that all jurisdictions, including private landowners, currently spend approximately $4 billion dollars annually on planting, maintenance, sidewalk repair, tree removal, and other expenses related to urban forests, and that reaching the theoretical maximum tree cover would require increasing that spending by a factor of 20. The cost of the Scoping Plan Scenario is predominantly a mix of urban forests and forests, shrubland, and grasslands spending.

[211] The Reference Scenario described in Chapter 2 and in Appendix I (NWL Technical Support Document) was the basis for the direct cost comparison.

Economy and Employment

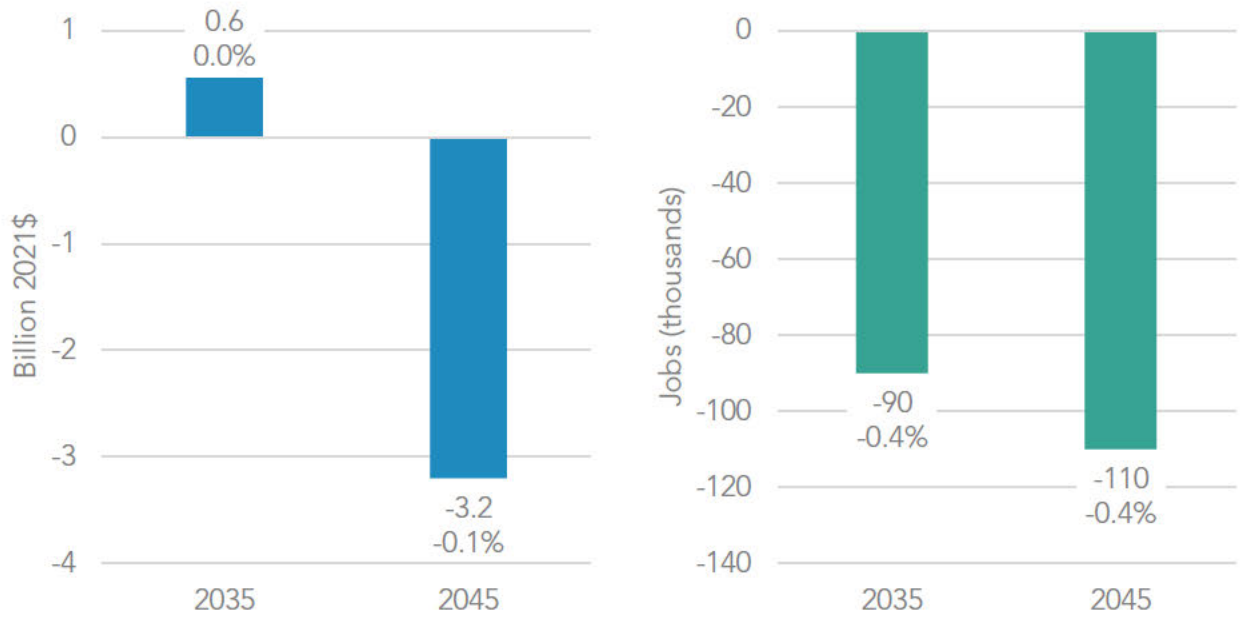
Two different models were used to estimate the overall impact that investing in a transition away from fossil fuels and in our NWL may have on the growing California economy. The transition away from fossil fuels was evaluated using the IMPLAN economic analysis model. The NWL investments were evaluated using the REMI PI+ economic model. These models provide similar outputs relative to the same economic and employment forecasts used to develop a Reference Scenario for use in each model.

AB 32 GHG Inventory Sectors

To estimate the overall impact that investing in a transition away from fossil fuels may have on the California economy, CARB used the IMPLAN model. Additional detail regarding the model, assumptions, and methodology are included in Appendix H (AB 32 GHG Inventory Sector Modeling). The IMPLAN model is a multisector representation of private industries in the U.S. economy that maps economic relationships across industries, households, and governments. This model translates direct costs and savings associated with transitioning away from fossil fuels with indirect effects such as wages, purchases of goods and services, business tax impacts, and supply chain effects. In addition, the induced effects of household purchases, local and import purchases, wages paid, and household tax impacts are estimated. This comprehensive assessment of the interactions between capital investment in fossil fuel alternatives and household purchases provides an indication of the response of the California economy to the Scoping Plan Scenario.

The Scoping Plan Scenario results in a small impact on the Gross State Product (GSP) and employment relative to the Reference Scenario, as shown in Figure 3-3. Economic growth is largely unaffected by the Scoping Plan Scenario in 2035 and slowed by 0.1 percent in 2045. Employment growth is also slowed a small amount, 0.4 percent in 2035 and in 2045, and employment still grows. Assuming annual growth rates of 0.7 percent means there would be more than 193,000 additional jobs in 2045.

Figure 3-3: Gross state product (left) and employment (right) relative to a growing California economy for the Scoping Plan Scenario in 2035 and 2045 (AB 32 GHG Inventory sectors)



California households will see increased costs from the purchase of new capital stock and savings from reduced spending on fuel, as shown in Figure 3-2. Households also will face increased costs associated with CDR, costs associated with energy efficiency measures, and commercial stock purchases—all of which are assumed to be passed directly to consumers. The impact to California households, however, is not limited to these direct costs, as changes in relative prices, employment, and wages can affect household well-being. Personal income, which captures the direct, indirect, and induced impacts, is a metric commonly used to evaluate the impact of policies on households.

Personal income in California is projected to grow from $2.7 trillion in 2021 to $3.6 trillion in 2035 and $4.4 trillion in 2045. Household projections are based on California Department of Finance population projections, which estimate the state's population to grow an average of 0.3 percent each year from 2021 to 2045.[212] California households are projected to increase from 13.3 million in 2020 to 14.6 million in 2035 and 15.0 million in 2045.

[212] California Department of Finance. Population Projections (Baseline 2019). https://dof.ca.gov/forecasting/demographics/projections/.

While the transition away from combustion of fossil fuels will improve air quality for all Californians (and even, more so in overly burdened communities), the economic impacts of the Scoping Plan Scenario are unlikely to be equal among Californians. Table 3-2 presents the change in income by household income group relative to the Reference Scenario in 2035 and 2045. While in 2035 there is a net decrease in personal income of $600 million, total income for households that make less than $100,000 per year is estimated to decline by $4.1 billion dollars, and the total income for households that make more than $100,000 per year will increase by $3.5 billion under the Scoping Plan Scenario. In 2045, although there is no net change in personal income across all California households, results vary by income level. Total income for households that make less than $100,000 per year are estimated to decline by $5.3 billion dollars, while the total income for households that make more than $100,000 per year will increase by $5.3 billion under the Scoping Plan Scenario.

Table 3-2: Income Impacts by California household income group in 2035 and 2045 for the Scoping Plan Scenario (AB 32 GHG Inventory Sectors)

Household Income Group ($2021)	Percentage of 2021 California Households[213]	Change in Income (Billion $2021)	
		2035	2045
Less than $50,000	30	-2.9	-3.9
$50,000 to $100,000	27	-1.2	-1.4
$100,000 to $200,000	28	2.5	4.0
More than $200,000	15	1.0	1.3
Total	100	-0.6	0.0

[213] U.S. Census Bureau. 2021. Household Income. California. https://data.census.gov/cedsci/table?q=california%20income.

In addition to income level, there is likely to be an impact to California personal income that varies based on race/ethnicity.[214] Table 3-3 shows the percentage of households within each income group based on eight race/ethnicity categories identified in the American Community Survey 2021. As shown in Table 3-2, households in lower income groups are anticipated to see negative impacts, while households in higher income groups are anticipated to see positive impacts from the Scoping Plan Scenario in both 2035 and 2045. Because more than 60% of households in the race/ethnicity categories of Hispanic, Black alone, Native Hawaiian (HI) or Pacific Islander, American Indian or Alaskan Native, Other, and Two or More make less than $100,000 per year, these populations generally are likely to experience reduced income. White and Asian households will generally experience both increased and decreased income because these households are distributed more evenly across all four income groups.

The state recognizes the need to ensure that accessibility to clean technology and energy do not further exacerbate health and opportunity gaps for low-income households and communities of color. The Climate Change Investments program exceeds the statutory minimums to invest in projects to benefit disadvantaged communities.[215] Utilities implement programs for reduced energy bills for qualifying low-income customers.[216] There are also resources for waste and water bills that leverage federal funds.[217] CARB also coordinated with the CPUC to ensure that the Climate Credit[218] funded from the sale of Cap-and-Trade allowances provided to utilities on behalf of ratepayers is credited equally to households and not based on how much energy is used. These are just a few examples of how the state is designing and implementing programs to avoid increasing existing disparities. The state must continue to find ways to relieve economic burdens on low-income households.

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[214] The number of households in each bracket and the race/ethnicity categories are from American Community Survey 2021 results. Population changes through 2035 and 2045 are not forecast. U.S. Census Bureau. 2021. Household Income. California. *https://data.census.gov/cedsci/table?q=california%20income*.
[215] CARB. Priority Populations — California Climate Investments. *https://www.caclimateinvestments.ca.gov/priority-populations*.
[216] CPUC. CARE/FERA Program. *https://www.cpuc.ca.gov/lowincomerates/*.
[217] California Department of Community Services and Development. Low Income Household Water Assistance Program. *https:/www.csd.ca.gov/lihwap*.
[218] CPUC. California Climate Credit - FAQ. *https://www.cpuc.ca.gov/industries-and-topics/natural-gas/greenhouse-gas-cap-and-trade-program/california-climate-credit/california-climate-credit---faq*.

Table 3-3: Percentage of households in each race/ethnicity category by household income group

Household Income Group ($2021)	Households in Income Group (%)							
	White Not Hispanic	Hispanic	Black Alone	Asian Alone	Native HI or Pacific Islander	American Indian or Alaskan Native	Other	Two or More
Less than $50,000	26	35	45	25	30	35	37	32
$50,000 to $100,000	25	32	27	21	31	33	33	30
$100,000 to $200,000	29	25	21	30	30	26	24	27
More than $200,000	19	7	7	24	9	7	5	11

Natural and Working Lands

The macroeconomic impact of the NWL scenario was evaluated separately in the REMI PI+ model. For the Scoping Plan Scenario, the macroeconomic impact was modeled by assuming that economic activity in the relevant industries grows in proportion to the proposed implementation spending in that industry. All funds for implementing the actions were assumed to be sourced from within the state. For urban forests, the funds were modeled as being sourced from a combination of state government and private property owners in proportion to the current estimated private/public spending ratio. For all other actions, funds were assumed to be sourced from the state government. In each modeled scenario, government spending and income to property owners were reduced relative to the Reference Scenario in proportion to the annual costs of implementation. None of the proposed spending was modeled as being sourced from increased taxes. Additional details on the methodology for evaluating macroeconomic impacts are in Appendix I (NWL Technical Support Document).

While the macroeconomic model does count the increased economic activity in the affected industries as part of GSP, it does not quantify many of the important economic, health, and environmental benefits that would occur if these actions were implemented. While these benefits—like the reduced use of pesticides, value of urban trees, and increased recreational opportunities—would be very significant, they are outside the scope of the macroeconomic model.

The macroeconomic model also makes projections about the total level of employment in the state. The model forecasts that the Scoping Plan Scenario, which greatly increases the level of NWL management actions, channels economic activity toward related industries and would lead to a slight increase in total employment. (Table 3-4). While the model does aim to accurately represent many labor market dynamics, including adjustments of wages and migration rates, it does not account for many costs that might be associated with dramatically scaling up employment in a particular industry, such as the cost of job training.

Table 3-4: Gross state product and employment relative to a growing California economy for the Scoping Plan Scenario in 2035 / 2045 (NWL)

	Scoping Plan Scenario (%)
Gross State Product	0.00 / 0.01
Employment	0.12 / 0.10
Personal Income	-0.04 / -0.04
Personal Income per Capita	-0.04 / -0.14

Health Analysis

Air quality is affected by pollutant emissions from various processes associated with energy systems, including the combustion of fossil fuels, as well as the combustion of vegetation biomass from NWL during wildfires. Pollutants that are important contributors to degraded air quality in California include nitrogen oxides (NO_x), particulate matter (PM), reactive organic gases (ROG), and others. Further, in the atmosphere these pollutants are transported away from the locations of the emissions by wind and other phenomena, and undergo chemical reactions that result in the formation of new pollutants such as ground-level ozone and fine particulate matter ($PM_{2.5}$). Both primary (emitted) and secondary (formed) pollutants are important from a public health standpoint and contribute to the incidence of air pollution-related mortality and disease within California populations. Measures focused on GHGs do not incorporate specific targets to reduce emissions of $PM_{2.5}$ or air toxics like benzene. These co-pollutants, which are emitted from many of the same pollution sources as GHGs, affect local air quality and pose known risks to public health, such as the risk of asthma and cardiovascular disease. Generally, for stationary sources, certain harmful pollutants are regulated via local rules and regulations that are reflected in permits for stationary sources and are enforced by local air districts, with CARB also regulating air toxics contaminants from stationary sources with the air districts.

AB 32 GHG Inventory Sectors

To assess health impacts for the AB 32 GHG Inventory sectors, an integrated modeling approach was used to quantify and value the air pollution-related public health benefits of the Scoping Plan Scenario relative to the Reference Scenario. Additional details about the models, assumptions, and methodology are included in Appendix H (AB 32 GHG Inventory Sector Modeling). Using output from the PATHWAYS model, projections of pollutant emissions to 2045 were developed for stationary, area, and mobile source emissions using a detailed base year CARB pollutant emissions inventory. Further, the emissions are processed, including for where and when they occur in California, using the Sparse Matrix Operator Kernels Emissions (SMOKE) model. For example, on-road vehicle emissions were allocated along existing roadways, and refining emissions were assigned to the locations of existing refineries. It should be noted that the emissions projections represent statewide average reductions associated with high-level assumptions about alternative fuels and technologies. For example, emissions occurring from refineries to produce liquid fuels are reduced in line with petroleum demand. This reduction is applied equally to all refineries in the Scoping Plan Scenario and does not specify individual facility responses to changing demand. Similarly, the Scoping Plan Scenario does not specify which refineries transition to biofuel production or where new electricity generation facilities are built.

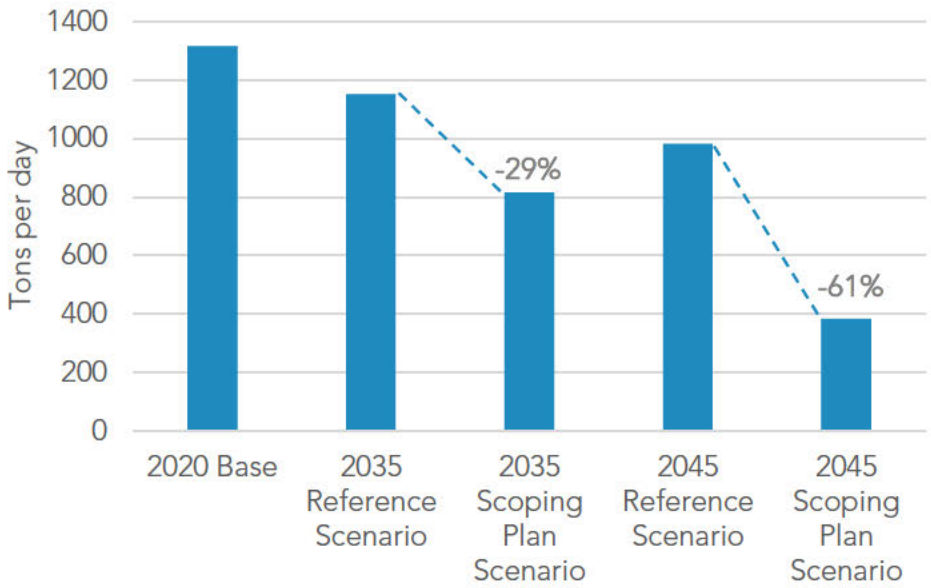
Next, emission changes were translated into impacts on atmospheric pollution levels, including ground-level ozone and $PM_{2.5}$, via an advanced photochemical air quality model called the Community Multiscale Air Quality (CMAQ) model, which accounts for atmospheric chemistry and transport. A comprehensive assessment of how pollutant concentrations are impacted throughout the year was achieved by simulating all months in 2035 and 2045 for the Scoping Plan Scenario.[219] Health benefits were estimated using the U.S. EPA's environmental Benefits Mapping and Analysis Program (BenMAP) model to translate pollutant changes into avoided incidence of mortality, hospital admissions, emergency room visits, and other outcomes as a result of reduced exposure to ozone and $PM_{2.5}$. These outcomes are associated with an economic value in order to aggregate health impacts.

The Scoping Plan Scenario shows a substantial reduction in pollutant emissions relative to the Reference Scenario, including NO_x, $PM_{2.5}$, and ROG. Reductions in NO_x are shown in Figure 3-4. Even under a business-as-usual trajectory, emissions are reduced from present levels by 26 percent in 2045 in the Reference Scenario, demonstrating the impact of current regulations and trends in energy sectors. The Scoping Plan Scenario further reduces NO_x

[219] This annual approach differs from the episodic modeling approach applied to the Proposed Scenario and Alternatives in the Draft 2022 Scoping Plan Update. Appendix H (AB 32 GHG Inventory Sector Modeling) describes both approaches.

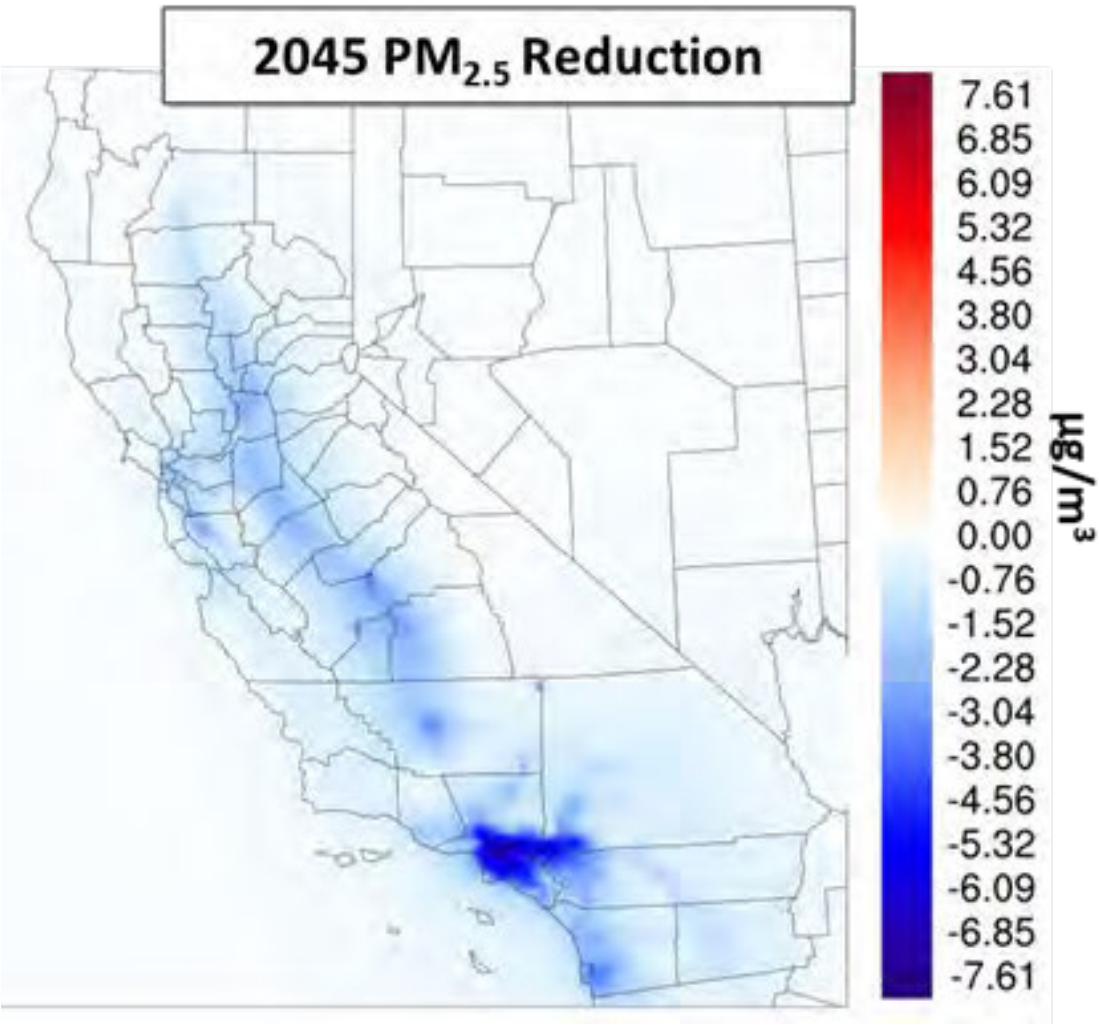
emissions from the Reference Scenario by 29% in 2035 and 61% in 2045. Emission reductions occur throughout the state with particular prominence in urban areas, including the South Coast Air Basin, due to the large presence and activity of emission sources. Appendix H (AB 32 GHG Inventory Sector Modeling) contains additional information about the pollutant emissions modeling and results.

Figure 3-4: Illustration of NOx emission reductions from current levels for the Reference Scenario and the Scoping Plan Scenario (AB 32 GHG Inventory sectors)



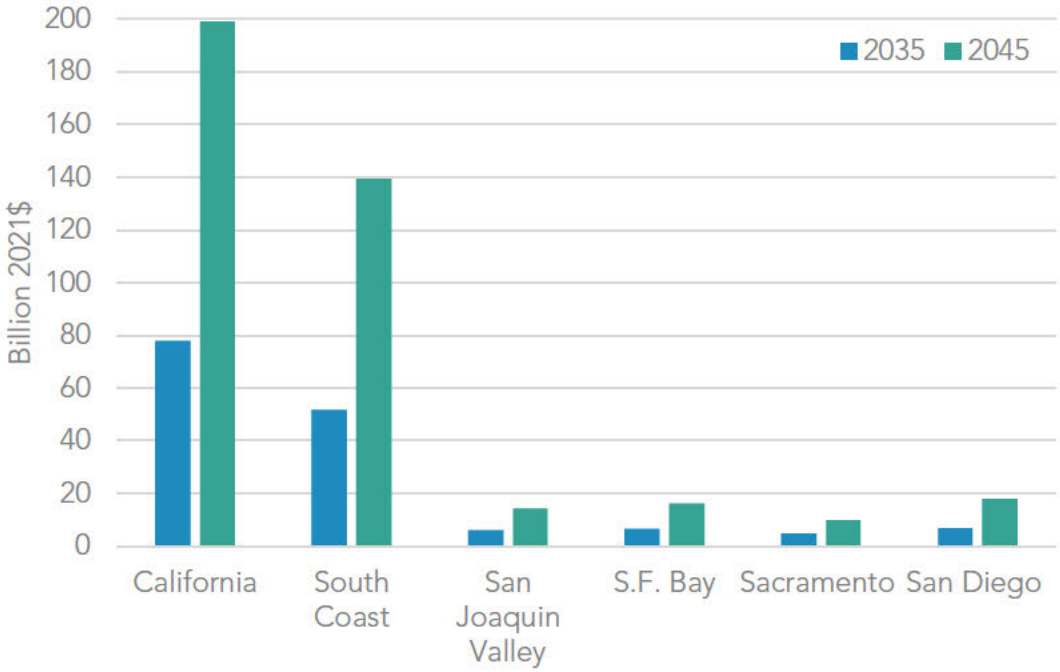
The emission reductions achieve important improvements in air quality throughout California, including reductions in the levels of ozone and $PM_{2.5}$. Reductions in annual $PM_{2.5}$ levels are shown in Figure 3-5. The greatest reductions are evident in Southern California, the San Joaquin Valley, the San Francisco Bay area, and the Greater Sacramento area due to the large presence and activity of emission sources, meteorology, topography, and others. To highlight the extent of the air quality improvements: reductions reach nearly 8 micrograms per cubic meter ($\mu g/m^3$) in 2045 and lead to 76% fewer exceedances of the health-based National Ambient Air Quality $PM_{2.5}$ standard of 12 $\mu g/m^3$. Similarly, ozone improvements reach 19 parts per billion (ppb) and yield 62% fewer exceedance events. Furthermore, the locations of improvements carry important implications for human health as these areas support large urban populations and generally experience the most degraded ozone and $PM_{2.5}$ pollution. Appendix H (AB 32 GHG Inventory Sector Modeling) provides details regarding the atmospheric modeling and results, including differences in ozone and $PM_{2.5}$.

Figure 3-5: Difference in annual average $PM_{2.5}$ (µg/m^3) in the Scoping Plan scenario relative to the Reference scenario in 2045 (AB 32 GHG Inventory sectors)



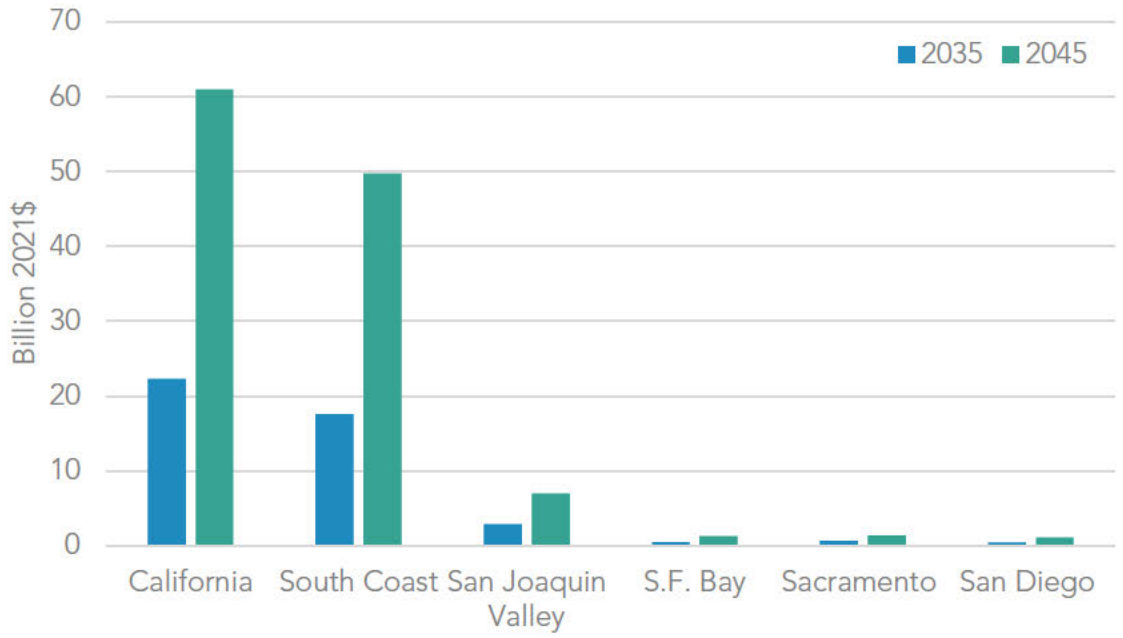
Notable health benefits representing the economic value of the avoided incidence of health effects are associated with the Scoping Plan Scenario. In total, the benefits reach $78 billion in 2035 and $199 billion in 2045, as shown in Figure 3-6. Populations in Southern California benefit the most due to preexisting air quality challenges, significant emission sources and activity, and the presence of a large, dense urban population. Additional details regarding the health impact assessment are provided in Appendix H (AB 32 GHG Inventory Sector Modeling).

Figure 3-6: Total health benefits estimated from air quality improvements in the Scoping Plan Scenario (AB 32 GHG Inventory sectors)



Furthermore, these benefits accrue within socially and economically disadvantaged communities identified by CalEnviroScreen, where they are most needed. Total health benefits within census tracts identified as disadvantaged communities using CalEnviroScreen 4.0 reach $22 billion in 2035 and $61 billion in 2045, as shown in Figure 3-7. Similarly to the statewide health benefits, the largest share of benefits occurs within disadvantaged communities in Southern California. Additional information on the health benefits within disadvantaged communities can be found in Appendix H (AB 32 GHG Inventory Sector Modeling).

Figure 3-7: Disadvantaged community health benefits relative to the Reference Scenario for the Scoping Plan Scenario (AB 32 GHG Inventory sectors)

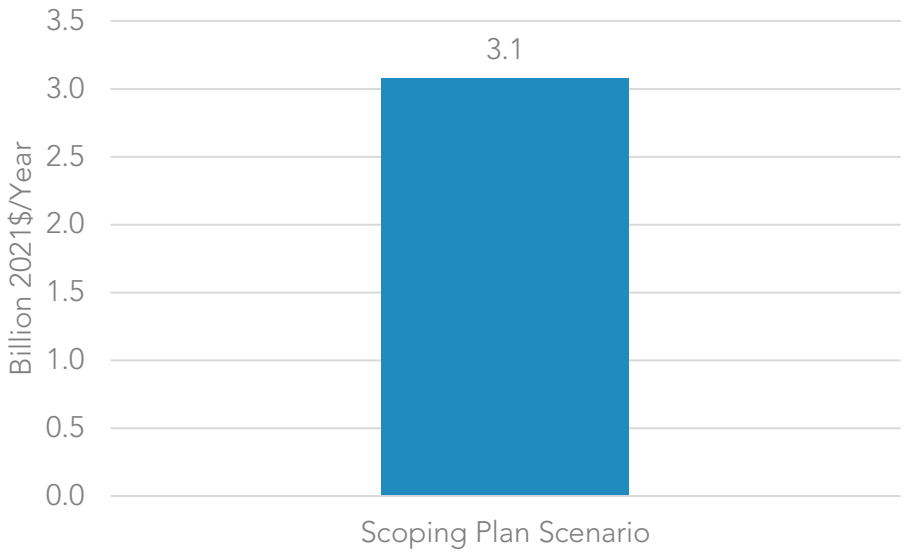


Natural and Working Lands

For NWL, health benefits were evaluated based on projected $PM_{2.5}$ wildfire emissions on forests, shrublands, and grasslands, discussed in the AB 197 Measure Analysis section of the chapter that follows.[220] The health endpoints for the Scoping Plan Scenario and in Appendix I (NWL Technical Support Document) for the alternative scenarios were the basis for the estimated health benefits shown in Figure 3-8. Health benefits were derived from the preliminary University of California, Los Angeles (UCLA) study that estimated annual health impacts and associated costs from California's wildfires from 2008–2018. Additional details are included in Appendix I (NWL Technical Support Document). These costs were applied to the health endpoints discussed in the AB 197 Measure Analysis section of the chapter.

[220] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, N11, N14. *finalejacrecs.pdf (arb.ca.gov)*.

Figure 3-8: Total average annual health benefits relative to the Reference Scenario for the Scoping Plan Scenario (NWL)



As health impacts analyzed here are driven by wildfire emissions, the health benefits for the Scoping Plan Scenario are directly related to the amount of forest, shrubland, and grassland management action. These management actions reduce vegetation fuels and, as a result, wildfire activity. The Scoping Plan Scenario increases the amount of these management actions, reducing wildfire emissions and avoiding incidence of emission-related health effects. The health benefits, or economic value of the avoided incidence of health effects, correspondingly increase with an increasing management implementation rate. Additional details are included in Appendix I (NWL Technical Support Document).

Estimated health benefits do not include the direct impact of wildfires on injuries, deaths, or mental health, nor the indirect costs of lost ecosystem benefits to wildfire. Additional direct health costs may result from wildfire that would likely increase the health benefits from increased forest, shrubland, and grassland management to reduce wildfire activity. Nonetheless, the conservative health benefits under the Scoping Plan Scenario are estimated to be $3.1 billion per year relative to the Reference Scenario for all NWL actions identified in the Scoping Plan Scenario.

AB 197 Measure Analysis

This section provides estimates for information associated with GHG emissions reduction measures evaluated in this Scoping Plan.[221] These estimates, which were developed as part of the process for meeting the requirements of AB 197 (E. Garcia, Chapter 250, Statutes of 2016), provide information on the relative impacts of the evaluated measures when compared to each other. To support the design of a suite of policies that result in GHG reductions, air quality co-benefits, and cost-effective measures, it is important to understand if a measure will increase or reduce criteria pollutants or toxic air contaminant emissions, or if increasing stringency at additional costs yields few additional GHG reductions. To this end, AB 197 requires the following for each potential emissions reduction measure evaluated in any Scoping Plan update:

- The range of projected GHG emissions reductions that result from the measure;
- The range of projected criteria pollutant emission reductions that result from the measure; and
- The cost-effectiveness, including avoided social costs, of the measure.

The following sections describe the evaluation of measures for the AB 32 GHG Inventory sectors and NWL. For the purposes of this Scoping Plan, the identified emissions reduction measures for the analysis required by AB 197 are actions grouped by sectors where several policies and programs are expected to overlap. This approach reflects the most granular feasible analysis given the modeling tools available,[222] the overlap and interaction effects among policies and incentive programs, the longer planning horizon used for this Scoping Plan compared to previous efforts, and the scale of transition needed to achieve carbon neutrality. To implement this Scoping Plan, dozens of individual regulations, policies, and incentive programs are anticipated that work together to drive down emissions across all economic sectors and support actions. Every specific policy or incentive program that could contribute to the deployment of clean technology and energy called for in this plan may overlap in ways that make it infeasible to tease out those policies and programs' individual effects with any reasonable degree of certainty. For example, in the transportation sector, deploying ZEVs and reducing driving demand may be achieved through a combination of the implementation of new or existing regulations, fuels programs, incentive programs, and VMT reduction initiatives that can each contribute to reductions in emissions for the sector. It is not feasible to isolate each sub action from each other at this time in terms of the share of contribution to total reductions. The estimated emission

[221] AB 197 calls for the evaluation of "emission reduction measures." This Scoping Plan treats each action and its variants on stringency as emission reduction measures for the purposes of this chapter. Appendix C (AB 197 Measure Analysis) lists the measures and corresponding modeling assumptions for each alternative.
[222] See Appendix H (AB 32 GHG Inventory Sector Modeling and Appendix I (NWL Technical Support Document).

reductions, health endpoints, and costs by measure for the Scoping Plan Scenario are presented in this chapter, and the corresponding estimates for the Proposed Scenario and Alternatives 1, 2, and 4 are included in Appendix C (AB 197 Measure Analysis).

Because many of the measures and underlying assumptions interact with each other, isolating the GHG emission reductions, corresponding changes to fuel combustion, and associated cost of an individual measure is analytically challenging. Each measure is evaluated by examining the change in fuel combustion, cost, and emissions associated with just that measure using the PATHWAYS model. The difference between the Scoping Plan Scenario and the Reference Scenario is estimated for each measure. Starting from the Scoping Plan Scenario, the modeling assumptions for an individual measure are reverted to the Reference Scenario values, resulting in GHG reductions, changes to fuel combustion, and costs (or savings). This approach does not reflect interactions between sectors in PATHWAYS that influence the results for each complete alternative, presented earlier. As such, the values associated with each measure should not be added to obtain an overall scenario estimate.

To arrive at the 2045 target for NWL, CARB modeled the ecological impact that climate smart land-based management strategies (suites of on-the-ground actions, or *treatments,* that are used across the landscape to manipulate an ecosystem) will have on ecosystem carbon; and whenever possible, additional co-benefits from those actions. The Scoping Plan Scenario incorporates a set of land management actions at varying scales of implementation for each land type to achieve the GHG emission reductions. Each land type, and its associated management actions, was considered a measure for this analysis. For modeling individual landscapes and management actions, CARB used a suite of models. The complexity of these models varies by land type, depending on the existing science, data, and availability of existing models to use. Appendix I (NWL Technical Support Document) provides detailed modeling assumptions for each NWL type. The estimated emission reductions, health endpoints, and costs by measure under the Scoping Plan Scenario for each NWL type are presented in this chapter, and the corresponding estimates for the Proposed Scenario and NWL Alternatives 1, 2, and 4 are included in Appendix C (AB 197 Measure Analysis).

Estimated Emissions Reductions

Both GHG emissions reductions and emissions of criteria air pollutants were evaluated for the AB 32 GHG Inventory sectors and for NWL. The methods and results are described in this section.

AB 32 GHG Inventory Sectors

In the absence of having direct modeling results for criteria pollutant estimates from PATHWAYS, CARB estimated criteria pollutant emissions impacts by using changes in fuel combustion in units of exajoules from PATHWAYS and emission factors in units of tons per exajoule to estimate the change in emissions in tons per year. Emission factors from a variety

of sources for each sector were utilized, including but not limited to CARB's mobile source emissions models,[223] U.S. EPA's AP 42 Emissions Factors,[224] and the South Coast Air Quality Management District's (AQMD's) District Rules.[225] These emission factors were applied to fuel burn change by fuel type, sector, equipment type, and process, where applicable. Statewide annual average emissions were estimated for three criteria pollutants: NO_x, $PM_{2.5}$, and ROG.

Table 3-5 provides the estimated GHG and criteria pollutant emission reductions for the measures in the Scoping Plan Scenario in 2035 and 2045. The other alternatives are presented in Appendix C (AB 197 Measure Analysis). Based on the estimates below, these measures are expected to provide air quality benefits. The estimates provided in this chapter and Appendix C (AB 197 Measure Analysis) are appropriate for comparing across alternatives considered for the development of this Scoping Plan, but they are not precise estimates.

[223] CARB. MSEI - Modeling Tools. *https://ww2.arb.ca.gov/our-work/programs/mobile-source-emissions-inventory/msei-modeling-tools*.
[224] U.S EPA. AP-42: Compilation of Air Emissions Factors. *https://www.epa.gov/air-emissions-factors-and-quantification/ap-42-compilation-air-emissions-factors*.
[225] South Coast AQMD. South Coast AQMD Rule Book. *https://www.aqmd.gov/home/rules-compliance/rules/scaqmd-rule-book*.

Table 3-5: Estimated GHG and criteria pollutant emission reductions relative to the Reference Scenario for the Scoping Plan Scenario in 2035/2045 (AB 32 GHG Inventory sectors)

Measure	GHG Reductions ($MMTCO_2$)	NOx Reductions (Short Tons/Year)	$PM_{2.5}$ Reductions (Short Tons/ Year)	ROG Reductions (Short Tons/Year)
Deploy ZEVs and reduce driving demand	-46 / -84	-51,620 / -122,806	-2,008 / -6,506	-18,967 / -30,410
Coordinate supply of liquid fossil fuels with declining California fuel demand	-25 / -30	-1,601 / -2,707	-978 / -1,705	-747 / -1,323
Generate clean electricity	-8 / -31	-92 / -1,555	-177 / -1,382	-41 / -425
Measure	**GHG Reductions ($MMTCO_2$)**	**NOx Reductions (Short Tons/Year)**	**$PM_{2.5}$ Reductions (Short Tons/ Year)**	**ROG Reductions (Short Tons/Year)**
Decarbonize industrial energy supply	-9 / -22	-21,172 / -34,876	-1,188 / -2,527	-3,710 / -6,298
Decarbonize buildings	-14 / -35	-8,105 / -94,455	-826 / -6,877	-1,093 / -8,109
Reduce non-combustion emissions[a]	-0.41 / -0.52 ($MMTCH_4$)	N/A	N/A	N/A
Compensate for remaining emissions	-25 / -64	N/A	N/A	N/A

[a] Methane emissions reductions are reported for this measure.

The measures related to reducing non-combustion emissions and compensating for the remaining emissions do not include changes to fuel combustion, and therefore are not

associated with changes to air pollutants. Biomethane combustion is captured in measures that reduce combustion of fossil gas, such as decarbonizing industrial energy supply and buildings.

Natural and Working Lands

NWL ecosystems naturally vary between being a source and a sink for carbon over time. The NWL ecosystem carbon stock changes projected through mid-century by the suite of models were used to estimate net emissions or emissions reductions relative to the Reference Scenario. These changes in carbon stocks were affected by projected climate change, the implementation of management actions under the various scenarios, land conversion, and (for forests, shrublands, grasslands) wildfire. Each NWL type was evaluated, and an overview of all NWL is presented in Table 3-6. More detailed results for each NWL type can be found in Appendix C (AB 197 Measure Analysis).

Table 3-6: Estimated average annual GHG and criteria pollutant emission reductions relative to the Reference Scenario for the Scoping Plan Scenario from 2025–2045 (NWL)

Measure	GHG Reductions ($MMTCO_2e$/year)	$PM_{2.5}$ Reductions (MT/Year)
Forests/Shrublands/Grasslands	-0.12	-17,500
Annual Croplands	-0.25	N/A
Perennial Croplands	-0.01	N/A
Urban Forest	-1.29	N/A
Wildland Urban Interface (WUI)	0.75	N/A
Wetlands	-0.43	N/A
Sparsely Vegetated Lands	<-0.01	N/A

Fine particulate wildfire emissions were evaluated for forests, shrublands, and grasslands only. Wildfire emissions decreased under the Scoping Plan Scenario compared to the Reference Scenario. The Scoping Plan Scenario's higher level of management actions that reduce tree or shrub densities, protect large trees, reintroduce fire to the landscape, and diversify species and structures result in greater reductions in wildfire emissions.

Estimated Health Endpoints

Climate change mitigation will result in both environmental and health benefits. This section provides information about the potential health benefits of the Scoping Plan Scenario. Health benefits are primarily the result of reduced $PM_{2.5}$ pollution, both from stationary and mobile sources, as well as wildfire in forests, shrublands, and chaparral.

AB 32 GHG Inventory Sectors

CARB used the criteria pollutant emissions in Table 3-5 to understand potential health impacts. Similar to the air quality estimates, this information should be used to understand the relative health benefits of the various measures and should not be taken as absolute estimates of health outcomes. CARB used the incidence-per-ton (IPT) methodology to quantify the health benefits of emission reductions. The IPT methodology is based on a methodology developed by the U.S.

EPA.[226,227,228,229] Under the IPT methodology, changes in emissions are approximately proportional to the resulting changes in health outcomes. IPT factors are derived by calculating the number of health outcomes associated with exposure to $PM_{2.5}$ for a baseline scenario using measured ambient concentrations and dividing that number by the emissions of $PM_{2.5}$ or a precursor. To estimate the reduction in health outcomes, the emission reductions are multiplied by the IPT factor. For future years, the number of outcomes is adjusted to account for population growth. IPT factors were computed for the two types of $PM_{2.5}$: primary $PM_{2.5}$ and secondary $PM_{2.5}$ of ammonium nitrate aerosol formed from precursors.

For this AB 197 analysis, CARB calculated the health benefits associated with the five key measures that are represented by changes to fuel combustion. The health benefits associated with emission reductions for the Scoping Plan Scenario were estimated for each air basin and then aggregated for the entire state of California. CARB assumed that the statewide emission reductions distribution among the air basins is proportional to the baseline emissions in that air basin.

Calculated health endpoints include premature mortality, cardiovascular emergency department (ED) visits, acute myocardial infarction, respiratory ED visits, lung cancer incidence, asthma onset, asthma symptoms, work loss days, hospitalizations due to cardiopulmonary illnesses, hospitalizations due to respiratory illnesses, hospital admissions for Alzheimer's disease, and hospital admissions for Parkinson's disease.[230,231,232] These health endpoints were calculated using the IPT method for estimated emission reductions. Table 3-7 compares the health benefits of emission reductions associated with each measure for the Scoping Plan Scenario in the year

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[226] CARB. CARB's Methodology for Estimating the Health Effects of Air Pollution. Retrieved February 9, 2021. *https://ww2.arb.ca.gov/resources/documents/carbs-methodology-estimating-health-effects-air-pollution*.

[227] Fann, N., C. M. Fulcher, and B. J. Hubbell. 2019. "The influence of location, source, and emission type in estimates of the human health benefits of reducing a ton of air pollution." *Air Quality, Atmosphere & Health* 2:169–176. *https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2770129/*.

[228] Fann, N., K. R. Baker, and C. M. Fulcher. 2012. "Characterizing the $PM_{2.5}$-related health benefits of emission reductions for 17 industrial, area and mobile emission sectors across the U.S." *Environ Int*. 49:141–51. November 15. *https://www.sciencedirect.com/science/article/pii/S0160412012001985*.

[229] Fann, N., K. Baker, E. Chan, A. Eyth, A. Macpherson, E. Miller, and J. Snyder. 2018. "Assessing Human Health $PM_{2.5}$ and Ozone Impacts from U.S. Oil and Natural Gas Sector Emissions in 2025." *Environ. Sci. Technol.* 52 (15), 8095–8103. *https://pubs.acs.org/doi/abs/10.1021/acs.est.8b02050*.

[230] CARB. CARB's Methodology. *https://ww2.arb.ca.gov/resources/documents/carbs-methodology-estimating-health-effects-air-pollution*.

[231] CARB. 2022. Updated Health Endpoints in CARB's Health Benefits Methodology. *Evaluating New Health Endpoints for Use in CARB's Health Analyses*.

[232] Cardio-pulmonary mortality, hospitalizations due to cardiopulmonary illnesses, and hospital admissions due to respiratory illnesses endpoints utilize studies documented in CARB's methodology document. For future assessments, CARB will use more recent studies to estimate cardiovascular hospital admissions and respiratory hospital admissions, as documented in CARB's updated health endpoints memo.

specified (2035 or 2045). The other alternatives are presented in Appendix C (AB 197 Measure Analysis).

Table 3-7: Estimated avoided incidence of mortality, cardiovascular and respiratory disease onset, work loss days and hospital admissions relative to the Reference Scenario for the Scoping Plan Scenario (AB 32 GHG Inventory sectors)

Measure	Mortality	Cardiovascular ED Visits	Acute Myocardial Infarction	Respiratory ED Visits	Lung Cancer Incidence	Asthma Onset	Asthma Symptoms	Work Loss Days	Hospital Admissions, Cardiovascular	Hospital Admissions, Respiratory	Hospital Admissions, Alzheimer's Disease	Hospital Admissions, Parkinson's Disease
Deploy ZEVs and reduce driving demand in 2035	635	170	70	400	45	1,475	128,930	92,510	95	115	245	40
Deploy ZEVs and reduce driving demand in 2045	1,820	475	200	1,115	135	3,995	343,095	255,800	295	350	745	125
Coordinate supply of liquid fossil fuels with declining CA fuel demand in 2035	115	30	15	70	10	275	23,530	16,880	20	20	50	10

Measure	Mortality	Cardiovascular ED Visits	Acute Myocardial Infarction	Respiratory ED Visits	Lung Cancer Incidence	Asthma Onset	Asthma Symptoms	Work Loss Days	Hospital Admissions, Cardiovascular	Hospital Admissions, Respiratory	Hospital Admissions, Alzheimer's Disease	Hospital Admissions, Parkinson's Disease
Coordinate supply of liquid fossil fuels with declining CA fuel demand in 2045	215	55	25	130	15	490	40,860	30,445	35	40	95	15
Generate clean electricity in 2035	20	5	0	10	0	45	3,930	2,820	5	5	10	0
Generate clean electricity in 2045	170	45	20	105	15	385	32,065	23,890	25	30	75	10
Decarbonize industrial energy supply in 2035	300	80	35	190	20	695	60,660	43,520	45	55	115	20
Decarbonize industrial energy supply in 2045	595	155	65	365	45	1,310	111,925	83,435	95	115	245	40

Measure	Mortality	Cardiovascular ED Visits	Acute Myocardial Infarction	Respiratory ED Visits	Lung Cancer Incidence	Asthma Onset	Asthma Symptoms	Work Loss Days	Hospital Admissions, Cardiovascular	Hospital Admissions, Respiratory	Hospital Admissions, Alzheimer's Disease	Hospital Admissions, Parkinson's Disease
Decarbonize buildings in 2035	155	40	15	95	10	360	31,130	22,335	25	30	60	10
Decarbonize buildings in 2045	1,610	420	175	985	120	3,550	303,830	226,500	260	310	665	115

Note: All values are rounded to the nearest 0 or 5.

The measures related to reducing non-combustion emissions and compensating for remaining emissions do not include changes to fuel combustion and therefore are not associated with changes to air pollutants or health endpoints. Biomethane combustion is captured in measures that reduce combustion of fossil gas, such as decarbonizing industrial energy supply and buildings.

Although the estimated health outcomes presented are based on a well-established methodology, they are subject to uncertainty. For instance, future population estimates are subject to increasing uncertainty as they are projected further into the future, and baseline incidence rates can experience year-to-year variation. Also, the relationship between changes in pollutant concentrations and changes in pollutant or precursor emissions is assumed to be approximately proportional.

In addition, emissions are reported at an air basin level and do not capture local variations. These estimates also do not account for impacts from global climate change, such as temperature rise, and are only based on the scenarios in this Scoping Plan.

The fuel changes for each AB 197 measure are estimated based on the impact of each measure compared to the Reference Scenario for the years 2035 and 2045. Therefore, aggregating the effect of each measure would overestimate the impacts of the Scoping Plan Scenario because the implementation of each measure would affect the level of benefits of the other measures. This measure-by-measure analysis uses a different methodology for calculating health endpoints than does the health analysis for the complete Scoping Plan Scenario provided earlier.

Natural and Working Lands

Implementation of NWL management strategies to mitigate and adapt to climate change will result in both environmental and health benefits. This section provides information about the potential health benefits of measures evaluated for the Scoping Plan Scenario. For this analysis, health benefit estimates were focused on increases or decreases to $PM_{2.5}$ resulting from wildfire emissions on forests, shrublands, and grasslands.[233] Other health benefits resulting from NWL management actions in the Scoping Plan Scenario are not quantified here but are important for all Californians. This includes, but is not limited to, reductions in exposure to synthetic pesticides when switching to organic agricultural systems, improvements in shade availability and mental health with increasing urban forest cover, improved mental health from opportunities for recreation in resilient and healthy environments, and protection from floods and rising sea levels.

[233] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, N11, N14. finalejacrecs.pdf (arb.ca.gov).

These examples are by no means exhaustive, as our natural and working lands provide immense health benefits to everyone.

For this analysis, CARB used the $PM_{2.5}$ emissions in Table 3-6 to understand potential health impacts. This information should be used to understand the relative health endpoints of the various measures and should not be taken as absolute estimates of health outcomes of this Scoping Plan statewide or within a specific community. The IPT methodology was used to calculate health endpoints, similar to the AB 32 GHG Inventory Sector analysis. CARB calculated the annual health endpoints associated with the wildfire emissions changes resulting from the implementation of management strategies on forests, shrublands, and grasslands under each alternative. The annual health endpoints associated with emission reductions for the Scoping Plan Scenario were estimated for the entire state. Calculated health endpoints include emissions-caused mortality, hospital admittance, and emergency room visits from asthma; hospital admittance from chronic obstructive pulmonary disease; and emergency room visits from respiratory and cardiovascular outcomes. Table 3-8 compares the average annual health endpoints of wildfire emission reductions associated with the Scoping Plan Scenario over the period 2025–2045. The other alternatives are presented in Appendix C (AB 197 Measure Analysis).

Table 3-8: Estimated average annual avoided incidence of hospital admissions, emergency room visits, and mortality relative to the Reference Scenario for the Scoping Plan Scenario resulting from forest, shrubland, and grassland wildfire emissions (NWL)

Health Endpoints from Forest, Shrubland, and Grassland Wildfire Emissions	Average Annual Avoided Incidence
Hospital admissions from asthma	22
Hospital admissions from chronic obstructive pulmonary disease without asthma	19
Hospital admissions from all respiratory outcomes	63
Emergency room visits from asthma	155
Emergency room visits from all respiratory outcomes	419
Emergency room visits from all cardiovascular outcomes	156
All causes of mortality	394

Estimated Social Cost

Social costs are generally defined as the cost of an action on people, the environment, or society and are widely used to understand the impact of regulatory actions. One tool, the social cost of greenhouse gases (SC-GHG), is an estimate of the present value of the costs associated with the emission of GHGs in future years. It combines climate science and economics to help understand the benefits of reducing GHG emissions. The estimates of the social cost of carbon (SC-CO_2) and social cost of methane (SC-CH_4), two types of SC-GHGs presented here, estimate the value of the net harm to society associated with adding GHGs to the atmosphere in a given year; they do not represent the cost of actions taken to reduce GHG emissions (known as the *cost of abatement*) nor the cost of GHG emissions reductions. In principle, the SC-GHG includes the value of climate change impacts, including but not limited to, changes in net agricultural productivity, human health effects, property damage from increased flood risk and other natural disasters, disruption of energy systems, risk of conflict, environmental migration, and the value of ecosystem services. It reflects the societal value of reducing emissions

of the gas in question by one metric ton.[234] Many of these damages from GHG emissions today will affect economic outcomes throughout the next several centuries.

In 2008, federal agencies began incorporating SC-CO_2 estimates into the analysis of their regulatory actions. U.S. EPA has used various models and discount rates to determine the value of future impacts. Generally, these models begin with assumptions to predict economic activity over time, along with projected GHG emissions. The modeled emissions are input into a model of the global climate system, which then translates into estimates of surface temperature, sea level rise, and other impacts. These outputs are used to estimate economic damages per ton of GHG emitted in a given year in the future. Since the models are calculating the present value of future damages, a discount rate is applied. For example, the SC-CO_2 for the year 2045 represents the value of climate change damages from a release of CO_2 in 2045 discounted back to today. The present value is significantly affected by the discount rate used; a higher discount rate results in a lower present value. For example, in 2021 dollars the SC-CO_2 in 2045 is $31 using a 5 percent discount rate, $88 using a 3 percent discount rate, and $122 using a 2.5 percent discount rate. Additional detail is included in Appendix C (AB 197 Measure Analysis).

The 2017 Scoping Plan utilized SC-CO_2 and SC-CH_4 Obama Administration-era values developed by the Council of Economic Advisors and the Office of Management and Budget-convened Interagency Working Group on the Social Cost of Greenhouse Gases (IWG)[235] to consider the social costs of actions to reduce GHG emissions. The Biden Administration reinstated these values in February 2021,[236] after they had been rescinded and significantly revised by the Trump Administration. The reinstatement was considered an interim step, and the Biden Administration also reconvened the IWG to continue its work to evaluate and incorporate the latest climate science and economic research and

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[234] U.S. Government. Interagency Working Group on Social Cost of Greenhouse Gases. February 2021. Technical Support Document: Social Cost of Carbon, Methane, and Nitrous Oxide – Interim Estimates under Executive Order 13990. https://www.whitehouse.gov/wp-content/uploads/2021/02/TechnicalSupportDocument_SocialCostofCarbonMethaneNitrousOxide.pdf

[235] Originally titled the "Interagency Working Group on the Social Cost of Carbon," the IWG was renamed in 2016. 82 Fed. Reg. 16093, 16095-96 (Mar. 28, 2017). https://www.govinfo.gov/content/pkg/FR-2017-03-31/pdf/2017-06576.pdf.

[236] Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis, Executive Order 13990 (Jan. 20, 2021), 86 Fed. Reg. 7037 (Jan. 25, 2021). https://www.energy.gov/sites/default/files/2021/02/f83/eo-13990-protecting-public-health-environment-restoring.pdf. IWG, Technical Support Document: Social Cost of Carbon, Methane, and Nitrous Oxide Interim Estimates Under Executive Order 13990 (February 2021), https://www.whitehouse.gov/wp-content/uploads/2021/02/TechnicalSupportDocument_SocialCostofCarbonMethaneNitrousOxide.pdf See also, The White House. 2021. A Return to Science: Evidence-Based Estimates of the Benefits of Reducing Climate Pollution. https://www.whitehouse.gov/cea/written-materials/2021/02/26/a-return-to-science-evidence-based-estimates-of-the-benefits-of-reducing-climate-pollution/.

respond to the National Academies' recommendations from 2017 as it develops a more complete revision of the estimates.

It is important to note that the models used to produce SC-GHG estimates do not include all of the important physical, ecological, and economic impacts of climate change recognized in the climate literature. There are additional costs to society, including the costs associated with changes in co-pollutants and costs that cannot be included due to modeling and data limitations. The IWG has stated that the range of the interim SC-GHG estimates likely underestimates societal damages from GHG emissions.[237] The revised estimates were originally slated to be released in early 2022 but were stalled.[238] CARB staff is applying the interim values presented in the IWG February 2021 Technical Support Document (TSD), which reflect the best available science in the estimation of the socioeconomic impacts of GHGs.[239] This Scoping Plan utilizes the TSD standardized range of discount rates, from 2.5 to 5 percent, to represent varying valuation of future damages.

AB 32 GHG Inventory Sectors

Table 3-9 presents the estimated social cost, in terms of avoided economic damages, for each measure of the Scoping Plan Scenario. For each measure, Table 3-9 includes the range of the SC-CO_2 and SC-CH_4 that results from the GHG emissions reductions in 2035 and 2045 at 2.5 and 5 percent discount rates. Additional background on the SC-GHG and methodology for calculating the SC-CO_2 and SC-CH_4 estimates in this Scoping Plan, as well as estimates for the alternatives, are provided in Appendix C (AB 197 Measure Analysis).

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[237] Interagency Working Group on Social Cost of Greenhouse Gases. 2021. Technical Support Document. https://www.whitehouse.gov/wp-content/uploads/2021/02/TechnicalSupportDocument_SocialCostofCarbonMethaneNitrousOxide.pdf

[238] See *Louisiana v. Biden* (W.D. La. 2022) 585 F.Supp.3d 840, stayed pending review (5th Cir. Mar. 16, 2022) 2022 WL 866282. A federal district court ruling issued in early February 2022 had granted a preliminary injunction blocking the Biden Administration from using the interim IWG SC-GHG estimates. However, a federal appeals court overturned the lower court's preliminary injunction in March 2022, which allows the Biden Administration to continue using the policy as legal proceedings continue. CARB will continue to monitor the litigation. However, the federal action does not prohibit CARB from using social cost of carbon and CARB will use the best available science regardless of politics. A separate federal appeals court upheld the Biden administration's use of the IWG SC-GHG estimates in October 2022. *Missouri v. Biden* (8th Cir. 2022) ____ F.4th ____.

[239] Interagency Working Group on Social Cost of Greenhouse Gases. 2021. Technical Support Document. https://www.whitehouse.gov/wp-content/uploads/2021/02/TechnicalSupportDocument_SocialCostofCarbonMethaneNitrousOxide.pdf

Table 3-9: Estimated social cost (avoided economic damages) of measures considered in the Scoping Plan Scenario (AB 32 GHG Inventory sectors)

Measure	Social Cost of Carbon in 2035, 5%–2.5% Discount Rate Billion USD (2021 dollars)	Social Cost of Carbon in 2045, 5%–2.5% Discount Rate Billion USD (2021 dollars)
Deploy ZEVs and reduce driving demand	1.12–4.87	2.64–10.23
Coordinate supply of liquid fossil fuels with declining California fuel demand	0.61–2.63	0.95–3.67
Generate clean electricity	0.20-0.88	0.97–3.75
Decarbonize industrial energy supply	0.23–1.01	0.69–2.67
Decarbonize buildings	0.35–1.52	1.11–4.32
Reduce non-combustion emissions	0.51–1.29 (SC-CH_4)	0.86–2.01 (SC-CH_4)
Compensate for remaining emissions	0.61–2.66	2.03–7.84
Scoping Plan Scenario SC-CO_2 **Scoping Plan Scenario SC-CH_4** **Scoping Plan Scenario (Total)[a]**	2.4–10.4 0.51–1.3 2.9–11.7	5.6–21.9 0.86–2.0 6.5–23.9

[a] CARB staff could not precisely separate some CO_2 and CH_4 from other GHGs from PATHWAYS outputs, but the contribution is believed to be small for purposes of calculating the social cost of carbon. The approach used to estimate GHG emissions reductions for individual measures in PATHWAYS does not reflect cross-sector interactions. Therefore, the GHG values for each measure do not sum to the overall scenario total. The total GHG emissions reduction used in this calculation is 97 $MMTCO_2e$ in 2035 and 180 $MMTCO_2e$ in 2045.

Natural and Working Lands

The SC-CO_2 estimates for the NWL measures shown in Table 3-10, in terms of avoided economic damages, reflect 2021 IWG interim values, updated for inflation, similar to the AB 32 GHG Inventory Sector analysis. This analysis utilizes the 2.5 percent and 5 percent

discount rate and the average annual emissions reductions from each NWL type from 2025–2045. Estimates for all alternatives are included in Appendix C (AB 197 Measure Analysis).

Table 3-10: Estimated social cost (avoided economic damages) of measures considered in the Scoping Plan Scenario (NWL)

Measure	Social Cost of Carbon in 2035, 5%–2.5% Discount Rate Billion USD (2021 dollars)	Social Cost of Carbon in 2045, 5%–2.5% Discount Rate Billion USD (2021 dollars)
Forests/Shrublands/Grasslands	0.003–0.012	0.004–0.014
Annual Croplands	0.006–0.027	0.008–0.031
Perennial Croplands	<0.001–0.001	0.000–0.001
Urban Forest	0.032–0.138	0.041–0.157
Wildland Urban Interface (WUI)	(0.018) – (0.080)[a]	(0.023) – (0.090)
Wetlands	0.011–0.046	0.014–0.053
Sparsely Vegetated Lands	<0.001	<0.001

[a] Parentheses indicate an increase in estimated social cost, i.e., an increase in economic damages. This is only the case for WUI measures where emissions are increased, shown in Table 3-6. The estimated social cost does not account for the decrease in wildfire risk or decrease in wildfire damages resulting from the WUI measures.

Social Costs of GHGs in Relation to Cost-Effectiveness

AB 32 includes a requirement that rules and regulations "achieve the maximum technologically feasible and cost-effective" greenhouse gas emissions reductions.[240] Under AB 32, *cost-effectiveness* means the relative cost per metric ton of various GHG reduction strategies,[241] which is the traditional cost metric associated with emission control. In contrast, the SC-CO_2, SC-CH_4, and social cost of nitrous oxide (SC-N_2O), because they are estimates of the cost to society of additional GHG emissions, can be used to estimate of the economic benefits of reducing emissions, but do not take into account the cost of the actions that must be taken to achieve those GHG emissions reductions.

There may be technologies or policies that do not appear to be cost-effective when compared to the SC-CO_2, SC-CH_4, and SC-N_2O associated with GHG reductions. However, these technologies or policies may result in other benefits that are not reflected in the IWG social costs. Examples include the evaluation of social diversification of the portfolio of transportation fuels (a goal outlined in the Low Carbon Fuel Standard) and reductions in criteria pollutant emissions from power plants (as in the Renewables Portfolio Standard). Additionally, costs for new technology may be higher early on in a technology's development cycle and may drop over time as use of the technology is scaled up.

Estimated Cost per Metric Ton

AB 197 requires an estimation of the cost-effectiveness of the measures evaluated for this Scoping Plan. The cost (or savings)[242] per metric ton of CO_2e reduced for each measure is one metric for comparing the performance of the measures. Additional factors beyond the cost per metric ton that could be considered include continuity with existing laws and policies, implementation feasibility, contribution to fuel diversity and technology transformation goals, and health and other benefits to California. These considerations are not reflected in the cost per metric ton estimates presented below. It is important to understand the relative cost-effectiveness of individual measures as presented in this section. However, the economic analysis presented earlier in this chapter, in Appendix H

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[240] AB 32 Air pollution: greenhouse gases: California Global Warming Solutions Act of 2006. (AB 32, Nuñez, Chapter 488, Statutes of 2006). https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=200520060AB32.

[241] Health & Saf. Code § 38505(d).

[242] Similarly, to the direct costs reported earlier, the cost per metric ton of a measure reflects the stock costs and any fuel or efficiency savings associated with a measure divided by the GHG emission reduction achieved by the measure. Costs are reported as positive values, and savings are reported as negative values.

(AB 32 GHG Inventory Sector Modeling), and in Appendix I (NWL Technical Support Document) provides a more comprehensive analysis of how the Scoping Plan Scenario and alternative scenarios affect the state's economy and jobs.

AB 32 GHG Inventory Sectors

The cost per metric ton for the AB 32 GHG Inventory sectors was computed for each measure independently relative to the Reference Scenario using the sensitivity calculations based on PATHWAYS and RESOLVE outputs. The difference in the annualized cost between the Scoping Plan Scenario and the Reference Scenario was computed for each measure in 2035 and in 2045. The incremental cost was divided by the incremental GHG emissions impact to calculate the cost per metric ton in each year. To capture the fuel and GHG impacts of investments made from 2022 through 2035, or from 2022 through 2045, CARB computed an average annual cost per metric ton. The incremental cost in each year was averaged over the period. This value is divided by the corresponding annual, incremental GHG impact averaged over the same period.

The cost metric includes the annualized incremental cost of energy infrastructure, such as zero-emission vehicles, electric appliances, and required revenue to support all electric assets. A residual value for equipment such as vehicles or appliances that are retired early is included. The annual fuel cost or avoided fuel cost that results from efficiency improvements or changes to demand for fuels associated with transitioning to alternative fuels is included. Not included in this cost metric are costs that represent transfers within the state, such as incentive payments for early retirement of equipment.

It is important to note that this cost per metric ton does not represent an expected market price value for carbon mitigation associated with these measures. In addition, the values do not capture fuel savings or GHG reductions associated with the full economic lifetime of measures that have been implemented by the target date of 2035 or 2045 but whose impacts extend beyond the target date.

Table 3-11 includes the cost per metric ton and annual average cost per metric ton estimates for the Scoping Plan Scenario. The other alternatives are presented in Appendix C (AB 197 Measure Analysis). Measures that are relatively less costly in 2035 or 2045 are also less costly over the extended period. As noted earlier, incremental costs of new vehicles are generally offset by gains in efficiency and avoided fuel consumption resulting in negative cost per metric ton.

Table 3-11: Estimated cost per metric ton of reduced CO_2e relative to the Reference Scenario for measures considered in the Scoping Plan Scenario (AB 32 GHG Inventory sectors)

Measure	Annual Cost, 2035 ($/ton)	Average Annual Cost, 2022–2035 ($/ton)	Annual Cost, 2045 ($/ton)	Average Annual Cost, 2022–2045 ($/ton)
Deploy ZEVs and reduce driving demand	-171	-99	-103	-122
Coordinate supply of liquid fossil fuels with declining CA fuel demand	60	109	-50	39
Generate clean electricity[a]	101	156	145	161
Decarbonize industrial energy supply	290	217	257	274
Decarbonize buildings	235	230	112	213
Reduce non-combustion emissions	93	94	106	99
Compensate for remaining emissions	745	823	236	485

[a] Note: The denominator of this calculation (2045) does not include GHG reductions occurring outside of California resulting from SB 100. If these reductions were included, this number would be lower.

Natural and Working Lands

The cost per metric ton for NWL measures were computed for the Scoping Plan Scenario relative to the Reference Scenario using the projected carbon stock/sequestration data from the NWL modeling and the direct cost estimates for each management action, described earlier. Direct costs represent the cost of implementing a certain management action. The projected emissions reductions take into account the loss of carbon that results from the management action, such as fuels reduction treatments in forests, as well as climate change effects on growth. The direct cost for each NWL measure was divided by the average annual emission reductions presented in Table 3-6 to produce the cost

per metric ton. The increasing effect of climate change on diminished future growth reduces the ability of the land to sequester or store carbon, driving up the cost per ton.

It is important to note that this cost per metric ton does not represent an expected market price value for carbon mitigation associated with these measures. In addition, emissions benefits of NWL management actions often take longer time periods to accrue, and these values only capture GHG reductions up to 2045.

Table 3-12 includes the average cost per metric ton estimates for the average annual CO_2e reductions from 2025 through 2045 for the Scoping Plan Scenario. The other alternatives are presented in Appendix C (AB 197 Measure Analysis).

Table 3-12: Estimated average cost per metric ton of reduced CO_2e relative to the Reference Scenario for measures considered in the Scoping Plan Scenario (NWL)

Measure	Average Cost per Reduced Ton CO_2e ($/Ton)
Forests/Shrublands/Grasslands	15,500
Annual Croplands	1,100
Perennial Croplands	412
Urban Forest	3,270
Wildland Urban Interface (WUI)	N/A
Wetlands	64
Sparsely Vegetated Lands	451,000

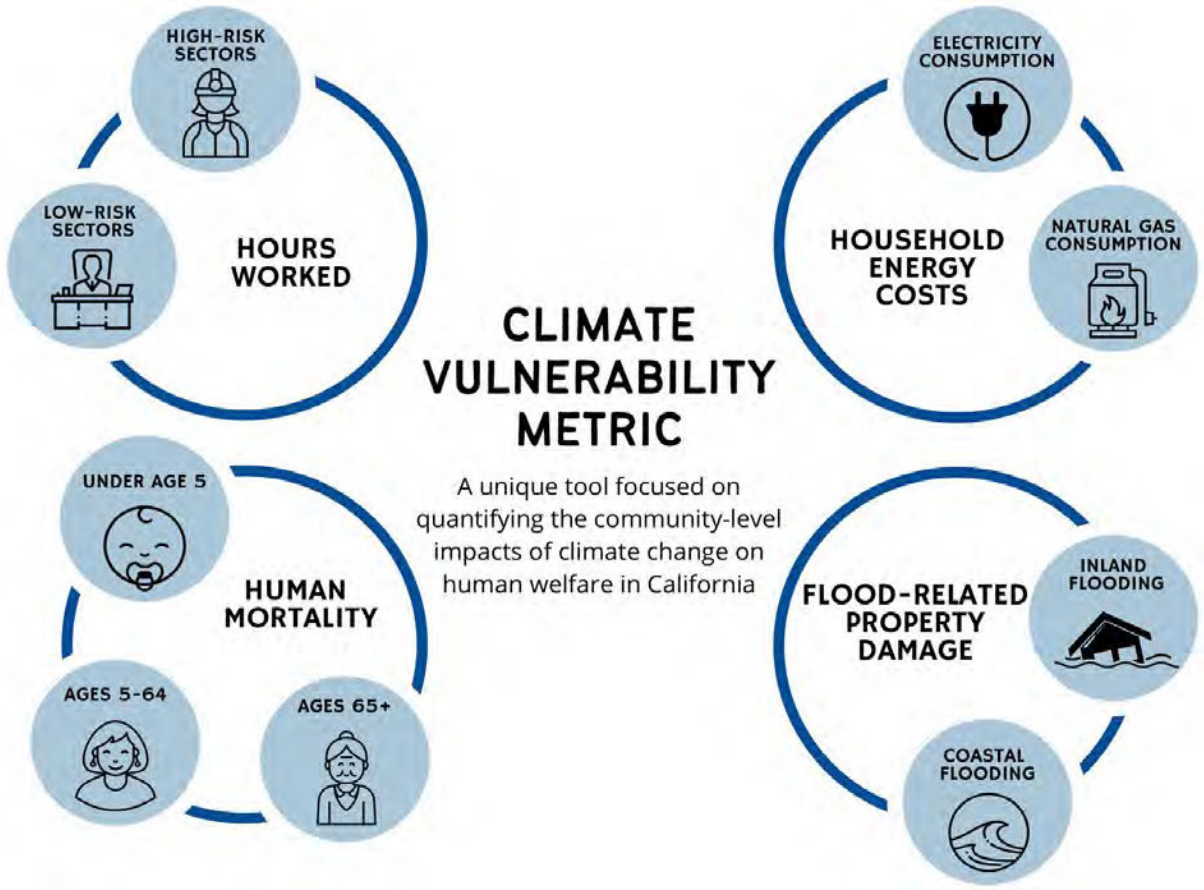
Climate Vulnerability Metric

As California invests in climate mitigation and adaptation, it is essential to understand that the relative impact of climate change will vary across the state's communities. Due to persisting health and opportunity gaps, not all communities are equally resilient in the face of climate impacts. A global metric such as the Social Cost of Carbon cannot adequately capture the incremental additional economic impact faced by overly burdened communities. The Climate Vulnerability Metric (CVM) is specifically focused on quantifying the community-level impacts of a warming climate on human welfare and the additional costs. Additional details and results are included in Appendix K (Climate Vulnerability Metric).

The CVM aggregates the impacts of climate change that can be quantified at the census tract level using robust and currently available research. The CVM includes the projected impacts of climate change on human welfare across four categories (hours worked, household energy costs, human mortality, and flood-related property damage) through midcentury. The CVM identifies nine components of the four climate impacts as shown in Figure 3-9 and aggregates the data to generate a total CVM result for each census tract. To ensure that the CVM represents the diversity of California communities, it is reported as the aggregate monetized impact of climate change as a percentage of census tract-specific incomes.[243] For example, a CVM value of 3 implies that by 2050, a census tract is projected to experience human welfare impacts of climate change that amount to 3% of annual income in that tract.

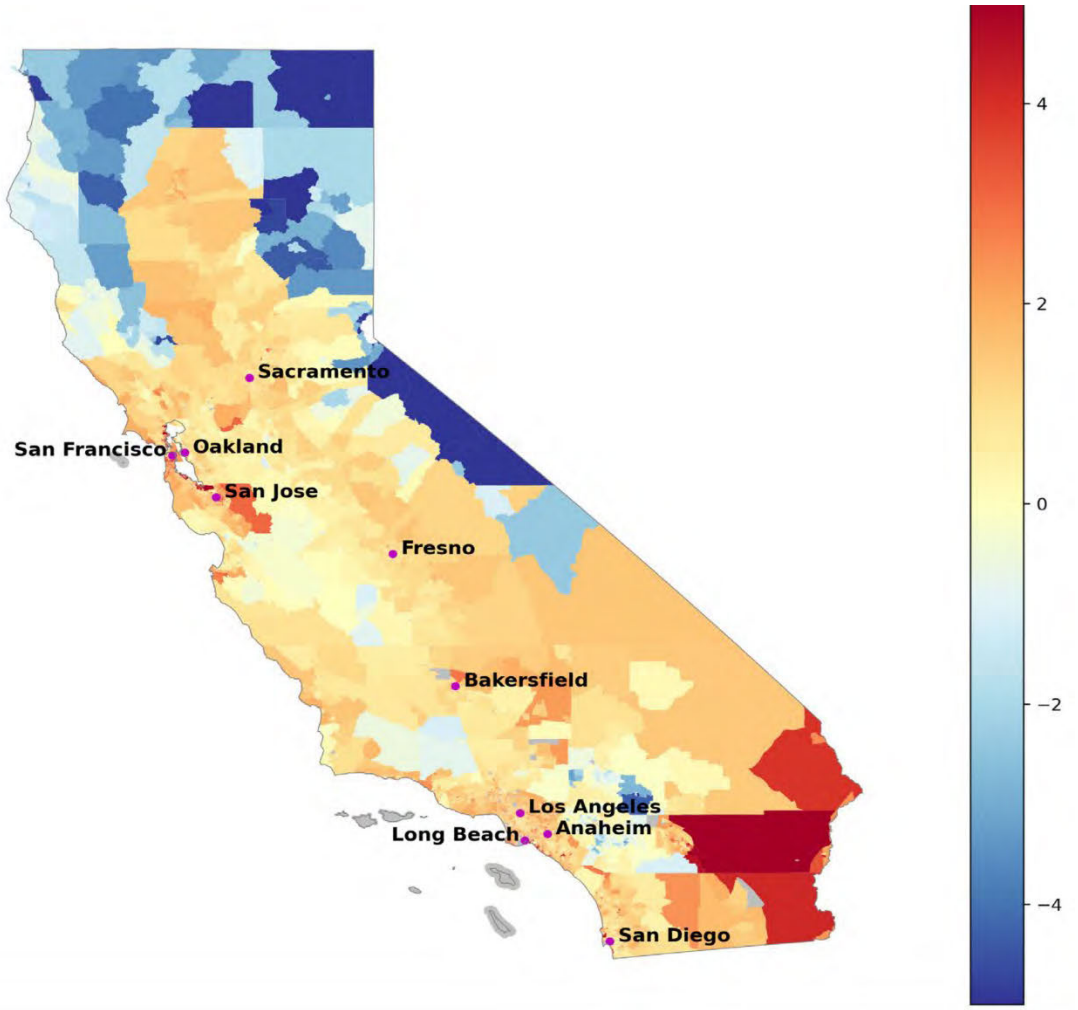
[243] Per capita income in 2019 for census tracts across California ranges from $633 to $176,388, with a median of $32,181 ($2019). Source: American Community Survey.

Figure 3-9: Categories of climate change impacts on human welfare included in the Climate Vulnerability Metric.



The CVM shows that climate change will have highly unequal impacts across California. While some southeastern regions of California are estimated to suffer damages that exceed 5% of annual income, other high-elevation northeastern regions of California are estimated to see benefits of up to 10%. Some low-lying urban areas, such as the San Francisco Bay Area, are estimated to be particularly vulnerable, while much of the Central Valley is estimated to suffer at least moderate economic damages relative to the rest of the state. It is important to note that the CVM does not set a threshold for vulnerability. Instead, it shows relative impacts across census tracts. The CVM is limited to the impacts that can currently be quantified at the census tract level.

Figure 3-10: Combined impacts of climate change in 2050 under a moderate emissions scenario; damages as share of 2019 tract income (%)



The map shows combined impacts of climate change in 2050 under a moderate emissions scenario (RCP 4.5), reported as a share of 2019 census tract income. For example, a CVM value of 3 implies that by 2050, a census tract is projected to experience human welfare impacts of climate change that amount to 3% of annual income. Impacts are combined across the categories shown in Figure 3-9. The higher the CVM for a given census tract, the more damaging the projected impacts of climate change on human welfare. Census tracts with high CVMs are represented by positive percentages in orange and red. A lower CVM is associated with lower projected impacts of climate change, shown in yellow, while a negative CVM value represents a projected beneficial impact of climate change (e.g., through reductions in deaths caused by extremely cold winter weather). Negative CVMs are represented by negative percentages in blue.

By providing information about how climate vulnerability varies across California (Figure 3-10), the CVM results can be used to direct resources to enhance resiliency in the state's

most vulnerable communities based on the specific impacts, such as heat or flooding, they are experiencing. The CVM may be used in combination with existing screening tools, such as CalEnviroScreen 4.0, to identify communities that face environmental and health hazards that contribute to disproportionate economic impacts in addition to climate vulnerability. The CVM can become an essential source of information to implement this Scoping Plan and build a more resilient, just, and equitable future for all communities.

Public Health

Health Analysis Overview

This section focuses on a broader evaluation of public health and climate change. Science demonstrates that taking action to address climate change presents one of the most significant opportunities to improve public health outcomes.[244] Transitioning to clean energy and technology and improving land and ecosystem management will lead to a much healthier future. Many actions to reduce GHG emissions also have health co-benefits that can improve the health and well-being of populations across the state, as well as address climate change. This section and the accompanying Appendix G (Public Health) provide a qualitative analysis of health benefits to accompany the quantitative health analysis included in this chapter, in Appendix C (AB 197 Measure Analysis), and in Appendix H (AB 32 GHG Inventory Sector Modeling). Together the qualitative and quantitative analyses of benefits are demonstrating the many ways that climate action and health improvements go hand in hand.

Climate change can lead to a wide range of direct health impacts such as increased heat-related illnesses (i.e., heat exhaustion and heat stroke), and injuries and deaths from extreme weather events or disasters (e.g., severe storms, flooding, wildfires). Indirect impacts include:

- more air pollution-related exacerbations of cardiovascular and respiratory diseases (e.g., due to increased smog, wildfire smoke)
- increased vector-borne and fungal diseases due to changes in the distribution and geographic range of disease-carrying species (e.g., mosquitoes, ticks, fungi in dust)
- negative nutritional consequences related to decreases in agricultural food yields
- stress and mental trauma due to extreme weather-related catastrophes
- anxiety, depression, and other mental health impacts associated with gradual changes in the climate (e.g., prolonged drought or temperature shifts affecting jobs and industries) that result in unemployment and income loss

[244] Watts, N., W. N. Adger, P. Agnolucci, et al. 2015. “Health and climate change: Policy responses to protect public health.” *Lancet* 386, 1861–1914.

- residential displacement and home loss (e.g., sea level rise impacting coastal communities)

Wildfires and wildfire smoke are one area where we have already seen and expect to see even further drastic impacts on the health of Californians. According to CalFire, since 1932 the top eight largest wildfires in California have occurred in the past five years (2017–2022), with 151 deaths due directly to fires during that period.[245] Researchers estimate that wildfire smoke during fall 2020 may have led to as many as 3,000 excess deaths, with at least 95% of Californians suffering unhealthy levels of particle pollution due to wildfires in 2020.[246] Continued climate change is projected to further increase smoke exposure from wildfires through the end of the century.[247] Wildfires also create a high-risk environment for outdoor workers, including agricultural workers. While the direct medical and physical health impacts are often most noticeable, the psychological impacts can develop and persist well after the event. Estimates indicate that 20%–65% of survivors of extreme weather events have mental health issues following the event.[248]

Extreme heat, drought, and associated worsened air quality impacts are among the most serious climate-related exposures affecting the health of Californians. Numerous studies find a wide range of adverse health effects accompanying extreme heat, including heat stroke and adverse birth outcomes, and find that extreme heat can harm most body systems. Climate change exacerbates air pollution problems that cause difficulty breathing and can lead to serious illness and death in many parts of California. Increasing temperatures cause increases in ozone and other pollution concentrations, including for California's most polluted regions, and heighten health risks for the vulnerable and marginalized populations living in these areas.[249] In 2020, there were 157 ozone polluted days across Los Angeles, Orange, Riverside, and San Bernardino Counties—the most days since 1997. In addition, particulate matter exposure is a heightened problem during

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[245] California Department of Forestry and Fire Protection (CAL FIRE). "Stats and Events." *Cal Fire Department of Forestry and Fire Protection*, https://www.fire.ca.gov/stats-events/.
[246] G-FEED. 2020. Indirect mortality from recent wildfires in CA. *http://www.g-feed.com/2020/09/indirect-mortality-from-recent.html*.
[247] M. D. Hurteau, A. L. Westerling, C. Wiedinmyer, and B. P. Bryant. 2014. "Projected effects of climate and development on California wildfire emissions through 2100." *Environ. Sci. Technol.* 48, 2298–2304.
[248] American Public Health Association. 2019. Addressing the Impacts of Climate Change on Mental Health and Well-Being. Policy No: 20196. *https://www.apha.org/policies-and-advocacy/public-health-policy-statements/policy-database/2020/01/13/addressing-the-impacts-of-climate-change-on-mental-health-and-well-being*.
[249] American Lung Association. State of the Air 2021. *https://www.lung.org/research/sota*.

droughts, which are expected to increase over this century.[250,251] Worse air quality leads to illnesses, emergency room visits, and hospitalizations for chronic health conditions, including chronic obstructive pulmonary disease (COPD), asthma, chronic bronchitis, and other respiratory and cardiovascular conditions, as well as increased risk for respiratory infections, which all result in greater health costs to the state.[252,253,254] These and other climate-related health impacts are discussed in more detail in Appendix G (Public Health).

Health Analysis Components

This Scoping Plan health analysis focuses on the contrast between a California that is still dependent on a fossil fuel-based economy and a California that is transitioned to a carbon-neutral, clean energy future. This qualitative analysis evaluates and demonstrates the broad range of benefits of a dramatic reduction in fossil fuels by 2045 combined with healthier ecosystem management, comparing health outcomes for a "no-action" scenario (Reference) to a "take-action" decarbonization scenario. As this is a qualitative analysis, it looks more broadly at the public health benefits of a drastic reduction in fossil fuel combustion. While this analysis provides scientific evidence for Scoping Plan benefits based on achieving carbon neutrality by 2045, it does not analyze a specific scenario.

The key areas of focus for the analysis are: heat impacts, children's health and development, economic security, food security, mobility and physical activity, urban greening, wildfires and smoke impacts, and housing affordability. For each area of focus, the analysis covers the scientific evidence and compares expected health effects between the Reference and decarbonization scenarios. This analysis looks at the major health outcomes, provides directional effects for each health outcome, and where possible provides information on the strength and scale of health impacts. Some areas include quantitative information where tools are available to measure health outcomes. While the analysis is focused on health outcomes statewide, it also includes discussion

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[250] Cvijanovic, I., B. D. Santer, C. Bonfils, et al. 2017. "Future Loss of Arctic Sea-ice Cover Could Drive a Substantial Decrease in California's Rainfall." 8 *Nat. Commun.* 1947. https://doi.org/10.1038/s41467-017-01907-4.

[251] Williams, A. P., R. Seager, J. T. Abatzoglou, B. I. Cook, J. E. Smerdon, and E. R. Cook. 2015. "Contribution of anthropogenic warming to California drought during 2012–2014." *Geophysical Research Letters* 42(16), 6819–6828.

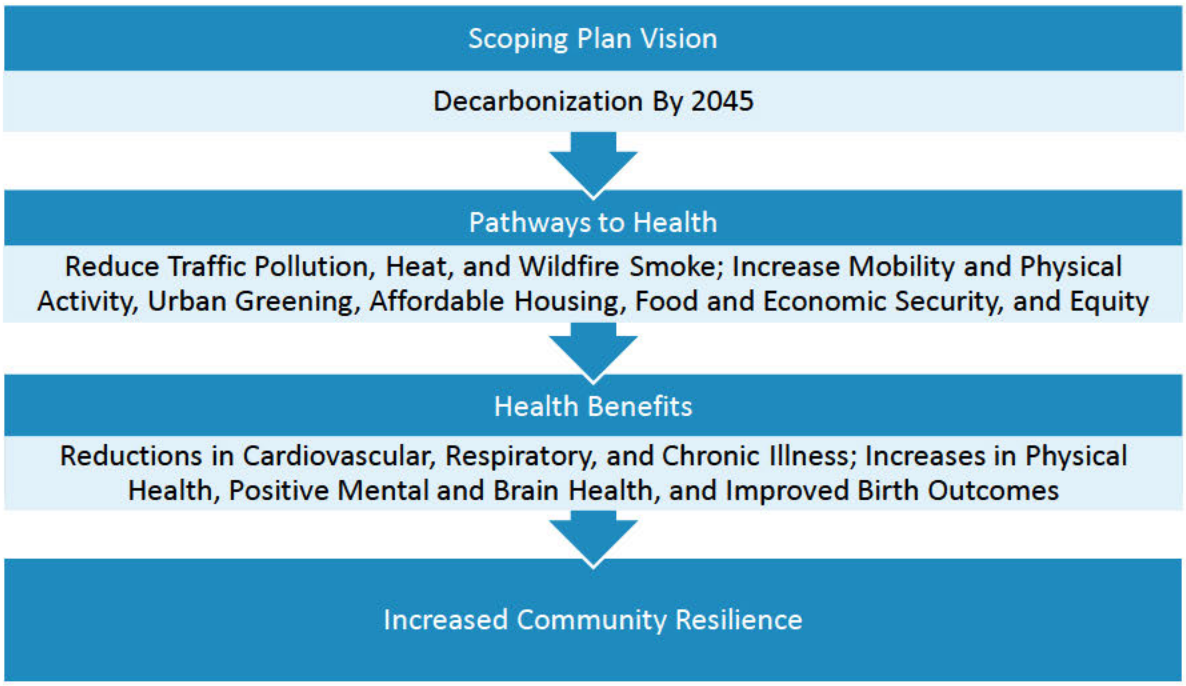
[252] Romley, J. A., A. Hackbarth, and D. P. Goldman. 2010. Cost and Health Consequences of Air Pollution in California. Santa Monica, California. RAND Corp. https://www.rand.org/pubs/research_briefs/RB9501.html.

[253] Wang, M., C. P. Aaron, J. Madrigano, E. A. Hoffman, E. Angelini, J. Yang, A. Laine, et al. 2019. "Association between long-term exposure to ambient air pollution and change in quantitatively assessed emphysema and lung function." *JAMA* 322(6), 546–556.

[254] Inserro, A. 2018. "Air Pollution Linked to Lung Infections, Especially in Young Children." *Am. J. Managed Care* (May 6). https://www.ajmc.com/view/air-pollution-linked-to-lung-infections-especially-in-young-children.

of benefits to community health and climate resilience, as well as potential inequities experienced at a community level. Figure 3-11 shows the co-benefit areas covered in this Scoping Plan and the path to health improvements and increased community resilience.

Figure 3-11: Scoping Plan outcome and the path to health improvements



Social and Environmental Determinants of Health Inequities

Communities across the state do not experience exposure to pollution sources and the resulting effects equally. Low-income communities and communities of color (including Black, Latino and Indigenous communities) consistently experience significantly higher rates of pollution and adverse health conditions than others due to factors including historic marginalization rooted in systemic racism. As shown in Figure 3-12, the most impacted neighborhoods according to CalEnviroScreen (CES) are home to very high percentages of people of color while the least impacted neighborhoods are predominantly white. Recent findings show that Black Californians have 19% higher $PM_{2.5}$ exposure from vehicle emissions than the state average, and the census tracts with the highest $PM_{2.5}$ pollution burden from vehicle emissions have a high proportion of people of color.[255] Air pollutant emissions from mobile sources have disproportionate impacts on low-income communities and communities of color due to their proximity.[256] Diesel-fueled vehicles traveling on California's freeways and major roads expose nearby residents to pollution that is linked to lung cancer, hospitalizations and emergency department visits for chronic heart and lung disease, and premature death.[257,258] A combination of historical and social inequities are evident in communities of color disproportionately living close to freeways and other major sources of vehicle pollution. Environmental exposures and contaminants are one component of a broader set of social, economic, and environmental factors that can amplify health conditions, and the combination of all these factors can compound the health effects of individual exposures. This broader set of community factors can be referred to as "cumulative impacts." In addition, specific populations are more sensitive to pollution and face greater susceptibility. This includes young children, older adults, and individuals with existing health conditions.

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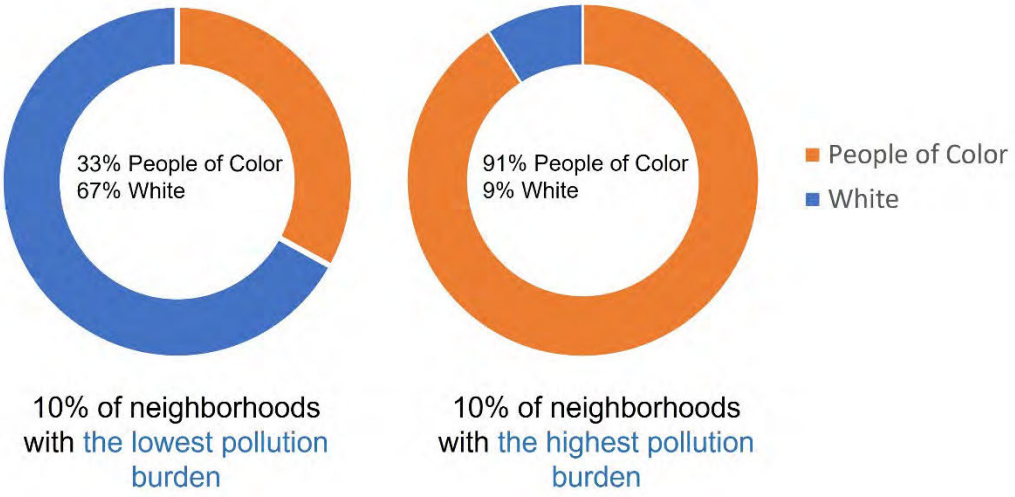
[255] Reichmuth, D. 2019. *Inequitable exposure to air pollution from vehicles in California.* https://www.ucsusa.org/resources/inequitable-exposure-air-pollution-vehicles-california-2019.
[256] CARB. 2017. *California's 2017 climate change scoping plan.* https://www.arb.ca.gov/cc/scopingplan/scoping_plan_2017.pdf.
[257] CARB. 2020. Overview: Diesel exhaust & health. https://ww2.arb.ca.gov/resources/overview-diesel-exhaust-and-health.
[258] Kagawa, J. 2002. "Health effects of diesel exhaust emissions—a mixture of air pollutants of worldwide concern." *Toxicology* 181–182:349–353.

Figure 3-12: Least and most impacted neighborhoods from CalEnviroScreen[259]



Social Determinants of Health Inequities

The physical and mental health of individuals and communities is shaped, to a great extent, by the social, economic, and environmental circumstances in which people live, work, play, and learn. According to the World Health Organization, these same circumstances—or social determinants of health—are "mostly responsible for health inequities: the unfair and avoidable differences in health status seen within and between countries." In fact, a strong body of research demonstrates that more than 50 percent of long-term health outcomes are the result of social determinants affecting an individual.[260] Race/ethnicity and socioeconomic status, for example, have been found to amplify impacts from long- and short-term environmental exposures for several health outcomes,

[259] The figure represents the top and bottom decile scoring of CalEnviroScreen census tracts for pollution burden. This chart is modified from Figure 2. Race in the Least and Most Impacted Census Tracts of CalEnviroScreen 4.0 in the Office of Environmental Health Hazard Assessment, California Environmental Protection Agency. Analysis of Race/Ethnicity and CalEnviroScreen 4.0 Scores. 2021. *https://oehha.ca.gov/media/downloads/calenviroscreen/document/calenviroscreen40raceanalysisf2021.pdf*.

[260] California Department of Public Health (CDPH). 2015. *The Portrait of Promise: The California Statewide Plan to Promote Health and Mental Health Equity.* A Report to the Legislature and the People of California by the Office of Health Equity. Sacramento, California. California Department of Public Health, Office of Health Equity.

such as mortality and birth outcomes.[261,262,263,264] Social factors combine in low-income communities and communities of color to create levels of toxic chronic stress and limit opportunities for healthy food and healthy lifestyles. Social factors also can cause health disparities through psychosocial pathways such as discrimination and social exclusion.[265] While the importance of social determinants is well known, measuring the specific and cumulative impacts of social determinants is challenging.

There are several important tools to evaluate and map cumulative impacts and factors contributing to the results of historical practices such as redlining, and these tools have been used for air quality and climate planning, community protection, and investments. CalEnviroScreen is a tool that maps cumulative pollution burdens and vulnerabilities on a statewide basis and ranks census tracts based on environmental, exposure, population, and socioeconomic indicators. An analysis using CES shows a direct, persistent relationship between exposure to environmental burdens and socioeconomic and health vulnerabilities affecting communities of color and historical redlining practices. OEHHA has evaluated health impacts of certain climate change policies on disadvantaged communities and communities of color utilizing CES rankings.[266] The Healthy Places Index (HPI) maps indicators that affect life expectancy on a statewide basis. In the future, these and other tools can be helpful to prioritizing investments and informing implementation efforts for GHG emission reductions policies.

Environmental Determinants of Health Inequities

Communities with large percentages of Black and other socially vulnerable and marginalized groups are disproportionately located near pollution sources, such as traffic

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[261] O'Neill, M. S., M. Jerrett, I. Kawachi, J. I. Levy, A. J. Cohen, N. Gouveia, et al. 2003. "Health, wealth, and air pollution: Advancing theory and methods." *Environ Health Perspect.* 111 (16): 1861–70.
[262] Ponce, N. A., K. J. Hoggatt, M. Wilhelm, and B. Ritz. 2005. "Preterm birth: The interaction of traffic-related air pollution with economic hardship in Los Angeles neighborhoods." *Am J Epidemiol.* 162 (2): 140–8.
[263] Morello-Frosch, R., B. Jesdale, J. Sadd, and M. Pastor. 2010. "Ambient air pollution exposure and full-term birth weight in California." *Environ Health.* 9: 44.
[264] Finkelstein, M. M., M. Jerrett, P. DeLuca, N. Finkelstein, D. K. Verma, K. Chapman, et al. 2003. "Relation between income, air pollution, and mortality: A cohort study." *CMAJ.* 169 (5): 397–402.
[265] Clougherty, J., and L. Kubzansky. 2009. "A framework for examining social stress and susceptibility in air pollution and respiratory health." *Environ Health Perspect.* 117 (9): 1351–8.
[266] OEHHA. 2022. *Impacts of Greenhouse Gas Emission Limits Within Disadvantaged Communities.* https://oehha.ca.gov/media/downloads/environmental-justice//impactsofghgpoliciesreport020322.pdf.

and freight facilities, industrial facilities, and hazardous waste sites.[267,268,269,270] Research shows large disparities in exposure to pollution between white and non-white populations in California, and between low-income and communities of color (Figure 3-13). The research also shows Black and Latino populations experience significantly greater air pollution impacts than white populations in California.[271] Additionally, Native Americans are disproportionately impacted by air pollution with high rates of exposure to industrial, diesel, and residential pollution sources and higher rates of diseases linked to air pollution.[272, 273]

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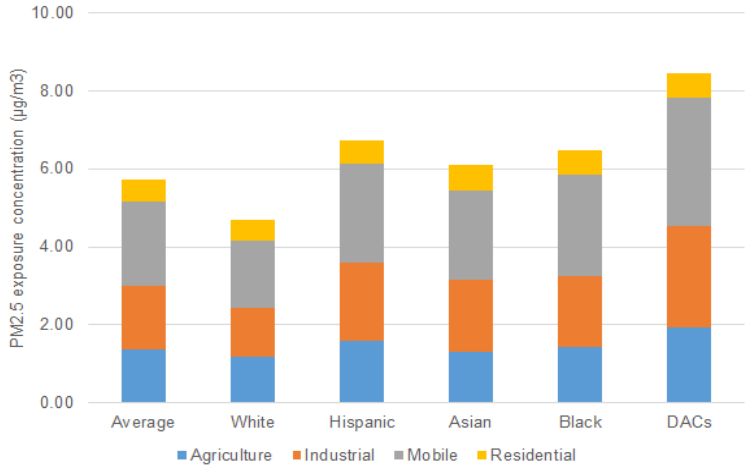
[267] Mohai. P., P. M. Lanz, J. Morenoff, J. S. House, and R. P. Mero. 2009. "Racial and socioeconomic disparities in residential proximity to polluting industrial facilities: Evidence from the Americans' Changing Lives Study." *Am J Public Health.* 99 (Suppl 3): S649–56.
[268] Mohai, P., and R. Saha. 2007. "Racial inequality in the distribution of hazardous waste: A national-level reassessment." *Soc Probl.* 54 (3): 343–70.
[269] Morello-Frosch, R., M. Pastor, C. Porras, and J. Sadd. 2002. "Environmental justice and regional inequality in southern California: Implications for future research." *Environ Health Perspect.* 110 (Suppl 2): 149–54.
[270] Gunier, R. B., A. Hertz, J. von Behren, and P. Reynolds. 2003. "Traffic density in California: Socioeconomic and ethnic differences among potentially exposed children. *J Expo Anal Environ Epidemiol.* 13 (3): 240–6.
[271] Apte, J. S., S. E. Chambliss, C. W. Tessum, and J. D. Marshall. 2019. *A Method to Prioritize Sources for Reducing High $PM_{2.5}$ Exposures in Environmental Justice Communities in California.* CARB Research Contract Number 17RD006.
[272] Indigenous People and Air Pollution in the United States. A Report from the National Tribal Air Association and Moms Clean Air Force. 2021. *https://7vv611.a2cdn1.secureserver.net/wp-content/uploads/2021/04/indigenousairpollution_041421.pdf*
[273] National Tribal Air Association. 2022. Status of Tribal Air Report. Pg. 66. *https://7vv611.a2cdn1.secureserver.net/wp-content/uploads/2022/10/2022-NTAA-Status-of-Tribal-Air-Report.pdf*.

Figure 3-13: Top sources of $PM_{2.5}$ and their contribution to $PM_{2.5}$ exposures by race and in disadvantaged communities



These disparities in exposure to pollution sources generate health inequities. Communities located near major roadways are at increased risk of asthma attacks and other respiratory and cardiac effects. Studies consistently show that mobile source pollution exposure near major roadways or freight sources contributes to and exacerbates asthma, impairs lung function, and increases cardiovascular mortality.[274] The exposure to mixtures of gaseous and particulate pollutants in mobile sources (including PM, NO_x, and benzene) is associated with higher rates of heart attacks, strokes, lung cancer, autism, and dementia.[275]

Environmental hazards found in communities also can include exposures to toxic substances and emissions, as well as occupational exposures. Due to historical inequities, under-resourced communities and communities of color are often located close to sources of toxic pollution, including chrome platers; metal recycling facilities; oil and gas operations; agricultural burning; railyards; facilities transporting, managing, or disposing of hazardous waste; and areas impacted by pesticides, among others. Some populations may be at increased risk of exposure to pollutants, both at work and home.

Children are more susceptible to environmental pollutants for many reasons, including the ongoing development of their nervous, immune, digestive, and other bodily systems. Moreover, children eat more food, drink more fluids, and breathe more air relative to their

[274] U.S. Environmental Protection Agency website. How Mobile Source Pollution Effects Your Health. https://www.epa.gov/mobile-source-pollution/how-mobile-source-pollution-affects-your-health.
[275] USC Environmental Health Centers. 2018. Living Near Busy Roads or Traffic Pollution. https://envhealthcenters.usc.edu/wp-content/uploads/2016/10/living-near-bus_19696172.pdf.

body weight, as compared to adults.[276] Exposure to high levels of air pollutants, including indoor air pollutants, increases the risk of respiratory infections, heart disease, and asthma.[277] Children living in low-income communities near industrial operations, rail yards, and heavily trafficked freeways and streets in urban areas are at especially high risk of chronic respiratory conditions. Black children are four times more likely to be hospitalized for asthma compared with white children, and urban Black and Latino children are two to six times more likely to die from asthma than white children.[278] Native American children also experience more impacts from asthma and Native American children, along with Black children, have the highest prevalence of asthma.[279]

For older adults, increased vulnerability is linked to respiratory, cardiovascular, and immune systems weakened by aging.[280] Preexisting health conditions interact with environmental pollutants to enhance risks of adverse health outcomes.[281,282] The recent COVID-19 pandemic has highlighted the heightened vulnerability of older adults as well as communities of color to respiratory disease, as hospital admissions and mortality data linked to COVID-19 cases for these groups have been higher than other groups. Research has also underscored the important link between COVID-19 mortality and morbidity and air pollution, demonstrating significantly higher mortality and morbidity for COVID-19 in areas of elevated $PM_{2.5}$ pollution.

Climate Vulnerabilities

Climate change is expected to exacerbate the existing disparities of health conditions and worsen climate vulnerability, which is the degree to which natural systems and people or

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[276] Blaisdell, R. J. Air Toxics Hot Spots Program Risk Assessment Guidelines. 2012. Technical Support Document for Exposure Assessment and Stochastic Analysis. Oakland, California: California Environmental Protection Agency, Office of Environmental Health Hazard Assessment. August.
[277] Woodruff, T. J., D. A. Axelrad, A. D. Kyle, O. Nweke, and G. G. Miller. 2003. *America's Children and the Environment: Measures of Contaminants, Body Burdens, and Illness.* 2nd ed. Washington, D.C.: United States Environmental Protection Agency. February.
[278] California Department of Public Health. Asthma Inequities in California Children. 2021. https://www.cdph.ca.gov/Programs/CCDPHP/DEODC/EHIB/CPE/CDPH%20Document%20Library/CA_Asthma_Inequities_Children_2021-Infographic.pdf.
[279] Meng, Y., S. H. Babey, T. A. Hastert, and E. Brown. 2007. California's Racial and Ethnic Minorities More Adversely Affected by Asthma. UCLA: Center for Health Policy Research. Retrieved from https://escholarship.org/uc/item/4k45v3xt.
[280] Sandström, T., A. J. Frew, M. Svartengren, and G. Viegi. 2003. "The need for a focus on air pollution research in the elderly." *Eur Respir J Suppl.* 40: 92s–5s.
[281] Zanobetti, A., and J. Schwartz. 2001. "Are diabetics more susceptible to the health effects of airborne particles?" *Am J Respir Crit Care Med.* 164 (5): 831–3. https://www.atsjournals.org/doi/pdf/10.1164/ajrccm.164.5.2012039.
[282] Zanobetti, A., J. Schwartz, and D. Gold. 2000. "Are there sensitive subgroups for the effects of airborne particles?" *Environ Health Perspect.* 108 (9): 841–5.

communities are at risk of experiencing the negative impacts of climate change.[283] A report from the California Climate Change Center warned that the impacts of climate change will likely create especially heavy burdens on low-income and other vulnerable populations: "*Without proactive policies to address these equity concerns, climate change will likely reinforce and amplify current as well as future socioeconomic disparities, leaving low-income, minority, and politically marginalized groups with fewer economic opportunities and more environmental and health burdens*."[284]

In the U.S. Environmental Protection Agency's "Climate Change and Social Vulnerability in the United States: A Focus on Six Impacts,"[285] investigators analyzed risks of six primary climate change impacts disproportionately affecting communities across income, educational attainment, race/ethnicity, and age groups. Four socially vulnerable populations—low income, communities of color, no high school diploma, and age 65 and older—were identified as having a higher likelihood of experiencing the greatest impacts of a changing climate (according to the projected 2°C of global warming or 50 centimeters of global sea level rise). Disproportionate impacts were projected for climate events, including air quality, extreme temperature, coastal flooding, and other impacts, leading to increased risk of health and other adverse outcomes. The study projected significant health impacts for low-income communities, certain racial and ethnic subgroups, and those with lower educational attainment.

Several climate vulnerability tools have been developed or are under development to better understand and map areas at higher risk of climate impacts. The Climate Change and Health Vulnerability Indicators (CCHVIs) for California helps state and local health officials prepare for and reduce adverse health impacts due to a changing climate.[286] For example, Los Angeles County shows higher than state average climate vulnerability overall, particularly for those who are linguistically isolated (more than twice the state average).

In summary, there are many environmental, social, individual, and economic factors affecting health and equity in California and contributing to worsening health outcomes from climate change impacts. This section and Appendix G (Public Health) reference a substantial and growing body of research documenting the different social and

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[283] OPR. 2018. Defining Vulnerable Communities in the Context of Climate Adaptation. *https://opr.ca.gov/docs/20180723-Vulnerable_Communities.pdf*.

[284] Shonkoff, S., R. Morello-Frosch, M. Pastor, and J. Sadd. 2011. "The climate gap: environmental health and equity implications of climate change and mitigation policies in California—A review of the literature." *Climatic Change* 109 (Suppl 1): S485–S503.

[285] U.S. EPA. 2021. Climate Change and Social Vulnerability in the United States: A Focus on Six Impacts. U.S. Environmental Protection Agency. EPA 430-R-21-003.

[286] CDPH. 2022. Climate Change and Health Vulnerability Indicators for California. California Department of Public Health. *https://www.cdph.ca.gov/Programs/OHE/Pages/CC-Health-Vulnerability-Indicators.aspx*.

environmental factors affecting health outcomes and the many groups that are vulnerable to increased effects or that experience health inequities in California (see Table 3-13).

Table 3-13: Examples of vulnerable groups due to socioeconomic, environmental, developmental, and climate change factors

Examples of Vulnerable Groups Due to Socioeconomic, Environmental, Developmental, and Climate Change Factors		
Older People	People with Existing Chronic Illness	People Impacted Due to Working Conditions
Tribal Groups	Infants and Children	Low-Income People
People with Disabilities	People Experiencing Homelessness	Pregnant People
Communities of Color	Marginalized People	Immigrants/Refugees
People with Less Educational Options	Linguistically Isolated Households	People Impacted Due to Poor Housing Conditions

Summary of the Qualitative Health Analysis

CARB has developed a detailed health analysis that covers eight social and environmental co-benefit areas that impact public health (listed below). These co-benefit areas were selected due to ongoing research in these areas as well as discussion in a public workshop on climate change and health impacts held in summer 2018. For each social and environmental area, the analysis includes:

- a discussion of health impacts and disparities,
- key health metrics or epidemiological research on this topic,
- a discussion of how these areas would be affected by "no-action" (i.e., Reference) scenario compared to a "take-action" (i.e., Scoping Plan) scenario
- a discussion of where there are actions to consider for further success, and
- the types of mitigation actions that can help reduce or eliminate disparities and promote greater health equity and resilience.

All co-benefit areas are interconnected, and pursuing benefits in all areas has the potential to multiply positive results and further support building community resilience. *Community resilience* is the ability of a community to reduce harm and maintain an acceptable quality of life in the face of climate-induced stresses, which vary depending on that community's circumstances and location. Below is a brief description of the areas evaluated for public health co-benefits. The specific health outcomes impacted by each

area, as well as the directional health benefits, are included in the Summary of Health Benefits section of the chapter and covered in more detail in Appendix G (Public Health).

Heat Impacts

Globally, increased GHG concentrations in the atmosphere are causing a continuing increase of the planet's average temperature. California temperatures have risen since records began in 1895, and the rate of increase is accelerating. Recent heat waves have broken heat records and caused serious illness across the state, and these events are becoming more frequent. Heat waves have a particularly high impact in Southern California, where they have become more intense and longer lasting. In the past two years, Los Angeles recorded 121°F, and the Coachella Valley had its hottest year ever, with temperatures reaching 123°F. Heat island effects in urbanized areas can elevate heat effects and disproportionately affect low-income communities and communities of color. Heat events exacerbate respiratory and cardiac illness and cause emergency room visits to soar. Strategies that reduce the impacts of heat exposure promote improved health outcomes.

Wildfires and Smoke

California's NWL cover more than 90 percent of California and include rangeland, forests, woodlands, grasslands, and urban green space. They provide biodiversity and ecosystem benefits, including their ability to sequester carbon from the atmosphere. Protecting and managing California's forests and other natural lands and maintaining their ecosystem health are key practices for maximizing GHG benefits and minimizing negative climate change impacts. Vegetation plays an important role in storing carbon; however, it can also release CO_2 back into the atmosphere when it dies or is burned by fires. California's wildfires are getting worse with increased fire risks, higher frequency of occurrence, larger burn areas, more costly damage, and a longer fire season due to climate change. Strategies that promote healthy ecosystem management of natural and working lands and increased urban greening promote improved health outcomes. Healthy ecosystems provide many health and environmental benefits and can maximize carbon sequestration.

Children's Health and Development

There are a wide range of interconnected environmental, social, biological, and community factors associated with climate change that are adversely affecting children's health. This section focuses on air pollution and near-roadway or traffic pollution as environmental impacts that have a profound effect on children's health. Children's bodies and lungs are still developing, and they take in more air per body weight than adults do. Many low-income communities and communities of color in California experience disproportionately high levels of air pollution, as well as high levels of traffic and freight that impact children. This excess exposure harms children's development and

predisposes them to increased risk of illness throughout their lives. Strategies that reduce air pollution and traffic emissions promote improved health outcomes for children.

Economic Security

Climate change is expected to result in serious adverse socioeconomic effects across many sectors. Economic factors, such as income inequality (among geographic regions), poverty, wealth, debt, unemployment rate, and job security are among the strongest determinants of health. Along the entire income spectrum, higher income is associated with increased life expectancy and improved health outcomes in the United States. Additionally, economic insecurity and negative health impacts are more pronounced in low-income communities and communities of color. Economic strategies, such as the promotion of clean energy and other green jobs and investments in low-income communities and communities of color, and promoting a transition to high road jobs in economic sectors tied to the current fossil fuel economy, can promote improved health outcomes.[287]

Food Security

The food system is under pressure from numerous factors, and climate change is a key concern. Climate change can affect food production and agricultural yield, impact culturally significant plants and animals for Native American tribes, and exacerbate factors that limit food availability, such as supply chain disruption. Food security is defined as stable access to affordable, sufficient food for an active, healthy life. Many Californians routinely experience food insecurity, and while that impacts Californians of all races and groups, low-income communities and communities of color and children are disproportionately affected by food insecurity. Many Native Americans depend on resources from the land, such as animals and plants for consumption and cultural practices. Strategies that promote sustainable agriculture, access to healthy foods, and reduced organic food waste promote improved health outcomes.

Mobility and Physical Activity

Physical activity is one of the most important factors for a healthy lifestyle, and lack of activity increases the risk of chronic illness and premature death. Research shows that regular physical activity improves health in people of all ages by improving heart and lung

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[287] According to the California Labor and Workforce Development Agency's High Road Training Partnership program, high road jobs are considered "Quality jobs [that] provide family-sustaining wages, health benefits, a pension, worker advancement opportunities, and collective worker input and are stable, predictable, safe and free of discrimination." *https://cwdb.ca.gov/wp-content/uploads/sites/43/2020/08/OneSheet_Job-Quality_ACCESSIBLE.pdf*.

function, muscle fitness, mental health and brain function, and sleep quality. A sedentary lifestyle contributes to chronic illnesses, including obesity, heart disease, and Type 2 diabetes among other chronic illnesses. Promoting community design that supports sustainable patterns of land use and transportation enables active transportation choices like walking, biking, and public transit over driving, and can significantly increase physical activity, leading to many valuable health benefits.

Affordable Housing

Housing is an important social determinant of health. The stability of housing, housing quality, conditions inside and outside the home, the cost of housing, and the environmental and social characteristics of the places people live all affect health (including energy efficiency and insulation, cooler building material, tree canopy, home size). Housing affordability is a key factor, and this section highlights how housing affordability supports not only improved health but also more sustainable land use and transportation patterns. A lack of affordable housing is increasing commute distances for low-income renters and creating health burdens. Strategies that support sustainable transportation and housing patterns, together with increased housing affordability, promote improved health outcomes.

Urban Greening

Urban Greening is well recognized as an important amenity, but the inherent health benefits are not always well understood. Under-resourced and vulnerable areas consistently show a lack of urban greening and higher percentages of concrete, asphalt, and impervious surfaces. Under-resourced communities have a greater proportion of concrete and heat-trapping surfaces and a lower amount of tree cover in the neighborhoods in which they live. Areas with reduced urban greening have the potential to create areas of higher temperatures as heat is reflected from pavements and buildings. By contrast, increasing urban greening can provide air pollution buffers and promote physical activity. Strategies that preserve and create urban parks, green space, natural infrastructure, and sustainable agricultural practices support improved physical and mental health outcomes.

No Action Scenario (Reference)

In a no-action scenario, California would remain dependent on fossil fuels and other GHG emitting technologies. Fossil-fuel powered mobile sources including cars, trucks, trains, tractors, and a myriad of other on-road and off-road vehicles and equipment are the largest source of criteria pollutants and toxic air contaminants that directly affect

community health and contribute the largest portion of GHG emissions.[288] Other key GHG emission sources include buildings, natural and working lands, and power production and industry. The no-action scenario reflects a continued reliance on fossil fuels in mobile and stationary sectors, including buildings. The continued production and use of fossil fuels; ongoing dependence on gasoline and diesel cars, trucks, buses, and equipment; continued releases of short-lived climate pollutants; and decreased emphasis on forest and ecosystem health will impact communities by reducing climate resilience and health benefits. Green space will likely remain at the same levels or degrade, and urban heat islands will likely increase. With continued growth of vehicle miles traveled, physical activity and the accompanying health benefits will not increase.

Exposure to wildfire smoke will increase, and air quality is expected to worsen as rising temperatures will increase levels of harmful air pollution. Jobs and economic security will be affected by the continuing potential for price spikes in fossil fuels, impacts to the economy from climate change, and fewer job opportunities in green technologies such as solar and electric vehicles. Food security in California will decrease due to the effects of accelerating climate impacts to agriculture; and without increased recovery of organic waste, including food products, food security will continue to decline under a no action scenario. All these impacts can be linked to worse health outcomes. Adverse health impacts are often most felt by Black, Latino, Native American, and other people of color and in low-income communities. These groups are affected more intensely by the physical stress of environmental pollution, social inequities, and the psychological stress of extreme weather events and food and economic insecurity.

Take Action Scenario

In the Take Action scenario, California will drastically reduce reliance on fossil fuels for motor vehicles, freight, buildings, electricity, or other sectors. This scenario is not a specific scenario within this Scoping Plan but examines the broad outcomes of actions to achieve carbon neutrality in 2045. Implementation of this Scoping Plan would achieve a transition to ZEVs, with 100% sales of light-duty ZEVs by 2035 and 100% sales of zero emission trucks by 2040, along with 30% VMT reductions below 2019 levels by 2045. State and local action that supports sustainable land use and transportation patterns and enables more transit and active transportation will lead to substantial health benefits from physical activity, including reduced illness and deaths.

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[288] CARB. 2022. *California Greenhouse Gas Emissions for 2000 to 2020.* https://ww2.arb.ca.gov/sites/default/files/classic/cc/inventory/2000-2020_ghg_inventory_trends.pdf.

The economic benefits of improved health through active transportation can be modeled using the Healthy Mobility Options Tool (HMOT).[289] In order to demonstrate the important health and economic benefits of VMT reduction, CARB and CDPH used the HMOT to analyze an illustrative trip reduction scenario for 2050 from the California Transportation Plan (CTP). The CTP has a goal of increasing active modes of travel and transit from the current level of 13 percent to a level of 23 percent of all travel trips. While the CTP goal of 23 percent for active modes of travel is not a VMT reduction target, the scenario increases active transportation through a mix of changes in land use planning for increased transportation options, including increases in biking, walking, and transit use, and it helps to show the health benefits of increased active transportation. By achieving the CTP 2050 goals, nearly 8,000 deaths would be avoided in 2050 alone (see Figure 3-14), along with significant reductions in chronic diseases. Achieving this would rank among the top public health accomplishments (see Appendix G [Public Health] for additional modeling results and detailed discussion).

The dramatic reduction in fossil fuel combustion, combined with reductions in VMT and freight and traffic emissions projected in this Scoping Plan will significantly reduce air pollution and its associated health impacts on a statewide basis and in communities near freight sources. Coordinated action strategies will emphasize natural and working lands management changes, including healthy forests, increased vegetative cover, and increased organic farming. Wildfire smoke exposure will reduce significantly with healthy ecosystem management strategies. Since many communities in California are disproportionately impacted by high levels of traffic pollution, the reduction in petroleum fueled vehicles will reduce the additional impacts of living or going to school near historically highly polluting sources. Indoor air quality is also likely to improve through a shift to non-fossil fuel appliances. Concerted state and local action to support sustainable land use and transportation patterns can enable more active transportation with health benefits from physical activity.

[289] ITHIM California. 2020. Transportation Planning for Health, Equity, and Climate Change. *https://skylab.cdph.ca.gov/HealthyMobilityOptionTool-ITHIM/*.

Figure 3-14: Quantified health benefits of active transportation from increased physical activity

*Calculated by the Healthy Mobility Options Tool, active transportation (including walking, rolling, cycling, and taking public transit) from the California Transportation Plan 2050 compared to business as usual for 2050.

Overall community resilience is expected to increase as physical activity and green space increases—potentially decreasing urban heat islands. Efforts to support VMT reduction will include coordination across state agencies on affordable housing measures. Reduced fossil fuel dependence will reduce economic pressure from wildfires, droughts, and price spikes in fossil fuels, especially as more jurisdictions implement plans with similar actions. Investment in sustainable agriculture, healthy forests, urban greening, and clean energy technologies will add sustainable jobs and further promote economic security. More sustainable agriculture and food recovery efforts will add to food security. All these impacts can be linked to wide ranging health benefits, including positive respiratory and cardiovascular effects, healthier birth and brain outcomes, improved mental health indicators, improved life expectancy, reductions in chronic illness and cancers, improved children's health and development, reduced depression, and other benefits. The magnitude of the possible co-benefits is extremely large, especially in areas that are currently the most affected.

Summary of Health Benefits

Below, Tables 3-14 and 3-15 show overall summaries of the directional benefits by co-benefit area estimated for this Scoping Plan. The supporting epidemiological studies used for qualitative or quantitative analysis of each co-benefit area are included in Appendix G (Public Health). Another section of Chapter 3, together with Appendix C (AB 197 Measure Analysis) and Appendix H (AB 32 GHG Inventory Sector Modeling), also includes the quantitative analysis of air pollution related health impacts, including recently added health endpoints for CARB's ongoing analysis.

Table 3-14: Scoping Plan directional benefits for health co-benefit areas (heat, affordable housing, food security, economic security, and urban greening)

	Health Co-benefit Areas*				
Quantitative vs. Qualitative	**Reduced Heat Impacts**	**Increased Affordable Housing**	**Increased Food Security**	**Increased Economic Security**	**Increased Urban Greening**
Research was used for Qualitative Analysis	↓ Mortality ↓ Emergency Room Visits for cardiovascular and respiratory causes and intestinal infections ↓Hospitalization for cardiovascular, respiratory causes ↓ Preterm Birth ↓ Mental Illness	↓ Infectious Disease ↓ Chronic Illness ↓ Asthma ↓ Injuries ↓ Mental Illness ↑ Children's Performance in Schools ↑ Children's Health ↓ Children's Behavioral Problems	↓ Mental Illness ↓ Iron Deficiency ↓ Chronic Diseases ↑ Life Expectancy ↓ Children's Mental Illness ↓ Children's Cognitive Problems ↓ Children's Behavioral Health Problems ↓ Children's Iron Deficiency ↓ Children's Oral Health Problems	↑ Life Expectancy ↑ Health Status ↑ Mental Health	↓ Mortality ↓ Asthma Prevalence ↓ Depression ↓ Adverse Birth Outcomes including low birth weight and small for gestational age ↑ Life Expectancy

*See Appendix G (Public Health) for a table with references to research for each health outcome listed.

Table 3-15: Scoping Plan directional benefits for health co-benefit areas (traffic pollution, wildfire, and active transportation)

	Health Co-benefit Areas*		
Quantitative vs. Qualitative	**Reduced Traffic Pollution**	**Reduced Wildfire Smoke**	**Increased Active Transportation**
Research was used for Quantitative Analysis	↓ Children's Respiratory Outcomes, Hospital Admissions ↓ Children's Respiratory Outcomes, Emergency Room Visits ↓ Children's Asthma Onset ↓ Children's Asthma Symptoms	↓ All-Cause Mortality ↓ Asthma, Hospital Admissions ↓ COPD, Hospital Admissions ↓ All Respiratory Outcomes, Hospital Admissions ↓ Asthma, Emergency Room Visits ↓ All Respiratory Outcomes, Emergency Room Visits ↓ All Cardiac Outcomes, Emergency Room Visits	↓ Cardiovascular Diseases ↓ Colon Cancer ↓ Breast Cancer ↓ Diabetes ↓ Dementia ↓ Lung Cancer ↓ Respiratory Disease ↓ Depression ↑ Traffic Accidents
Research was used for Qualitative Analysis	↑ Children's Lung Function Growth ↓ Children's Bronchitic Symptoms ↓ Children's Impaired Cognitive Development ↓ Children's Adverse Birth Outcomes, including low birth weight and preterm birth		

*See Appendix G (Public Health) for a table with references to research for each health outcome listed.

In summary, the qualitative health analysis of the No-Action versus Take-Action scenarios for this Scoping Plan shows an overwhelming benefit for the state by taking action to move forward to carbon neutrality while continuing efforts to increase health equity and resilience in individual communities. Taking action can improve physical and mental health for adults and children, reduce a range of chronic illnesses, and promote improvements in life expectancy. Development and implementation of actions to achieve the outcomes called for in this Scoping Plan should consider how to engage affected communities in implementation, address the existing health and opportunity gaps, and pursue equitable implementation statewide and locally. This Scoping Plan deployment of clean technology and fuels, together with improved land management, will reduce GHGs and air pollution and create more resilient communities that are better able to prepare for and recover from extreme climate events.

Environmental Analysis

In May 2022, CARB, as the lead agency for the Scoping Plan, released for public review the Draft Environmental Analysis (Draft EA) for this Scoping Plan; it assessed the potential environmental impacts of implementing the Scoping Plan. CARB circulated the Draft EA for public review and comment for a period of 45 days that began on May 10, 2022, and ended on June 24, 2022. CARB held a public hearing on June 23, 2022 to provide the opportunity for public comment. During the review period, written and oral comments were received on the Draft EA. CARB reviewed the comments to identify environmental topics and began preparation of responses to those comments.

After the end of the Draft EA public review period, CARB identified potential revisions to certain aspects of this Scoping Plan that merit revisions to the project description. This new information results from, among other things, revisions to the project description regarding energy sector goals (including offshore wind), revised carbon removal targets, and additional strategies for natural and working lands. CARB released a Recirculated Draft EA for a written public comment period that started September 9, 2022, and ended on October 24, 2022. See Chapter 2 of the Recirculated Draft EA[290] for further information regarding the changes. The Recirculated Draft EA assesses the potential for significant adverse and beneficial environmental impacts associated with all proposed actions in this Scoping Plan, and provides a programmatic environmental analysis of the reasonably foreseeable compliance responses that could result from implementation of the Scoping

[290] CARB. 2022. Recirculated Draft EA. *https://ww2.arb.ca.gov/sites/default/files/2022-09/2022-draft-sp-appendix-b-draft-ea-recirc.pdf*.

Plan.[291] The Recirculated Draft EA concluded implementation of this Scoping Plan could result in the following:

- Beneficial impacts to: air quality (long-term operational-related) and GHG emissions (short-term construction-related and long-term operational-related)
- Less than significant impacts to: energy demand, mineral resources, population and housing, public services, recreation (short-term construction-related), and wildfire (short-term construction-related)
- Potentially significant and unavoidable adverse impacts to: aesthetics, agriculture and forest resources, air quality (construction-related and operational odors), biological resources, cultural resources, geology and soils, hazards and hazardous materials, hydrology and water quality, land use and planning, noise, recreation (long-term operational-related), transportation and traffic, tribal cultural resources, utilities and service systems, and wildfire (long-term operational-related

Before the public meeting at which the Board will consider this Scoping Plan Update, CARB will publish the Final EA as Appendix B (Final Environmental Analysis) to this Scoping Plan, along with written responses to timely submitted comments raising significant environmental issues received on the Draft EA and the Recirculated Draft EA, which will be presented to the Board for consideration.

[291] The Recirculated Draft EA is available at *https://ww2.arb.ca.gov/our-work/programs/ab-32-climate-change-scoping-plan/2022-scoping-plan-documents*.

Chapter 4: Key Sectors

Chapter 4 provides an overview of the major energy sources and technology in use today, and of alternative clean technology and fuels to support decarbonization based on the latest information available. Every sector of the economy will need to begin to transition in this decade to meet our GHG reduction goals and achieve carbon neutrality no later than 2045. AB 32 requires climate change mitigation policies to be considered in the context of the sector's contribution to the state's total GHG emissions. The transportation, electricity (in-state and imported), and industrial sectors are the largest contributors of GHGs in the state and present the largest opportunities for GHG reductions. Actions to reduce fossil fuel combustion in these sectors also can provide critical air pollution reductions in low-income communities and communities of color, which are often located adjacent to these sources. A carbon neutrality framework also elevates the role of CO_2 removal through natural and working lands and mechanical capture and storage. Actions that support energy efficiency, reduced VMT, alternative fuels, and renewable power also can provide benefits by reducing both criteria and toxic air pollutants.

What sets this plan apart from previous Scoping Plans is the focus on the accelerated rate of deployment of clean technology and energy within every sector. As a result, specific actions, including accelerated rates of deployment of clean technology and fuels identified within this Scoping Plan, will need to be translated into both new and amended regulations, policies, and incentive programs. State agencies will need to evaluate current authority to align existing policies or develop new ones to achieve outcomes called for in this Scoping Plan. Legislative support may be needed in some cases to ensure authority and funding is sufficient to ensure this Scoping Plan is translatable to action on the ground. Most regulations, or change to existing regulations, ultimately considered by the Board or other state agencies for adoption will be subject to administrative procedure requirements. Accordingly, they must rely on specific subsequent supporting analysis and extensive public processes and consultations with interested tribes to develop and identify appropriate proposals for effective implementation. For example, any proposal to strengthen the LCFS regulations through amendments increasing the stringency of the carbon intensity (CI) targets would be considered on the basis of a public process, including workshops, and focused environmental, economic, and public health analyses.

Policies that ensure economy-wide investment or program decisions that incorporate consideration of GHG emissions are particularly important. As we pursue GHG reduction targets, we must acknowledge the manner in which built and natural environments are connected, how changes in one may impact the other, and how policy choices in one sector can and do impact other sectors. For example, fostering more compact, transportation-efficient development in infill areas and increasing transportation choices with the goal of reducing VMT not only reduces demand for transportation fuel but also requires less energy for buildings and helps to conserve natural and working lands that

sequester carbon. Therefore, the multiple and often interwoven actions that reduce VMT both reduce emissions from the transportation sector and support reductions needed in other sectors.

Legislation, such as SB 350[292] (De León and Leno, Chapter 457, Statutes of 2015), has recognized the need for CARB, the CEC, and the CPUC to work together to ensure the state's energy and climate goals are integrated in procurement decisions by load serving entities as part of Integrated Resource Plans. Moving forward, it is especially critical that similar approaches are adopted to break down silos across state agencies to ensure policies and programs are aligned with multiple state priorities outlined in this plan. Finally, supportive legislative direction, such as SB 905 that requires CARB to create the Carbon Capture, Removal, Utilization, and Storage Program, may also benefit emerging areas of policy to provide express agency authority and roles for these nascent efforts, including streamlining of permitting, while ensuring that protections for communities are in place.

Unlike previous Scoping Plans that separated out individual economic sectors, this Scoping Plan approaches decarbonization from two perspectives: (1) managing a phasedown of existing energy sources and technology and (2) ramping up, developing, and deploying alternative clean energy sources and technology over time. This approach supports a more comprehensive consideration of our energy infrastructure, the ability to repurpose existing assets, and the need to build new assets. It also provides multiple metrics beyond just the annual AB 32 GHG Inventory to better enable tracking progress. For example, it clearly demonstrates the production and distribution rates of specific types of clean energy, such as adding 4.3 GW of utility solar and 2.5 GW of storage year-over-year between now and 2035 to be on track to achieve carbon neutrality no later than 2045, and does the same for technology deployment, such as 11 million ZEVs in 2035.

The sections below include key actions to support success in the necessary transition away from fossil combustion, which is an overriding goal of this plan. The wide array of complementary and supporting actions being contemplated or to be undertaken across state government are detailed here. The broad view of actions described in this chapter thus provides context for the specific deployment of clean technology and fuels identified in the Scoping Plan Scenario described in Chapter 2. Actions identified in this Scoping Plan are based on currently known options and the latest science. As part of future Scoping Plan updates, additional clean technology and fuels may be identified and added to the mix of needed tools to continue to reduce the state's GHG emissions, support air quality co-benefits, and remove carbon from the atmosphere.

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[292] California Air Resources Board. SB 350 Electricity Sector Greenhouse Gas Planning Targets. https://ww2.arb.ca.gov/our-work/programs/sb350.

Transportation Sustainability

The transportation sector has long relied on liquid petroleum fuels as the primary energy source for internal combustion engine (ICE) vehicles, including cars, trucks, locomotives, marine equipment, and aircraft. Combustion of fossil fuels in vehicles emits significant amounts of GHGs, criteria pollutants, and toxic air contaminants. In 2019,[293] the transportation sector accounted for approximately 50 percent of statewide GHG emissions[294] and thus was by far the single largest source of carbon pollution in the state. In addition, the transportation sector accounted for over 80 percent of statewide NOx emissions and 30% of fine particulate matter emissions, including toxic diesel particulate matter.[295]

Communities adjacent to congested roadways, including ports and distribution centers, are exposed to the highest concentration of toxic pollutants from vehicles and equipment consuming fossil fuels, leading to a number of demonstrated health impacts such as respiratory illnesses, higher likelihood of cancer development, and premature death. In addition, communities located near oil extraction operations or crude oil refineries often experience higher exposure to poor air quality. While CARB's programs, along with local action, have made substantial progress over the past few decades, it is clear that California must transition away from fossil fuels to zero-emission technologies with all possible speed and pursue policies that result in less driving, in order to meet our GHG and air quality targets.

The transportation sector can be divided into three general categories: Technology, Fuels, and Vehicle Miles Traveled.

- *Technology* refers to the vehicles themselves, as well as the associated refueling infrastructure for those vehicles.
- *Fuels* refers to the energy source used to power vehicles and the facilities that produce them.
- Vehicle travel is measured as *vehicle miles traveled* (VMT), and is a product of development patterns and available transportation options.

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[293] In 2020 the state experienced shelter-in-place orders in response to the COVID-19 pandemic. The orders, and the effects of the pandemic, led to a significant year-over-year decline in transportation emissions in 2020. This means 2019 is likely a more representative year for overall transportation emissions and 2020 a likely outlier in the historical transportation emissions trend data.
[294] CARB. 2022. *California Greenhouse Gas Emissions for 2000 to 2020.* *https://ww2.arb.ca.gov/sites/default/files/classic/cc/inventory/2000-2020_ghg_inventory_trends.pdf*. This includes upstream oil extraction and refining emissions.
[295] CARB. California Greenhouse Gas Emission Inventory Program. *https://ww2.arb.ca.gov/our-work/programs/ghg-inventory-program*.

Sector Transition

Technology

Vehicles must transition to zero emission technology to decarbonize the transportation sector. Executive Order N-79-20[296] reflects the urgency of transitioning to zero emission vehicles (ZEVs) by establishing target dates for reaching 100 percent ZEV sales or fleet transitions to ZEV technology. The primary ZEV technologies available today are battery-electric and hydrogen fuel cell electric vehicles (FCEVs), both of which emit zero tailpipe GHGs, criteria pollutants, and toxic air contaminants, as they do not burn fuel. These vehicles are rapidly growing in performance, affordability, and popularity.[297] Plug-in hybrid electric vehicles also offer a limited but increasing range of zero emission operation and will play a role in the transition to ZEVs.

Light-duty passenger vehicles consume the majority of gasoline in the state—12.9 billion gallons in 2019[298]—and are well-suited for transitioning to ZEVs. EO N-79-20 calls for 100 percent ZEV sales of new light-duty vehicles by 2035, and this target is reflected in this Scoping Plan.[299] The Advanced Clean Cars II regulation fulfills the goal in the Executive Order and serves as the primary mechanism to help deploy ZEVs. A number of existing incentive programs also support this transition, including the Clean Cars 4 All Program.[300] Heavy-duty trucks are the largest source of diesel particulate matter, a toxic air contaminant that is directly linked to a number of adverse health impacts, and EO N-79-20 also sets targets for transitioning the medium- and heavy-duty fleet to zero emissions: by 2035 for drayage trucks and by 2045 for buses and heavy-duty long-haul trucks where feasible. Replacing heavy-duty vehicles with ZEV technology will significantly reduce GHG emissions and diesel PM emissions in low-income communities and communities of color adjacent to ports, distribution centers, and highways. The existing Advanced Clean Trucks regulation, paired with the proposed Advanced Clean Fleets regulation, are designed to transition a significant amount of the

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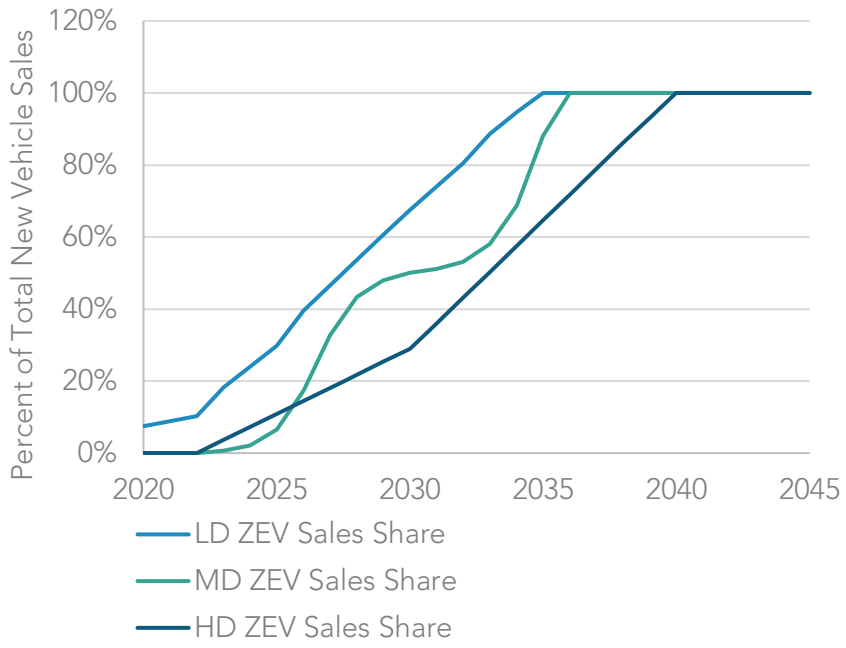
[296] Executive Department. State of California. Executive Order N-79-20. *https://www.gov.ca.gov/wp-content/uploads/2020/09/9.23.20-EO-N-79-20-Climate.pdf*.
[297] CARB. 2021. Public Workshop for Advanced Clean Cars II. May 6. *https://ww2.arb.ca.gov/sites/default/files/2021-05/acc2_workshop_slides_may062021_ac.pdf*.
[298] CARB. 2022. *Fuel Activity for California's Greenhouse Gas Inventory by Sector and Activity.* *https://ww2.arb.ca.gov/sites/default/files/classic/cc/inventory/fuel_activity_inventory_by_sector_all_00-20.xlsx*.
[299] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, F1A, with reference to the date at which all new vehicle sales are ZEVs. *finalejacrecs.pdf (arb.ca.gov)*.
[300] CARB. Clean Cars 4 All. *https://ww2.arb.ca.gov/our-work/programs/clean-cars-4-all*. The Clean Vehicle Rebate Project (CVRP) also supports the transition to ZEVs. *https://cleanvehiclerebate.org/en*.

California truck fleet to ZEV technology. As with the LDV sector, a number of incentive programs support this transition, such as the Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project (HVIP).[301]

Figure 4-1 below illustrates the pace of transition in vehicle technology needed to drastically reduce GHG emissions from vehicles. All vehicle classes reach 100 percent ZEV sales before 2045, with some achieving this well before. The ZEV technology across the vehicle classes is assumed to be primarily battery electric and hydrogen fuel cell (reflecting the primary ZEV technologies available today).[302]

Figure 4-1: Transition of on-road vehicle sales to ZEV technology in the Scoping Plan Scenario



Today, off-road vehicles also rely heavily on ICE technology. Executive Order N-79-20 sets an off-road equipment target of transitioning the entire fleet to ZEV technology by 2035, where feasible. There is a great need for both investment and innovation in the off-road space in order to develop and commercialize zero emission equipment types that meet or exceed the performance of existing equipment. A number of funding sources currently support this transition, including programs such as FARMER, Carl Moyer, and

[301] California HVIP. Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project. https://californiahvip.org/?msclkid=efaf65f2c26f11eca6bdd08ecc323864.

[302] The light-duty fleet includes more than 11 million battery electric and hydrogen fuel cell vehicles in 2035 and over 23 million battery electric and hydrogen fuel cell vehicles in 2045.

the Community Air Protection Incentives—as well as Low Carbon Transportation Incentives, including the Clean Off-Road Equipment (CORE) program. In addition, the 2021–22 California budget provided record-high allocations for funding ZEVs, including off-road equipment, and the 2022–23 budget is similarly ambitious.[303] Several regulations focused on transitioning to zero emission off-road equipment have recently been adopted or are in the works, and apply to locomotives,[304] forklifts, ocean-going vessels at berth,[305] commercial harbor craft,[306] small off-road engines,[307] and more.

Intrastate aviation relies on ICE technology today, but battery-electric and hydrogen fuel cell aviation applications are in development, along with sustainable aviation fuel. The Scoping Plan Scenario includes a transition of 20% of aviation fuel demand to ZEV technologies by 2045 and sustainable aviation fuel for the rest.

Refueling infrastructure is a crucial component of transforming transportation technology. Electric vehicle chargers and hydrogen refueling stations must become easily accessible for all drivers to support a wholesale transition to ZEV technology. Deployment of ZEV refueling infrastructure is currently supported by a number of existing local and state public funding mechanisms, the new National Electric Vehicle Infrastructure (NEVI) federal funding mechanism, California's electric utilities, the Electrify America initiative that was established in response the Volkswagen ZEV commitment, and by numerous companies, such as EVgo, ChargePoint, Tesla, Ford, FirstElement Fuel, Chevron, Shell, and Iwatani, who are investing substantial private resources into developing these networks. Private investment in reliable, affordable and ubiquitous refueling infrastructure must drive the transition as the business case for ZEVs continues to strengthen.

Strategies for Achieving Success

- Achieve 100 percent ZEV sales of light-duty vehicles by 2035[308] and medium-heavy-duty vehicles by 2040.
- Achieve a 20% zero emission target for the aviation sector.

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[303] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, F1C. CARB and the Administration are committed to increasing focus on transportation equity investment as was reflected in the governor's 2022–23 budget. *finalejacrecs.pdf (arb.ca.gov)*.
[304] CARB. Reducing Rail Emissions in California. *https://ww2.arb.ca.gov/our-work/programs/reducing-rail-emissions-california*.
[305] CARB. Ocean-Going Vessels At Berth Regulation. *https://ww2.arb.ca.gov/our-work/programs/ocean-going-vessels-berth-regulation*.
[306] CARB. CARB passes amendments to commercial harbor craft regulation. *https://ww2.arb.ca.gov/news/carb-passes-amendments-commercial-harbor-craft-regulation*.
[307] CARB. Small Off-Road Engines (SORE). *https://ww2.arb.ca.gov/our-work/programs/small-off-road-engines-sore*.
[308] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, F1A. *finalejacrecs.pdf (arb.ca.gov)*.

- Develop a rapid and robust network of ZEV refueling infrastructure to support the needed transition to ZEVs.
- Ensure that the transition to ZEV technology is affordable for low-income households and communities of color, and meets the needs of communities and small businesses.[309]
- Prioritize incentive funding for heavy-duty ZEV technology deployment in regions of the state with the highest concentrations of harmful criteria and toxic air contaminant emissions.[310]
- Promote private investment in the transition to ZEV technology, undergirded by regulatory certainty such as infrastructure credits in the Low Carbon Fuel Standard for hydrogen and electricity[311] and hydrogen station grants from the CEC's Clean Transportation Program[312] pursuant to Executive Order B-48-18.[313]
- Evaluate and continue to offer incentives similar to those through FARMER,[314] Carl Moyer,[315] the Clean Fuel Reward Program,[316] the Community Air Protection Program,[317] and Low Carbon Transportation,[318] including CORE.[319] Where feasible, prioritize and increase funding for clean transportation equity programs.[320]
- Continue and accelerate funding support for zero emission vehicles and refueling infrastructure through 2030 to ensure the rapid transformation of the transportation sector.

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[309] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, NF6, in the context of communities. *finalejacrecs.pdf (arb.ca.gov)*.
[310] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, NF7. *finalejacrecs.pdf (arb.ca.gov)*.
[311] CARB. LCFS ZEV Infrastructure Crediting. *https://ww2.arb.ca.gov/resources/documents/lcfs-zev-infrastructure-crediting*.
[312] CEC. Clean Transportation Program. *https://www.energy.ca.gov/programs-and-topics/programs/clean-transportation-program*.
[313] EO B-48-18 calls for 200 hydrogen refueling stations by 2025. *https://www.library.ca.gov/wp-content/uploads/GovernmentPublications/executive-order-proclamation/39-B-48-18.pdf*.
[314] CARB. FARMER program. *https://ww2.arb.ca.gov/our-work/programs/farmer-program*.
[315] CARB. Carl Moyer program. *https://ww2.arb.ca.gov/our-work/programs/carl-moyer-memorial-air-quality-standards-attainment-program*.
[316] California Clean Fuel Reward Program. *https://cleanfuelreward.com/*.
[317] CARB. Community Air Protection Program. *https://ww2.arb.ca.gov/capp*.
[318] CARB. Low Carbon Transportation Investments and Air Quality Improvement Program. *https://ww2.arb.ca.gov/our-work/programs/low-carbon-transportation-investments-and-air-quality-improvement-program*.
[319] Clean Off-Road Equipment (CORE) Voucher Incentive Program. *https://californiacore.org/*.
[320] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, F1C. *finalejacrecs.pdf (arb.ca.gov)*.

- Evaluate and align with this Scoping Plan relevant CARB policies such as Advanced Clean Cars II,[321] Innovative Clean Transit,[322] Zero Emission Airport Shuttle,[323] California Phase 2 GHG Standards,[324] Advanced Clean Trucks, Advanced Clean Fleets, Zero Emission Forklifts,[325] In-use Locomotives,[326] the Off-Road Zero-Emission Targeted Manufacturer rule, Clean Off-Road Fleet Recognition Program, In-use Off-Road Diesel-Fueled Fleets Regulation,[327] Commercial Harbor Craft,[328] Off-Road Zero-Emission Targeted Manufacturer rule, Clean Off-Road Fleet Recognition Program, Amendments to the In-use Off-Road Diesel-Fueled Fleets Regulation,[329] carbon pricing through the Cap-and-Trade Program,[330] and the Low Carbon Fuel Standard.[331]
- Identify and address permitting and market barriers to successful rapid ZEV technology deployment while protecting public health and the environment.

Fuels

Transitioning away from conventional ICE vehicles is part of the solution, but we must ensure that an adequate supply of zero-carbon alternative fuel and distribution is available to power these vehicles. Electricity and hydrogen are currently the primary fuels for ZEVs,

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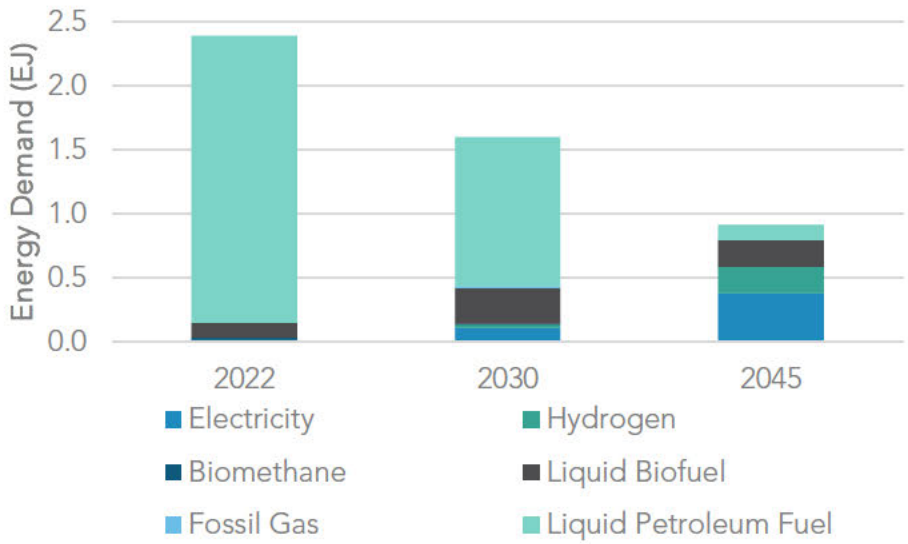
[321] CARB. Advanced Clean Cars Program. *https://ww2.arb.ca.gov/our-work/programs/advanced-clean-cars-program*. Cal. Code Regs., tit. 13, §§ 1900, 1961.2, 1961.3, 1961.4, 1962.2, 1962.3, 1962.4, 1962.5, 1962.6, 1962.7, 1962.8, 1965, 1968.2, 1969, 1976, 1978, 2037, 2038, 2112, 2139, 2140, 2147, 2317, 2903.
[322] CARB. Innovative Clean Transit. *https://ww2.arb.ca.gov/our-work/programs/innovative-clean-transit*. Cal. Code Regs., tit. 13, §§ 2023—2023.11.
[323] CARB. Zero-Emission Airport Shuttle. *https://ww2.arb.ca.gov/our-work/programs/zero-emission-airport-shuttle*. Cal. Code Regs., tit. 17, §§ 95690.1—95690.8.
[324] CARB. California Phase 2 Greenhouse Gas Standards. *https://ww2.arb.ca.gov/our-work/programs/greenhouse-gas-standards-medium-and-heavy-duty-engines-and-vehicles/phase2*. Cal. Code Regs., tit. 13, §§ 1956.8 and 2036; and Cal. Code Regs., tit. 17, §§ 95301, 95302, 95303, and 95663.
[325] CARB. Zero-Emission Forklifts. *https://ww2.arb.ca.gov/our-work/programs/zero-emission-forklifts*. Cal. Code Regs., tit. 17, §§ 95690.1—95690.8.
[326] CARB. Reducing Rail Emissions. *https://ww2.arb.ca.gov/our-work/programs/reducing-rail-emissions-california*. Proposed Cal. Code Regs., tit. 13, §§ 2478—2478.16.
[327] CARB. In-use Off-Road Diesel-Fueled Fleets Regulation. *https://ww2.arb.ca.gov/our-work/programs/use-road-diesel-fueled-fleets-regulation*. Cal. Code Regs., tit. 13, §§ 2449, 2449.1, 2449.2.
[328] CARB. Commercial Harbor Craft. *https://ww2.arb.ca.gov/our-work/programs/commercial-harbor-craft*. Cal. Code Regs., tit. 13, § 2299.5.
[329] CARB. In-use Off-Road Diesel-Fueled Fleets Regulation. *https://ww2.arb.ca.gov/our-work/programs/use-road-diesel-fueled-fleets-regulation*.
[330] CARB. Cap-and-Trade Program. *https://ww2.arb.ca.gov/our-work/programs/cap-and-trade-program*. Cal. Code Regs., tit. 17, §§ 95801 et seq.
[331] CARB. Low Carbon Fuel Standard. *https://ww2.arb.ca.gov/our-work/programs/low-carbon-fuel-standard*. Cal. Code Regs., tit. 17, §§ 95480 et seq.

and both fuels must be produced using low-carbon technology and feedstocks to minimize upstream emissions.

The transition to complete ZEV technology will not happen overnight. Conventional ICE vehicles from legacy fleets will remain on the road for some time, even after all new vehicle sales have transitioned to ZEV technology. In addition, some equipment types are only now in the initial stages of development of ZEV technology for propulsion, such as commercial aircraft or ocean-going vessels. In addition to building the production and distribution infrastructure for zero-carbon fuels, the state must continue to support low-carbon liquid fuels during this period of transition and for much harder sectors for ZEV technology such as aviation, locomotives, and marine applications. Biomethane currently displaces fossil fuels in transportation and will largely be needed for hard-to-decarbonize sectors but will likely continue to play a targeted role in some fleets while the transportation sector transitions to ZEVs. Figure 4-2 provides the detail on fuels used in 2020 and the fuel mix under the Scoping Plan Scenario for 2035 and 2045.

Figure 4-2: Transportation fuel mix in 2022, 2030, and 2045 in the Scoping Plan Scenario[332]



Private investment in alternative fuels will play a key role in diversifying the transportation fuel supply away from fossil fuels. The Low Carbon Fuel Standard is the primary mechanism for transforming California's transportation fuel pool with low-carbon

[332] See https://ww2.arb.ca.gov/sites/default/files/2022-11/2022-sp-PATHWAYS-data-E3.xlsx for transportation fuels by year.

alternatives and has fostered a growing alternative fuel market. Partially as a result of the powerful market signals from the LCFS, fuels like renewable diesel, sustainable aviation fuel, biomethane, and electricity have all gained significant market shares and continue to displace gasoline and diesel in both on- and off-road vehicles. In addition, Executive Order N-79-20 calls on state agencies to support the transition of existing fuel production facilities away from fossil fuels and directs that this transition also protect and support workers, public health, safety, and the environment. In line with this direction, existing refineries could be repurposed to produce sustainable aviation fuel, renewable diesel, and hydrogen. This trend has already begun, and continuing to develop fuel production capacity in-state to support the energy transition while making the most efficient use of existing assets is critical to avoiding emissions leakage. If fuel demand persists after fuel production facilities have ceased operations, fuel demand will have to be met through imports.

As we transition or build new energy production facilities and infrastructure, it will be important to ensure low-income communities, tribes, and communities of color do not experience increases in existing air pollution disparities and continue to experience a reduction in the air pollution disparities that exist today. California must use the best available science to ensure that raw materials used to produce transportation fuels do not incentivize feedstocks with little to no GHG reductions from a life cycle perspective. A dramatic increase in alternative fuel production must not come at the expense of global deforestation, unsustainable land conversion, or adverse food supply impacts, to name a few examples. CARB will continue to monitor scientific findings on these topics to ensure that California policies, such as the LCFS, send the appropriate market signals and do not result in unintended consequences.[333]

Strategies for Achieving Success

- Accelerate the reduction and replacement of fossil fuel production and consumption in California.[334]
- Incentivize private investment in new zero-carbon fuel production in California.
- Incentivize the transition of existing fuel production and distribution assets to support deployment of low- and zero-carbon fuels while protecting public health and the environment.
- Invest in the infrastructure to support reliable refueling for transportation such as electricity and hydrogen refueling.

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[333] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, F1E. finalejacrecs.pdf (arb.ca.gov).
[334] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, F3. finalejacrecs.pdf (arb.ca.gov).

- Evaluate and propose, as needed, changes to strengthen the Cap-and-Trade Program.
- Initiate a public process focused on options to increase the stringency and scope of the LCFS:
    - Evaluate and propose accelerated carbon intensity targets pre-2030 for LCFS.
    - Evaluate and propose further declines in LCFS post-2030 carbon intensity targets to align with this 2022 Scoping Plan.
    - Consider integrating opt-in sectors into the program.
    - Provide capacity credits for hydrogen and electricity for heavy-duty fueling.
- Monitor for and ensure that raw materials used to produce low-carbon fuels or technologies do not result in unintended consequences.[335]

Vehicle Miles Traveled

Transforming the transportation sector goes beyond phasing out combustion technology and producing cleaner fuels. Managing total demand for transportation energy by reducing the miles people need to drive on a daily basis is also critical as the state aims for a sustainable transportation sector in a carbon neutral economy. Though GHG emissions are declining due to cleaner vehicles and fuels, rising VMT can offset the effective benefits of adopted regulations.

Even under full implementation of Executive Order N-79-20 and CARB's Advanced Clean Cars II Regulations, with 100 percent ZEV sales in the light-duty vehicle sector by 2035, a significant portion of passenger vehicles will still rely on ICE technology, as demonstrated in Figure 4-2 above. Accordingly, VMT reductions will play an indispensable role in reducing overall transportation energy demand and achieving the state's climate, air quality, and equity goals. After a significant pandemic-induced reduction in VMT during 2020, passenger VMT has steadily climbed back up and is now closing in on pre-pandemic levels.[336] Driving alone with no passengers remains the primary mode of travel in California, amounting to 75 percent of the mode share for daily commute trips. Conversely, the transit industry, which was significantly impacted during

[335] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, F1E. *finalejacrecs.pdf (arb.ca.gov)*.
[336] U.S. Department of Transportation. 2021. December 2021 Traffic Volume Trends. Figure 3 - Seasonally Adjusted Vehicle Miles Traveled by Month. *https://www.fhwa.dot.gov/policyinformation/travel_monitoring/21dectvt/figure3.cfm*.

the lockdown months, and has struggled to recover; ridership only averages two-thirds of pre-pandemic levels,[337] [338] and service levels also lag behind.

Sustained VMT reductions have been difficult to achieve for much of the past decade, in large part due to entrenched transportation, land use, and housing policies and practices. Specifically, historic decision-making favoring single-occupancy vehicle travel has shaped development patterns and transportation policy, generating further growth in driving (and making transit, biking and walking less viable alternatives). These policies have also reinforced long-standing racial and economic injustices that leave people with little choice but to spend significant time and money commuting long distances, placing a disproportionate burden on low-income Californians, who pay the highest proportion of their wages on housing and transportation. While CARB has included VMT reduction targets and strategies in the Scoping Plan and appendices, these targets are not regulatory requirements, but would inform future planning processes. CARB is not setting regulatory limits on VMT in the 2022 Scoping Plan; the authority to reduce VMT largely lies with state, regional, and local transportation, land use, and housing agencies, along with the Legislature and its budgeting choices.

Appendix E (Sustainable and Equitable Communities) elaborates on reasons for reducing VMT and identifies a series of policies that, if implemented by various responsible authorities, could help to achieve the recommended VMT reduction trajectory included in this Scoping Plan (and related mode share increases for transit and active transportation). These policies aim to advance four strategic objectives:

1. Align current and future funding for transportation infrastructure with the state's climate goals, preventing new state-funded projects from inducing significant VMT growth and supporting an ambitious expansion of transit service and other multimodal alternatives.
2. Move funding for transportation beyond the gasoline and diesel taxes and implement fuel-agnostic pricing strategies that accomplish more productive uses of the roadway network and generate revenues to further improve transit and other multimodal alternatives.
3. Deploy autonomous vehicles, ride-hailing services, and other new mobility options toward high passenger-occupancy and low VMT-impact service models that complement transit and ensure equitable access for priority populations.
4. Encourage future housing production and multi-use development in infill locations and other areas in ways that make future trip origins and destinations

[337] U.S. Government Accountability Office. January 25, 2022. During COVID-19, Road Fatalities Increased and Transit Ridership Dipped. *https://www.gao.gov/blog/during-covid-19-road-fatalities-increased-and-transit-ridership-dipped*.
[338] American Public Transportation Association. APTA - Ridership Trends. *https://transitapp.com/APTA*.

closer together and create more viable environments for transit, walking, and biking.

The pace of change to reduce VMT must be accelerated. Certainly, structural reform will be challenging, but California has demonstrated time and again that it possesses the collective leadership and commitment to break away from ideas that no longer represent Californians' values and their aspirations for the many generations to come.

Strategies for Achieving Success

- Achieve a per capita VMT reduction of at least 25 percent below 2019 levels by 2030 and 30 percent below 2019 levels by 2045. [339]
- Reimagine new roadway projects that decrease VMT in a way that meets community needs and reduces the need to drive.
- Invest in making public transit a viable alternative to driving by increasing affordability, reliability, coverage, service frequency, and consumer experience.[340]
- Implement equitable roadway pricing strategies based on local context and need, reallocating revenues to improve transit, bicycling, and other sustainable transportation choices.[341]
- Expand and complete planned networks of high-quality active transportation infrastructure.[342]
- Channel the deployment of autonomous vehicles, ride-hailing services, and other new mobility options toward high passenger-occupancy and low VMT-impact service models that complement transit and ensure equitable access for priority populations.
- Streamline access to public transportation through programs such as the California Integrated Travel Project.
- Ensure alignment of land use, housing, transportation, and conservation planning in adopted regional plans, such as regional transportation plans (RTP)/ sustainable communities strategies (SCS), regional housing needs assessments (RHNA), and local plans (e.g., general plans, zoning, and local transportation plans), and develop tools to support implementation of these plans.

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[339] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, F1D. finalejacrecs.pdf (arb.ca.gov).
[340] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, F1D. finalejacrecs.pdf (arb.ca.gov).
[341] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, F1D. finalejacrecs.pdf (arb.ca.gov).
[342] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, F1F. finalejacrecs.pdf (arb.ca.gov).

- Accelerate infill development and housing production at all affordability levels in transportation-efficient places, with a focus on housing for lower-income residents.

Clean Electricity Grid

Much of the state's success to date in reducing GHGs is due to decarbonization of the electricity sector as a result of the RPS, SB 100 implementation, and the Cap-and-Trade Program. Moving forward, a clean, affordable, and reliable electricity grid will serve as a backbone to support deep decarbonization across California's economy. Under this Scoping Plan, the role of electricity in powering the economy will grow in almost every sector.

In 2021, 70 percent of California electricity demand was served by in-state power plants totaling about 82 GW, with the rest coming from out-of-state imports.[343] Additionally, approximately 8 GW of customer solar photovoltaic capacity has been installed to date to help with in-state demand.[344] Figure 4-3 shows the breakdown of in-state and imported sources of electricity.

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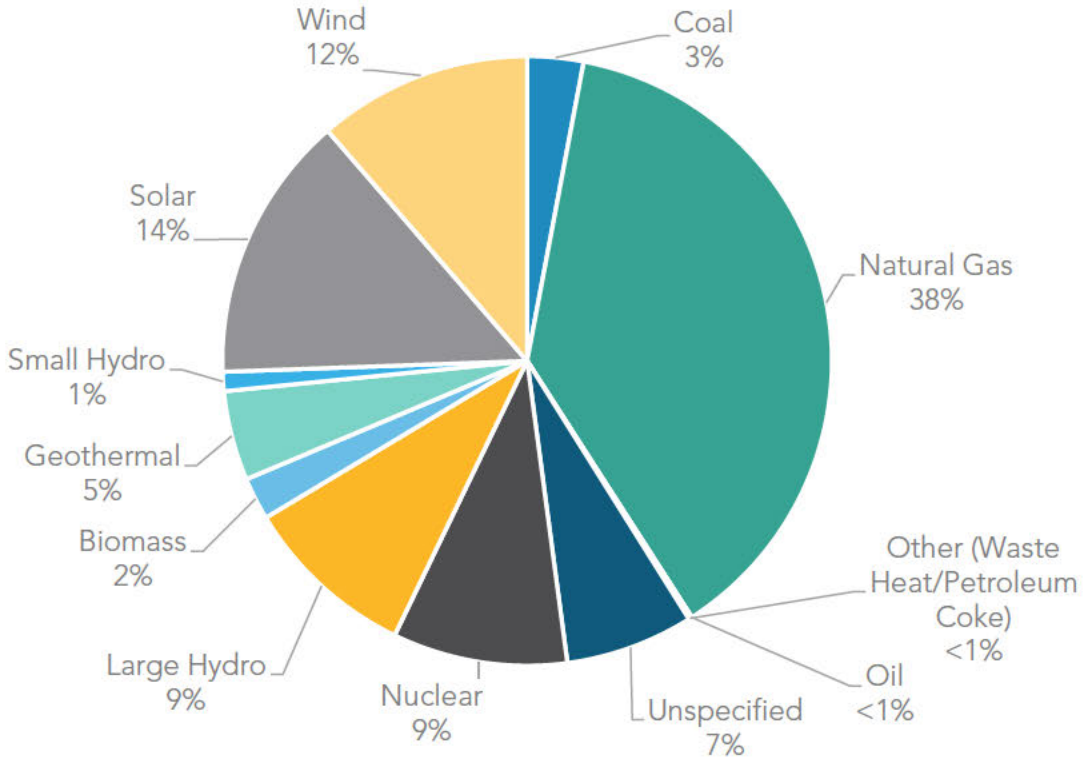
[343] CEC. 2021. Electric Generation Capacity and Energy. Data available at: https://www.energy.ca.gov/data-reports/energy-almanac/california-electricity-data/electric-generation-capacity-and-energy and CEC. 2021. Total System Electric Generation. Data available at: https://www.energy.ca.gov/data-reports/energy-almanac/california-electricity-data/2021-total-system-electric-generation. Capacity values are nameplate capacity from sources 1 MW and larger.

[344] CEC. 2021. *SB 100 Joint Agency Report Summary: Achieving 100% Clean Electricity in California, An Initial Assessment.* 10. https://www.energy.ca.gov/publications/2021/2021-sb-100-joint-agency-report-achieving-100-percent-clean-electricity.

Figure 4-3: 2021 total system electric generation (based on GWh)[345]



Note: Imports contributing to total system generation are comprised of 58% zero-carbon energy and 42% non-renewable and unspecified energy. Percentages do not add to exactly 100 due to rounding.

In 2021, about 48 percent of electricity generation serving California came from non-renewable and unspecified[346] resources, while 52 percent came from renewable and zero-carbon resources. The state's Strategic Reliability Reserve, established in AB 205 to provide additional reliability insurance during extreme events, may make three of the fossil gas-fired OTC plants planned for retirement available to support the grid on a limited basis after 2023. The state also adopted legislation to facilitate extension of the Diablo Canyon Nuclear Power Plant for five years beyond its 2025 planned closure.[347] At the

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[345] *Total system generation* is the sum of all utility-scale, in-state generation, plus net electricity imports. CEC. 2021 Total System Electricity Generation. https://www.energy.ca.gov/data-reports/energy-almanac/california-electricity-data/2021-total-system-electric-generation.

[346] *Unspecified power* refers to electricity that is not traceable to a specific generating facility, such as electricity traded through open market transactions. It typically consists of a mix of resources and may include renewables.

[347] In accordance with SB 846 (Dodd, Chapter 239, Statutes of 2022).

same time, the state continues to rapidly expand deployment of clean energy generation and storage resources and plan for increased electrification.[348] This is critical to reducing GHG emissions and addressing the long-term impacts of climate change.

Climate change is causing unprecedented stress on California's energy system—driving high demand and constraining supply. Heat, drought, and wildfires can both reduce electricity supply from reductions in hydropower generation and impacts on generation and transmission performance, and increase demand, especially in the evening hours when solar generation is declining.

California has experienced three straight years of energy reliability challenges, including a multi-day extreme heat event across the western United States with temperatures up to 20 degrees above normal in California, resulting in rotating outages in August 2020. In 2021, heat waves in June prompted a Grid Warning and the onset of emergency conditions, and the Bootleg Fire caused the loss of one transmission line, reducing import capability by 3,000 megawatts into the California Independent System Operator (CAISO) balancing authority area. And from August 31–September 9, 2022, a 10-day extreme heat event resulted in an unprecedented, sustained period of high peak loads in the CAISO system, averaging 47,000 MW and maxing at an all-time record of over 52,000 MW on September 6. The Western region also hit its record peak load on September 6, at 167.5 GW.

Reliable electricity service was maintained throughout the 10-day September 2022 heat wave in spite of the record breaking load levels. Factors that contributed to this outcome include the installation of over 3,500 MW of lithium-ion battery storage since summer 2020, enhanced coordination and communication within and outside of California, engagement with customer groups and other stakeholders, state actions to reduce load during critical times, and the additional capacity provided through the Strategic Reliability Reserve and other new state programs authorized in the 2022 Budget to provide load reduction and support the grid in extreme events. CEC, CPUC, CAISO, and the California Department of Water Resources will continue to build out strategies to enhance reliability in light of the increasing and compounding impacts of climate change on the electricity system.

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[348] In June 2021, the CPUC adopted D.21-06-035 directing procurement of 11,500 MW of new capacity between 2023 and 2026 to ensure systemwide electric reliability as Diablo Canyon and several OTC facilities retire. It requires that, out of the 11,500 MW, 2,500 MW must be from zero-emission resources. Additionally, 2,000 MW must be long lead-time resources, with at least 1,000 MW of long-duration storage and 1,000 MW of firm capacity with zero on-site emissions or that qualifies under the RPS eligibility requirements.

While the electricity sector is using less fossil fuel due to increasing amounts of renewables,[349] existing fossil gas generation will continue to play a critical role in grid reliability until other clean, dispatchable alternatives can be deployed at scale. The integration of greater amounts of variable renewable generation resources[350] is changing power system planning and operations, and system operators need resources with flexible attributes to balance shifting supply and demand.

High levels of solar generation can lead to instances of oversupply during the middle of the day, when the sun is brightest.[351] In the evening hours, as the sun is setting, solar generation declines to zero and customers with solar generation shift back to the electric grid. In hot weather, customer demand remains high well into the summer evening period to power air conditioning, which can lead to reliability challenges.[352]

Figure 4-4 shows the energy sources used throughout one summer day in July. Renewable energy is consistent during the middle of the day, but it cannot meet all of the evening demand in the gray area. As illustrated in the figure, fossil gas generation is currently a resource that is typically ramped up to meet this evening demand as solar production begins to drop and electrical loads increase To help address this challenge, resource installations that pair solar with batteries, as well as a greater amount of battery build-out, are coming online currently and over the next five years. Nevertheless, the state's electricity grid is expected to be stressed further in the coming years by heat waves, drought, wildfires, and the growing intermittent power supply from renewables. California must accelerate deployment of diverse clean energy resources to maintain reliability and affordability in the face of climate change.

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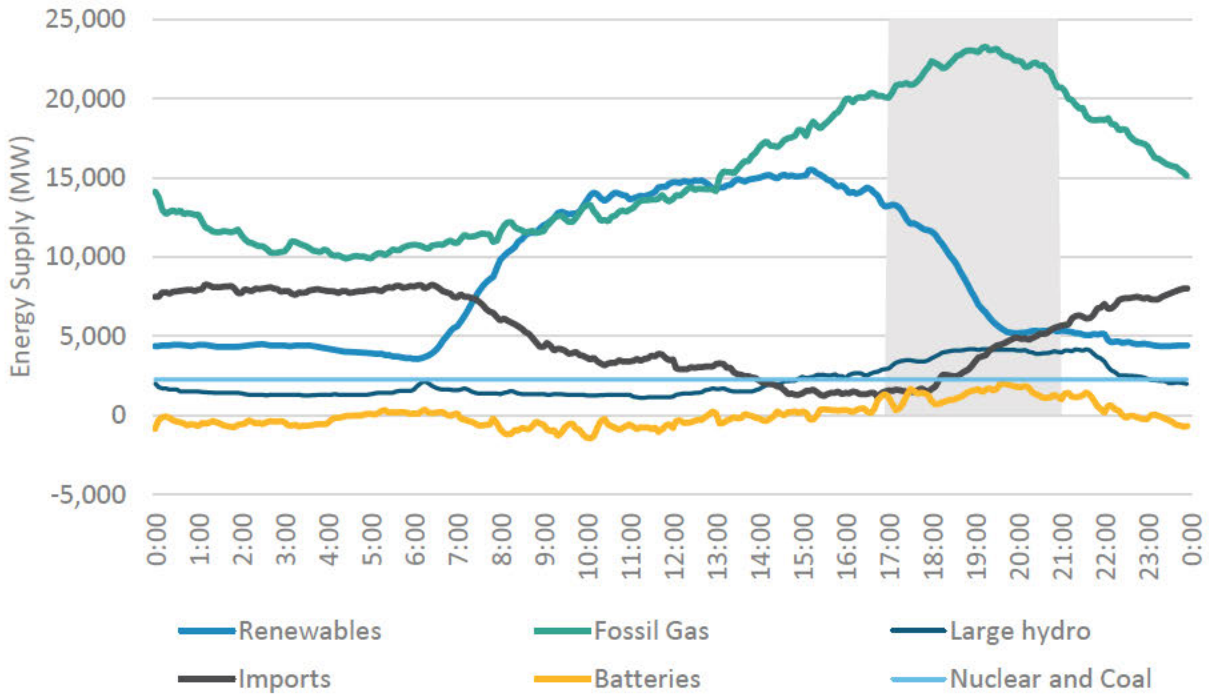
[349] CARB. 2022. *California Greenhouse Gas Emissions for 2000 to 2020.* https://ww2.arb.ca.gov/sites/default/files/classic/cc/inventory/2000-2020_ghg_inventory_trends.pdf.

[350] A *variable renewable generation resource* is a renewable source of electricity that is non-dispatchable due to its fluctuating nature and only produces electricity when weather conditions are right, such as when the sun is shining or the wind is blowing. Renewable resources that can be controlled and are dispatchable include geothermal, biomass, and dam-based hydroelectric power.

[351] *Brightness* is used colloquially here; solar energy depends on insolation (e.g., sun-hours), which is the measurement of cumulative solar energy that reaches an area over a period of time.

[352] CAISO, CPUC, and CEC. 2021. *Final Root Cause Analysis: Mid-August 2020 Extreme Heat Wave.* http://www.caiso.com/Documents/Final-Root-Cause-Analysis-Mid-August-2020-Extreme-Heat-Wave.pdf.

Figure 4-4: Electricity supply trend by resource for a California summer day, July 2022



Sector Transition

Decarbonizing the electricity sector is a crucial pillar of this Scoping Plan. It depends on both using energy more efficiently and replacing fossil-fueled generation with renewable and zero carbon resources, including solar, wind, energy storage,[353] geothermal, biomass, and hydroelectric power. The RPS Program[354] and the Cap-and-Trade Program continue to incentivize dispatch of renewables over fossil generation to serve state demand. SB 100 increased RPS stringency to require 60 percent renewables by 2030 and for California to provide 100 percent of its retail sales[355] of electricity from renewable and zero-carbon resources by 2045. Furthermore, SB 1020 has added interim targets to

[353] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, NF1, NF2. *finalejacrecs.pdf (arb.ca.gov)*.

[354] The CEC estimates that 36 percent of California's 2019 retail electricity sales was served by RPS-eligible renewable resources (see CPUC. 2021. CPUC Perspectives on Electric Sector Decarbonization. *https://ww2.arb.ca.gov/sites/default/files/2021-11/CPUC-sp22-electricity-ws-11-02-21.pdf*).

[355] SB 100 speaks only to retail sales and state agency procurement of electricity. The *2021 SB 100 Joint Agency Report* interprets this to mean that other loads—wholesale or non-retail sales and losses from storage and transmission and distribution lines—are not subject to the law.

SB 100's policy framework to require renewable and zero-carbon resources to supply 90 percent of all retail electricity sales by 2035 and 95 percent of all electricity retail sales by 2040; the governor has asked the CEC to establish a planning goal of at least 20 GW of offshore wind by 2045; and the governor directed that state agencies plan for an energy transition that avoids the need for new fossil gas capacity to meet California's long-term energy goals.[356] In addition to grid-level resources, state efforts have supported rapid growth of the distributed solar industry through key actions like the California Solar Initiative (SB 1, Murray, Chapter 132, Statues of 2006).[357] Steps to commercialize microgrids powered by clean resources[358] are also being examined as part of SB 1339 (Stern, Chapter 566, Statutes of 2018).[359]

California also continues to advance its appliance and building energy efficiency standards to reduce growth in electricity consumption and meet the SB 350 goal to double statewide energy efficiency savings in electricity and fossil gas end uses[360] by 2030. In 2018, the CEC adopted a building energy efficiency code requiring most new homes to have solar photovoltaic systems[361] (or be powered by a solar array nearby) starting January 1, 2020. In 2019, California reached the milestone of 1 million solar rooftop installations.

Increased transportation and building electrification and continued policy commitment to behind-the-meter solar and storage will continue to drive growth of microgrids and other distributed energy resources (DER).[362] The CPUC's High-DER proceeding is examining how to prepare the electric grid for a high DER future by determining how to integrate

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[356] Newsom, Gavin. July 22, 2022. Letter from Governor Newsom to CARB Chair Liane Randolph. *https://www.gov.ca.gov/wp-content/uploads/2022/07/07.22.2022-Governors-Letter-to-CARB.pdf*.

[357] More information on the program, which closed in 2016, can be found on the CPUC website, including annual program assessment reports, at: *https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/demand-side-management/california-solar-initiative*.

[358] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, In part (NF2, NF13). *finalejacrecs.pdf (arb.ca.gov)*.

[359] CPUC. Resiliency and Microgrids. *https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/infrastructure/resiliency-and-microgrids*.

[360] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, NF1, ES1. *finalejacrecs.pdf (arb.ca.gov)*.

[361] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, NF2. *finalejacrecs.pdf (arb.ca.gov)*.

[362] Distributed energy resources include rooftop solar and other distributed renewable generation resources, energy storage, electric vehicles, time variant and dynamic electric rates, flexible load management, demand response, and energy efficiency technologies.

millions of DERs within the distribution grid to maximize societal and ratepayer benefits from DERs while ensuring grid reliability and affordable rates.[363]

SB 350 also aims to connect long-term planning for electricity needs with the state's climate targets. This is primarily accomplished through CARB's establishment of 2030 GHG emissions targets for the electricity sector in general and for each electricity provider, which inform the CPUC and publicly owned utilities' integrated resource planning. A GHG planning target range of 30 to 53 $MMTCO_2e$—informed by the 2017 Scoping Plan—was originally developed and adopted by CARB in 2018. In its 2021 IRP planning cycle, the CPUC adopted a 38 MMT GHG target for the electricity sector in 2030, which drops to 35 MMT in 2032.[364]

The Scoping Plan Scenario incorporates SB 350's energy efficiency doubling goal, aligns with the CPUC's IRP 2030 GHG target and latest GHG emissions benchmarks through 2035,[365] the governor's 20 GW offshore wind and no new gas generation[366] goals, and SB 100's 2030 RPS and 2045 zero-carbon retail sales targets to reduce dependence on fossil fuels in the electricity sector by transitioning substantial energy demand to renewable and zero-carbon resources.[367] As described in Chapter 2, CCS is applied in limited sectors, including on 16.7 MMT of CO_2 from existing fossil gas electricity generation in 2045, to ensure the state achieves the 85 percent reduction in anthropogenic emissions required by AB 1279. Continued transition to renewable and

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[363] The High-DER proceeding is one of four "anchor" proceedings in the CPUC's DER Action Plan 2.0 and is within the Action Plan's infrastructure track. Information on the High-DER proceeding is available at: *https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/infrastructure/distribution-planning*. The Action Plan can be accessed at: *https://www.cpuc.ca.gov/about-cpuc/divisions/energy-division/der-action-plan*.

[364] The February 10, 2022, Decision 22-02-004 by the CPUC adopts the 2021 Preferred System Plan, completing the 2019–21 IRP cycle. *https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M451/K412/451412947.PDF*. The Decision requires load serving entities to submit plans in the next IRP cycle detailing how they will meet their proportionate share of a 30 MMT electric sector target, as well as a 38 MMT GHG target.

[365] June 15, 2022, Administrative Law Judge's Ruling for 2022 integrated resource plan filings specifies the need for GHG targets to plan for in 2035 to continue progress toward the 2045 goal. The ruling proposes a straight-line projection from the GHG planning target for 2030. Corresponding to the adopted Preferred System Plan in D.22-02-004, 38 MMT in 2030 leads to a target of 30 MMT in 2035. *https://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M485/K625/485625915.PDF*.

[366] The governor's July 22, 2022, letter specifies no new gas generation but does not place any constraints on existing gas resources. Therefore, for purposes of RESOLVE electricity sector modeling, existing gas capacity is an available resource that is able to be reduced over time based on announced retirements or if selected for retirement by the model.

[367] CARB. 2021. PATHWAYS Scenario Modeling: 2022 Scoping Plan Update – Attachment B: Generation Technologies to be included in Modeling. *https://ww2.arb.ca.gov/sites/default/files/2021-12/Revised_2022SP_ScenarioAssumptions_15Dec.pdf*.

zero-carbon electricity resources will enable electricity to become a zero-carbon substitute for fossil fuels across the economy.

Figure 4-5 shows the modeled resource capacity to meet the SB 100 retail sales target.[368] Energy efficiency moderates some of the need for additional electricity generation. However, that is quickly surpassed by growing electricity demand of 26 percent by 2030 and 76 percent by 2045 compared to today (2022) from increased population and electrification of other sectors, as shown in Figure 4-6. The estimated resource build needed to meet this level of demand amounts to approximately 72 GW of utility solar[369] and 37 GW of battery storage by 2045. Annual build rates (over the 2022–2035 period) for the Scoping Plan Scenario will need to increase by about 60 percent and over 700 percent for utility solar and battery storage, respectively, compared to historic maximum rates.[370] To reach the 2045 target, the state will need to quadruple its current level of wind and solar capacity. This does not include capacity associated with hydrogen production nor mechanical CDR, which was modeled off-grid; assuming hydrogen production via electrolysis, this would roughly be equivalent to an additional 10 GW[371] of solar generation needed in 2045, and an additional 64 GW of solar generation for direct air capture in 2045. The scale of solar and battery build rates needed could be reduced through the commercialization of new zero-carbon technologies.

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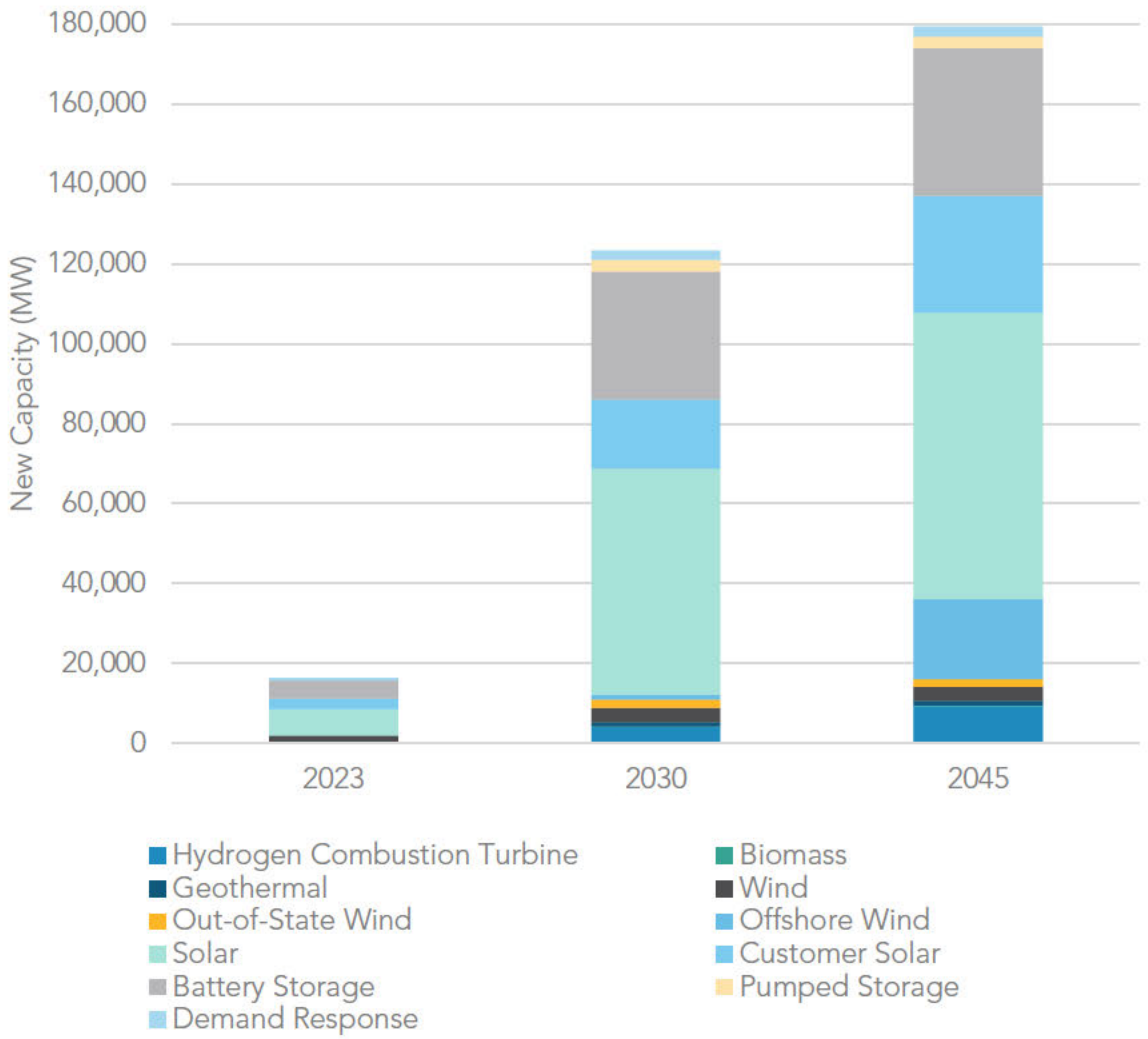
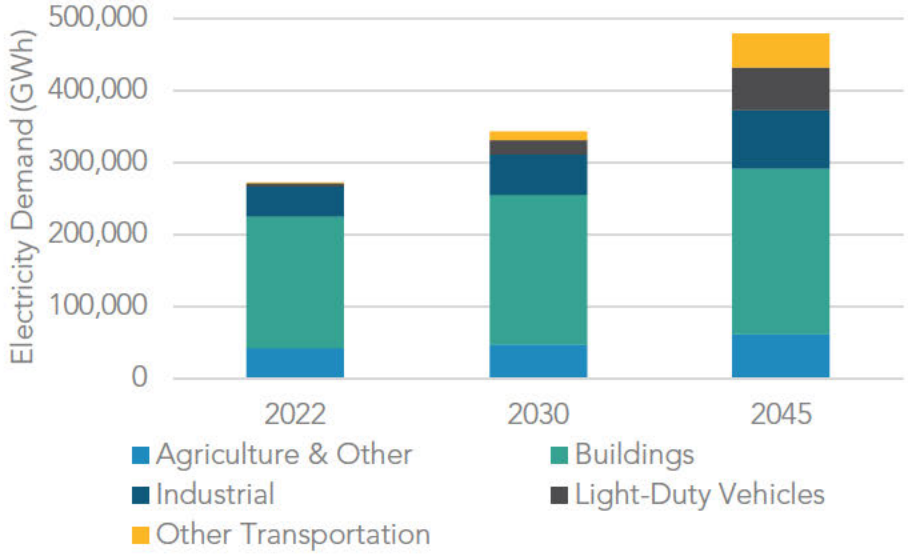
[368] SB 846 requires that load-serving entities exclude energy, capacity, or any attribute from the Diablo Canyon power plant in their resource plans. The Scoping Plan Scenario excludes energy, capacity, or any attribute from the Diablo Canyon power plant after the prior planned retirement date of 2025.
[369] The amount of additional customer solar included in the Scoping Plan Scenario is 29,208 MW by 2045.
[370] E3. 2022. CARB Scoping Plan: AB32 Source Emissions Final Modeling Results. PowerPoint. *https://ww2.arb.ca.gov/sites/default/files/2022-11/SP22-MODELING-RESULTS-E3-PPT.pdf*. Build rates are from EIA data historical builds in the 2011–2021 time frame.
[371] The estimate does not include hydrogen production assumed to be produced with bioenergy with carbon capture and storage (BECCS) and steam methane reforming (SMR).

Figure 4-5: Projected new electricity resources needed by 2045 in the Scoping Plan Scenario[372]



[372] See https://ww2.arb.ca.gov/sites/default/files/2022-11/2022-sp-PATHWAYS-data-E3.xlsx for the capacity build-out by resource type.

Figure 4-6: Electric loads in 2022, 2030 and 2045 for the Scoping Plan Scenario[373]



This transformation will drive investments in a large fleet of generation and storage resources but will also require significant transmission to accommodate these new capacity additions. Transmission needs include high-voltage lines to access out-of-state resources and major in-state generation pockets. In consideration of typical 8- to 10-year lead times for many projects, the CAISO published its first 20-Year Transmission Outlook to inform transmission planning focused on meeting the needs identified through the 2021 SB 100 Joint Agency Report process. The outlook calls for significant transmission development to access offshore wind and out-of-state wind and reinforce the existing CAISO footprint at an estimated cost of $30.5 billion.[374]

Presently, fossil gas power plants provide about 75 percent of the flexible capacity for grid reliability as more renewable power enters the system. Moving forward, other resources such as storage and demand-side management are essential to maintain reliability with high concentrations of renewables. Hydrogen produced from renewable resources and renewable feedstocks can serve a dual role as a low-carbon fuel for existing combustion turbines or fuel cells, and as energy storage for later use. Reliability

[373] *Other Transportation* includes all non-light-duty vehicles and reflects electrification of modes like passenger and freight rail, aviation, and ocean-going vessels.
[374] CAISO. 2022. *20 Year Transmission Outlook*. http://www.caiso.com/InitiativeDocuments/20-YearTransmissionOutlook-May2022.pdf.

also can be supported through increased coordination and markets in the interconnected western power grid; this is already helping to better integrate renewables.[375]

Strategies for Achieving Success

- Use long-term planning processes (Integrated Energy Policy Report, IRP, CAISO Transmission Planning Process, AB 32 Climate Change Scoping Plan) to support grid reliability and expansion of renewable and zero-carbon resource and infrastructure deployment.
- Complete systemwide and local reliability assessments across CAISO and other balancing authority areas, using realistic assumptions for land use, build rates, statewide and distribution system level constraints, and energy needs. Such assessments should be completed before state agencies update their electricity sector GHG targets.
- Prioritize actions to mitigate impacts to electricity reliability and affordability and provide sufficient flexibility in the state's decarbonization roadmap for adjustments as may be needed.
- Facilitate long lead-time resource development through the IRP and the SB 100 interagency process and through technology development and demonstration funding[376] that includes resources such as long-duration energy storage and hydrogen production.
- Continue coordination between energy agencies and energy proceedings to maximize opportunities for demand response.
- Continue to explore the benefits of regional markets to enhance decarbonization, reliability, and affordability.
- Address resource build-out challenges, including permitting, interconnection, and transmission network upgrades.
- Explore new financing mechanisms and rate designs to address affordability.[377]
- Per SB 350, double statewide energy efficiency savings in electricity and fossil gas end uses by 2030, through a combination of energy efficiency and fuel substitution actions.[378]
- Per SB 100 and SB 1020, achieve 90 percent, 95 percent, and 100 percent

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[375] CEC. 2021. *2021 SB 100 Joint Agency Report – Achieving 100 Percent Clean Electricity in California: An Initial Assessment.* Publication Number: CEC-200-2021-001.
[376] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, ES2. The committee recommendation speaks specifically to offshore wind production. *finalejacrecs.pdf (arb.ca.gov)*.
[377] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, NF30. *finalejacrecs.pdf (arb.ca.gov)*.
[378] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, NF1, NF2. *finalejacrecs.pdf (arb.ca.gov)*.

renewable and zero-carbon retail sales by 2035, 2040, and 2045, respectively.

- Evaluate and propose, as needed, changes to strengthen the Cap-and-Trade Program.
- Target programs and incentives to support and improve access to renewable and zero-carbon energy projects (e.g., rooftop solar, community owned or controlled solar or wind, battery storage, and microgrids) for communities most at need, including frontline, low-income, rural, and indigenous communities.[379]
- Prioritize public investments in zero-carbon energy projects to first benefit the most overly burdened communities affected by pollution, climate impacts, and poverty.[380]

Sustainable Manufacturing and Buildings

Fossil gas is the primary gaseous fossil fuel used to produce heat at industrial facilities, as well as in residential and commercial buildings. In buildings, space and water heating, cooking, and clothes drying all rely on gaseous fuels today. Industrial processes that require heat for conventional boilers and other processes also rely on gaseous fuels. Refineries rely on fossil gas and other gaseous fossil fuels, like liquefied petroleum gas and refinery fuel gas, and fossil gas is also used to generate electricity, as discussed earlier.

Gaseous fossil fuel use can be displaced by four primary alternatives: zero-carbon electricity, solar thermal heat, hydrogen, and biogas/biomethane. Displacing gaseous fossil fuel use can yield indoor air quality benefits, protect public health and property from unexpected fossil gas leaks, and reduce short-lived climate pollutants, which are many times more potent in affecting climate change than CO_2. The Scoping Plan Scenario reduces dependence on fossil gas in the industrial and building sectors by transitioning substantial energy demand to alternative fuels. Reducing fossil gas combustion also will help toward achieving our air quality and equity goals by reducing pollution in neighboring areas and communities. In addition, reduced dependence on gasoline and diesel in the transportation sector diminishes the need for gaseous fossil fuels to support oil and gas production and petroleum refining operations as those are phased down relative to the demand.

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[379] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, NF2, NF9, NF11, NF12, NF13. *finalejacrecs.pdf (arb.ca.gov)*.

[380] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, NF14. *finalejacrecs.pdf (arb.ca.gov)*.

Sector Transition

Industry

California's industrial sector contributes significantly to the state's economy, with a total output from manufacturing in 2019 of $324 billion (10.4 percent of the state total)[381] and employment of 1,222,000 manufacturing jobs (7.6 percent of the total state workforce).[382] California industry includes a diverse range of facilities, including cement plants, refineries, glass manufacturers, oil and gas producers, paper manufacturers, mining operations, metal processors, and food processors. Combustion of fossil gas, other gaseous fossil fuels, and solid fossil fuels provide energy to meet three broad industry needs: electricity, steam, and process heat. Non-combustion emissions result from fugitive emissions and from the chemical transformations inherent to some manufacturing processes. About 20 percent of the GHG emissions from the industrial sector are non-combustion emissions.

Decarbonizing industrial facilities depends upon displacing fossil fuel use with a mix of electrification, solar thermal heat, biomethane, low- or zero-carbon hydrogen, and other low-carbon fuels to provide energy for heat and reduce combustion emissions. Emissions also can be reduced by implementing energy efficiency measures and using substitute raw materials that can reduce energy demand and some process emissions. Some remaining combustion emissions and some non-combustion CO_2 emissions can be captured and sequestered. The strategy employed will depend on the industrial subsector and the specific processes utilized in production. The left side of Figure 4-7 illustrates the fuels used to meet industrial manufacturing energy demand in 2020. Industrial manufacturing energy demand needs to transition to the fuel mix shown for 2035 and 2045. The right side of Figure 4-7 illustrates the fuel mix needed to meet the energy demand of oil and gas extraction and petroleum refining operations for the same years. Energy demand in this portion of the industrial sector declines along with decreased demand for gasoline and diesel in the transportation sector. In both figures there is a continuing demand for fossil gas due to lack of non-combustion technologically feasible or cost-effective alternatives for certain industrial sectors. Policies that support decarbonization strategies like electrification, use of renewable energy, and transition to alternative fuels are needed.

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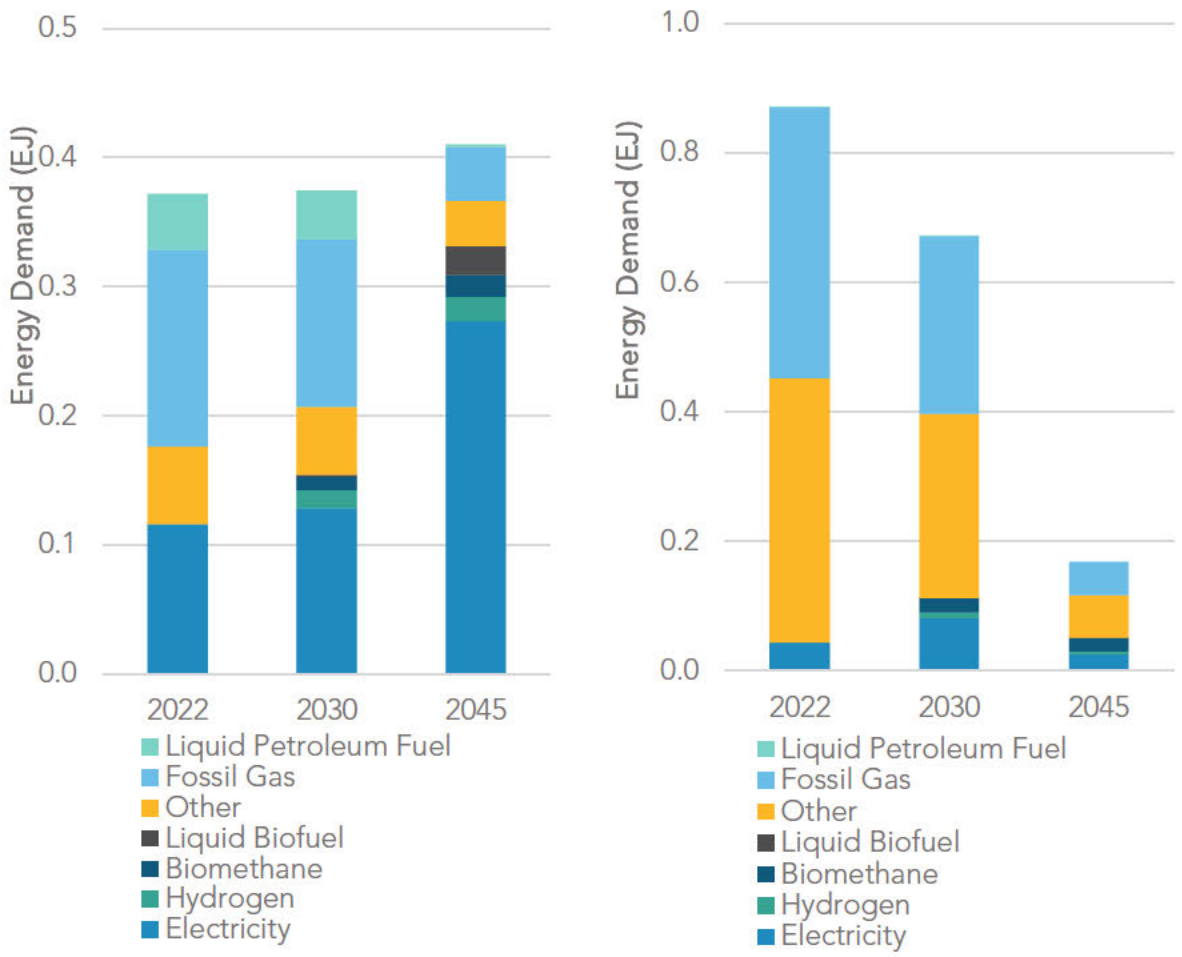
[381] National Association of Manufacturers (NAM). 2021 California Manufacturing Facts. https://www.nam.org/state-manufacturing-data/2021-california-manufacturing-facts/.
[382] NAM. 2021 California Manufacturing Facts. https://www.nam.org/state-manufacturing-data/2021-california-manufacturing-facts/.

Figure 4-7: Final energy demand in industrial manufacturing (left) and in oil and gas extraction and petroleum refining (right) in 2022, 2030, and 2045 in the Scoping Plan Scenario[383]



Electrification and solar thermal heat are best-suited to industrial processes that have relatively low heat requirements, such as food processors, paper mills, and industries that use low-pressure steam in their processes. Approaches could include replacing fossil gas boilers with electric boilers, process heaters with industrial electric heat pumps, steel forging furnaces with induction heaters, and implementing other sector-specific process electrification. Under current rate structures for industrial electricity and fossil gas in

[383] *Other* fuel in the industrial manufacturing sector is primarily coke and coal for cement production. *Other* fuel in the petroleum refining sector is primarily fossil gas associated with refining petroleum products.

California, most projects to electrify a fossil gas-powered industrial process will face operating cost barriers and potential reliability concerns. Microgrids powered by renewable resources and with battery storage are emerging as a key enabler of electrification and decarbonization at industrial facilities.

There are fewer commercially available and economically viable electrification options to replace industrial processes that require higher-temperature heat. For these processes, onsite combustion may continue to be needed, and decarbonization will require fuel substitution to hydrogen,[384] biomethane, or other low-carbon fuels. Fuel substitution and continued combustion will require monitoring and mitigation of any potential air quality impacts, especially in low-income and communities of color which already face disproportionate air pollution burdens. Industries in California with high heat needs include steel forging, glass manufacturing, and industries with calcination processes, such as manufacturing lime and cement.

Onsite emissions from cement manufacturing derive from two main sources: (1) fuel combustion to heat the kiln to a very high temperature and (2) process CO_2 emissions from the chemical transformation of limestone. Over 60 percent of emissions from the sector are process emissions unrelated to fuel use, and most emissions related to fuel use are from coal and petroleum coke combustion. Process emissions from cement manufacturing are significant and will continue even if the sector were to operate using only zero-carbon fuels; thus carbon capture and use/sequestration will be a likely component of any strategy to fully decarbonize cement manufacturing. There are additional opportunities to reduce GHG emissions from cement manufacturing via the combination of fuel-switching to low-carbon fuels (e.g., biomethane, municipal solid waste, biochar), increased blending of non-clinker materials, and efficiency improvements. High technological and economic barriers exist to electrifying kiln process heat at cement plants, as clinker production requires temperatures in excess of 1,500°C. There are potential decarbonization opportunities throughout the value chain of cement use, including in cement manufacturing, concrete mixing, and construction practices.[385] SB 596 (Becker, Chapter 246, Statutes of 2021), which was signed by Governor Newsom in September 2021, requires CARB to develop a comprehensive strategy for cement use in California to achieve a GHG intensity 40 percent below 2019 levels by 2035, and net-zero emissions by 2045.

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[384] Griffiths, Steve, Benjamin K. Sovacool, Jinsoo Kim, Morgan Bazilian, and Joao M. Uratani. 2021. "Industrial decarbonization via hydrogen: A critical and systematic review of developments, socio-technical systems and policy options." *Energy Research & Social Science* 80. 102208, ISSN 2214-6296. https://doi.org/10.1016/j.erss.2021.102208.

[385] California Nevada Cement Association. Achieving Carbon Neutrality in the California Cement Industry. https://cncement.org/attaining-carbon-neutrality.

Oil and gas extraction and refining make up over half of California's industrial GHG emissions. Reduced demand for transportation fossil fuels corresponds to reduced supply of fossil gas and other gaseous fossil fuels for refineries to produce these fuels. Some refining operations will continue to operate to produce fossil fuel for the remaining transportation energy demands, along with renewable diesel and sustainable aviation fuel, as discussed in the Transportation Sustainability section of this chapter.

Across industrial subsectors and processes, California facilities also could realize significant reductions in GHG emissions and energy-related costs by implementing advanced energy efficiency projects and tools.[386] While enhanced operation and maintenance practices are typical at industrial facilities, additional strategic energy management practices offer greater efficiency gains by focusing on setting goals, tracking progress, and reporting results.

Strategies for Achieving Success

- Maximize air quality benefits using the best available control technologies for stationary sources in communities most in need, including frontline, low-income, disadvantaged, rural, and tribal communities.[387]
- Prioritize alternative fuel transitions first in communities most in need, including frontline, low-income, disadvantaged, rural, and tribal communities.[388]
- Invest in research and development and pilot projects to identify options to reduce materials and process emissions along with energy emissions in California's industrial manufacturing facilities, leveraging programs like the CEC's Electric Program Investment Charge (EPIC).[389]
- Evaluate and propose, as needed, changes to strengthen the Cap-and-Trade Program.
- Support electrification with changes to industrial rate structures.
- Develop infrastructure for CCS and hydrogen production to reduce GHG emissions where cost-effective and technologically feasible non-combustion alternatives are not available.
- Implement SB 905.

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[386] Therkelsen, Peter, Aimee McKane, Ridah Sabouini, and Tracy Evans. 2013. *Assessing the Costs and Benefits of the Superior Energy Performance Program.* U.S Department of Energy. https://www.osti.gov/servlets/purl/1165470.
[387] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, JT14. finalejacrecs.pdf (arb.ca.gov).
[388] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, JT15. finalejacrecs.pdf (arb.ca.gov).
[389] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, M20. finalejacrecs.pdf (arb.ca.gov).

- Establish markets for low-carbon products and recycled materials using Buy Clean California Act and other mechanisms relying on robust data
- Develop a net-zero cement strategy to meet SB 596 targets for the GHG intensity of cement use in California.
- Continue to leverage energy-efficiency programs, including the U.S. DOE's ENERGY STAR program,[390] U.S. DOE's Superior Energy Performance program,[391] and ISO 50001.[392]
- Evaluate and continue to offer incentives to install energy efficiency and renewable energy technologies through programs such as CPUC decisions as part of rulemaking R.19-09-009[393] and the CEC's Food Production Investment Program (FPIP) and EPIC programs.[394]
- Leverage low-carbon hydrogen programs, including the Bipartisan Infrastructure Law, for regional hydrogen hubs, hydrogen electrolysis, and hydrogen manufacturing and recycling.
- Evaluate the role of hydrogen in meeting GHG emission reductions, including policy recommendations regarding the use of hydrogen in California as required by SB 1075.
- Address cost barriers to promote low-carbon fuels for hard-to-electrify industrial applications.

Buildings

Buildings have cross-sector interactions that influence our public health and well-being and affect land use and transportation patterns, energy use, water use, and indoor and outdoor environments.[395] There are about 14 million existing homes and over 7.5 billion square feet of existing commercial buildings[396] in California. Fossil gas supplies about half of the energy consumed by end uses in these buildings. In addition to GHG emissions, fossil gas usage in buildings also produces CO_2, NOx, $PM_{2.5}$, and

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[390] ENERGY STAR. ENERGY STAR Guidelines for Energy Management. https://www.energystar.gov/buildings/tools-and-resources/energy-star-guidelines-energy-management.
[391] Energy.gov. Superior Energy Performance 50001. https://www.energy.gov/eere/amo/superior-energy-performance.
[392] ISO. ISO 50001 Energy Management. https://www.iso.org/iso-50001-energy-management.html.
[393] CPUC. January 14, 2021. CPUC Adopts Strategies to Help Facilitate Commercialization of Microgrids Statewide. https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M360/K370/360370887.PDF.
[394] Bailey, Stephanie, David Erne, and Michael Gravely. 2021. *Final 2020 Integrated Energy Policy Report Update, Volume II: The Role of Microgrids in California's Clean and Resilient Energy Future, Lessons Learned From the California Energy Commission's Research.* California Energy Commission. Publication Number: CEC-100-2020-001-V2-CMF.
[395] See Appendix F (Building Decarbonization).
[396] CEC. 2021. California Building Decarbonization Assessment. https://efiling.energy.ca.gov/GetDocument.aspx?tn=239311&DocumentContentId=72767.

formaldehyde.[397] Each year, about 120,000 new homes[398] and more than 100 million-square feet[399] of commercial buildings are newly constructed across California. These new buildings will represent between a third to half of the total building stock by mid-century.

Achieving carbon neutrality must include transitioning away from fossil gas in residential and commercial buildings, and will rely primarily on advancing energy efficiency while replacing gas appliances with non-combustion alternatives. This transition must include the goal of trimming back the existing gas infrastructure so pockets of gas-fueled residential and commercial buildings do not require ongoing maintenance of the entire limb for gas delivery. Blending low-carbon fuels such as hydrogen and biomethane into the pipeline further displaces fossil gas. Pipeline safety and reliability must be evaluated to accommodate low-carbon fuels. Figure 4-8 illustrates the energy Californians use in buildings at present compared with the Scoping Plan Scenario, which introduces alternatives to fossil gas. In that scenario almost 90 percent of energy demand is electrified by 2045, and the remaining energy demand is met with combustion of hydrogen, biomethane, and fossil gas.

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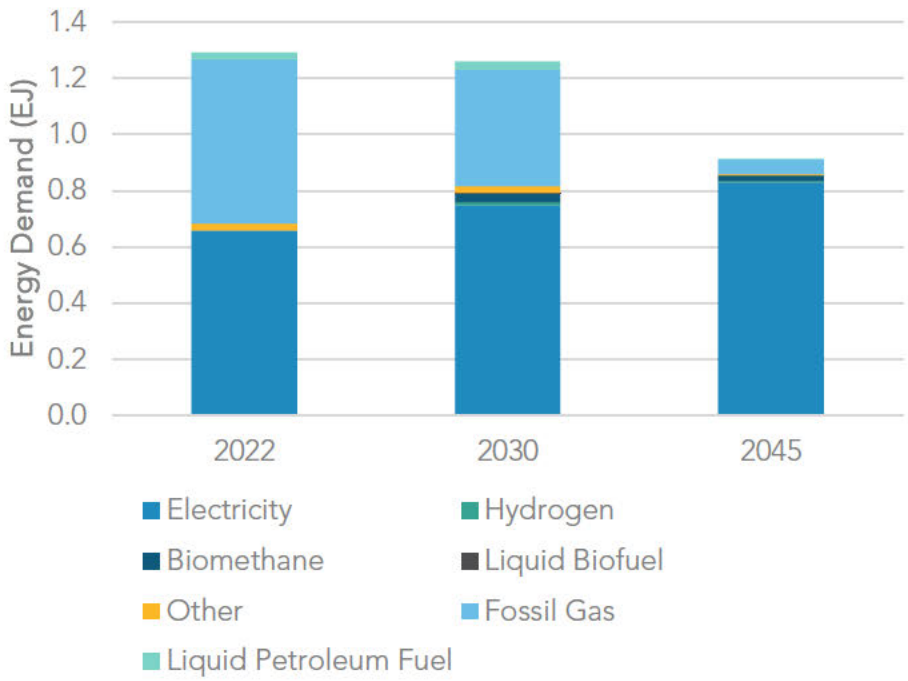
[397] Zhu, Yifang, et al. 2020. *Effects of Residential Gas Appliances on Indoor and Outdoor Air Quality and Public Health in California.* UCLA Fielding School of Public Health Department of Environmental Health Sciences.

[398] Construction Industry Research Board. 2018. Annual Building Permit Summary. *http://www.cirbreport.org*.

[399] Delforge, Pierre. August 11, 2021. California Forging Ahead on Zero Emission Buildings. Blog. NRDC. *https://www.nrdc.org/experts/pierre-delforge/california-forging-ahead-zero-emission-buildings*.

Figure 4-8: Final energy demand in buildings in 2022, 2030, and 2045 in the Scoping Plan Scenario[400]

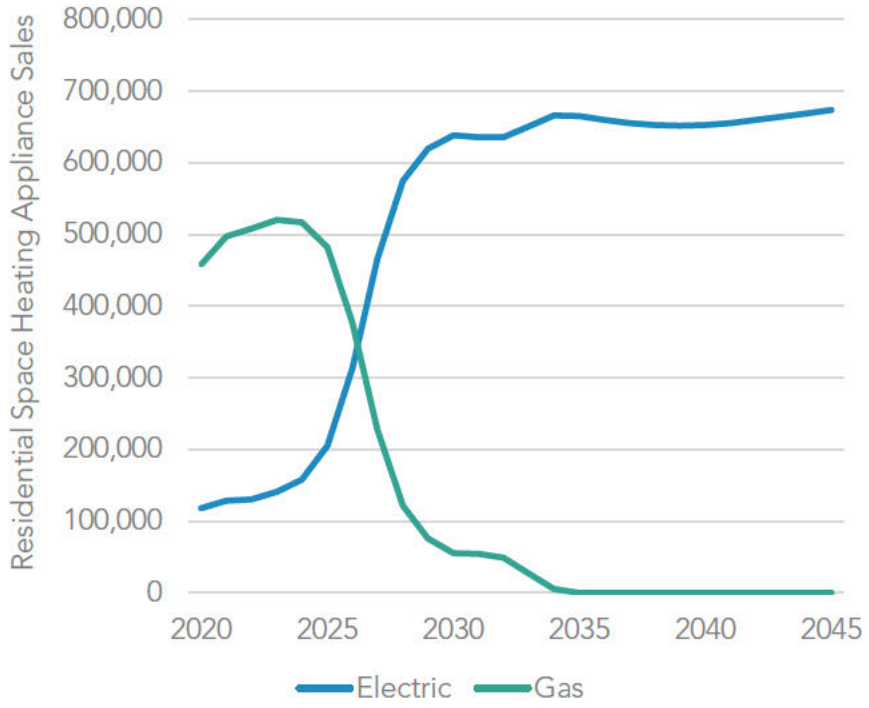


This transition is achieved when all new buildings constructed include non-combustion appliances, and appliances in existing buildings are replaced at the end of their useful life with non-combustion alternatives. Currently, electric alternatives, combined with the decarbonizing of California's grid, are the most effective alternatives, and the Scoping Plan Scenario modeled these alternatives. The Scoping Plan Scenario assumes three million all-electric and electric-ready homes by 2030 and seven million by 2035. Figure 4-9 illustrates the pace at which electric space heating appliance sales increase and gas space heating appliance sales decrease in residences in the Scoping Plan Scenario, such that by 2035 100 percent of residential home appliance sales are electric. By 2030 over six million electric heat pumps are installed statewide. The residential electric space heating appliance sales increases rapidly in the near term as new all-electric buildings are constructed and as existing buildings are renovated to utilize electric appliances. A similar transition is envisioned for other home appliances. Commercial buildings also will undergo a transition away from gas appliances to electric appliances, achieving 80 percent sales of all-electric appliances by 2035 and 100 percent by 2045. Appendix F (Building Decarbonization) describes a holistic policy approach to rapidly grow the

[400] *Other* fuel in the buildings sector is primarily liquid petroleum gas and waste heat.

number of zero emission appliances and buildings, to surmount the market barriers, and to prioritize an equitable transition for vulnerable communities.

Figure 4-9: Residential space heating appliance sales in the Scoping Plan Scenario



Strategies for Achieving Success

- Prioritize California's most vulnerable residents with the majority of funds in the new $922 million Equitable Building Decarbonization program, created through the 2022–2023 state budget. This would include residents in frontline, low-income, disadvantaged, rural, and tribal communities. This program is dedicated to a statewide direct-install building retrofit program for low-income households to replace fossil fuel appliances with electric appliances, energy-efficient lighting, and building insulation and sealing while also coordinating reductions in gas infrastructure in specific geographic areas.
- Achieve three million all-electric and electric-ready homes by 2030 and seven million by 2035 with six million heat pumps installed statewide by 2030.
- Expand incentive programs to support the holistic retrofit of existing buildings, especially for vulnerable communities.
- Ensure that incentive programs prioritize energy affordability and tenant protections, promote affordable and low-income household retrofits that improve habitability and reduce expenses, protect and empower small landlords and homeowners, address overlooked consumer groups, and pair decarbonization

with other critically needed renovation efforts to ensure that buildings support human health and are climate- and weather-resistant.[401]

- End fossil gas infrastructure expansion for newly constructed buildings.[402]
- Evaluate and propose, as needed, changes to strengthen the Cap-and-Trade Program.
- Strengthen California's building standards to support zero-emission new construction.
- Develop building performance standards for existing buildings.
- Adopt a zero-emission standard for new space and water heaters sold in California beginning in 2030, as specified in the 2022 State Strategy for the State Implementation Plan.
- Expand use of low-GWP refrigerants within buildings.
- Support electrification with changes to utility rate structures and by promoting load management programs.
- Increase funding for incentive programs and expand financing assistance programs focused on existing buildings and appliance replacements.
- Expand consumer education efforts to raise awareness and stimulate the adoption of decarbonized buildings and appliances, especially in vulnerable communities.
- Implement biomethane procurement targets for investor-owned utilities as specified in SB 1440 (Hueso, Chapter 739, Statutes of 2018) to reduce GHG emissions in remaining pipeline gas and reduce methane emissions from organic waste.

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[401] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, NF23, NF24, NF25, NF26, NF28. *finalejacrecs.pdf (arb.ca.gov)*.
[402] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, NF22. *finalejacrecs.pdf (arb.ca.gov)*.

Carbon Dioxide Removal and Capture

Climate Change 2022: Mitigation of Climate Change,[403] a report by the IPCC released in early 2022, states "The deployment of CDR to counterbalance hard-to-abate residual emissions is unavoidable if net zero CO_2 or GHG emissions are to be achieved. The scale and timing of deployment will depend on the trajectories of gross emission reductions in different sectors. Upscaling the deployment of CDR depends on developing effective approaches to address feasibility and sustainability constraints especially at large scales." In line with that report, this Scoping Plan considers CDR as a complement to technologically feasible and cost-effective GHG emissions mitigation, and the size of its role will depend on the degree of success in reducing GHG emissions at the source across the economy. [404] The modeling shows that emissions from the AB 32 GHG Inventory sources will continue to persist even if all fossil related combustion emissions are phased out. These residual emissions must be compensated for to achieve carbon neutrality. Options for CDR include both sequestration in natural and working lands and mechanical approaches like direct air capture. Chapter 2 provides estimates on how much CO_2 removal is possible by our natural and working lands and how much must be removed by mechanical CDR.

CCS, which is carbon capture from anthropogenic point sources, is described in Chapter 2 and involves capturing carbon from a smokestack of an emitting facility. Direct air capture, on the other hand, captures carbon directly from the atmosphere. Direct air capture technologies, unlike CCS, are not associated with any particular point source.

For this section, *carbon management* refers to the capture, movement, and sequestration of CO_2 through mechanical solutions for both capture at point sources and direct removal from the atmosphere through direct air capture.[405] Enabling policies and regulations across each of these steps are necessary for individual projects, and on a broader scale, for delivering reductions in support of the state's carbon neutrality and long-term carbon-negative goals. Figure 4-10 provides a graphic of the typical carbon management infrastructure.

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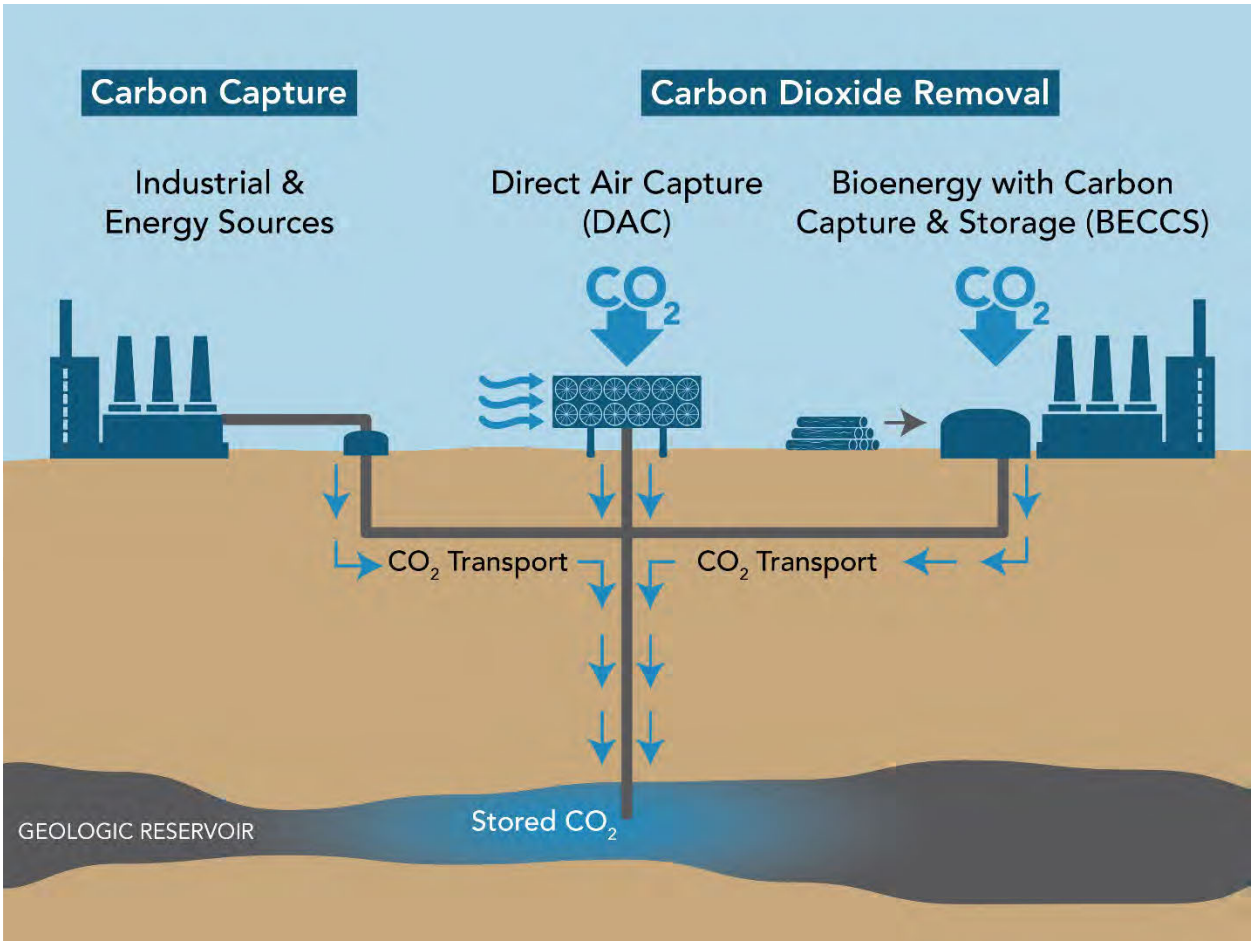
[403] IPCC. 2022. *Climate Change 2022: Mitigation of Climate Change.* https://www.ipcc.ch/report/sixth-assessment-report-working-group-3/.
[404] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, F4.7. finalejacrecs.pdf (arb.ca.gov).
[405] CDR through natural and working lands is discussed in Chapter 2 and later in this chapter.

Figure 4-10: Carbon management infrastructure



Carbon dioxide removal directly from the atmosphere itself refers to a suite of carbon negative technologies that can be used to draw down ongoing and historical carbon emissions already in the atmosphere. Some CO_2 removal technologies leverage the abilities of both natural photosynthesis and mechanical removal by using biomass wastes as inputs to make low- or zero-carbon energy or fuels, all while capturing and storing produced CO_2.

Captured CO_2 from point sources or from the atmosphere is permanently stored in specialized geologic formations, typically half a mile or more underground. A recent Stanford University study estimated the state's commercial storage potential is nearly 70,000 million metric tons of CO_2, even when excluding oil and gas reservoirs.[406] California is well-positioned because few other places on the West Coast are suitable for

[406] Stanford Center for Carbon Storage. Opportunities and Challenges for CCS in California. https://sccs.stanford.edu/california-projects/opportunities-and-challenges-for-CCS-in-California.

geologic storage at scale. To inform discussion around CO_2 removal, CARB held two full-day workshops exploring the types of options for carbon capture and geologic storage and utilization in products.[407,408,409]

The modeling results provided in Chapter 2 demonstrate the targeted need for CCS on large facilities such as refineries and cement. The CCS numbers do not include the potential additional applications for producing hydrogen with biomethane, other manufacturing, electricity, or other bioenergy. If CCS is not deployed, those emissions would be released directly into the atmosphere and instead need to be addressed through CDR to achieve carbon neutrality. Although a study finds California has 76 existing electricity and industrial facilities that are suitable candidates for CCS retrofit,[410] this Scoping Plan proposes a targeted role for this technology such that it would only be used to address sectors where non-combustion options are not technologically feasible or cost-effective at this time, to the extent needed to achieve the 85 percent reduction in anthropogenic emissions as called for in AB 1279. In future updates to the Scoping Plan, there may be additional options for technologically feasible or cost-effective technologies that may be deployed, which would further reduce the need for CCS and CDR except in situations to address historical GHG emissions.

Recognizing the need for carbon capture and utilization sequestration and removal, the Legislature passed, and the governor signed, SB 905. It includes several key requirements in the development of the state's Carbon Capture Removal, Utilization, and Storage Program. The following is a summary of the work to be completed to establish and administer this program. Many of these steps will address the need to evaluate the safety and efficacy of actions to support carbon removal, sequestration, and transfer via pipelines. Note that not all of these actions are under CARB's authority.

- Review technology to evaluate efficacy, safety, viability of CCUS/CDR methodologies.
- Develop monitoring and reporting requirements and schedules.
- Develop a unified permit application.
- Develop financial responsibility requirements.
- Develop a centralized public database for project status.

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[407] CARB. December 11, 2019. Carbon Neutrality Meetings & Workshops. https://ww2.arb.ca.gov/our-work/programs/carbon-neutrality/carbon-neutrality-meetings-workshops.
[408] CARB. August 2, 2021 Scoping Plan Meetings & Workshops. https://ww2.arb.ca.gov/our-work/programs/ab-32-climate-change-scoping-plan/scoping-plan-meetings-workshops.
[409] *Carbon utilization* refers to the use of captured carbon to produce products such as plastics and concrete.
[410] Glenwright, Kara. 2020. *Roadmap for carbon capture and storage in California.* Precourt Institute for Energy. https://earth.stanford.edu/news/roadmap-carbon-capture-and-storage-california#gs.ysj78q.

- Consult with CNRA on pore space requirements as CNRA develops a framework for pore space governing agreements.
- Establish a Geologic Carbon Sequestration Group to identify suitable injection well locations, subsurface monitoring, and potential hazards that may require suspension of injection.

SB 905 also has requirements for project developers such as to develop monitoring plans and to avoid any adverse health and environmental impacts at the carbon capture location—or mitigation of unavoidable impacts as required under existing requirements. For the site of injection, there are requirements for site stability, monitoring, and reporting plans. SB 905 also bans CCS with enhanced oil recovery in California and prohibits the transfer of CO_2 via pipeline until the U.S. Department of Transportation's Pipelines and Hazardous Materials Safety Administration (PHMSA) completes its current rulemaking to update existing CO_2 pipeline safety requirements.

An often-cited example of pipeline concerns involves a CO_2 pipeline in Mississippi. On February 22, 2020, a CO_2 pipeline operated by Denbury Gulf Coast Pipelines LLC (Denbury) ruptured in proximity to the community of Satartia, Mississippi. The rupture followed heavy rains that resulted in a landslide, creating excessive axial strain on a pipeline weld (DOT 2022). The combination of weather and topography resulted in a slower dissipation of the gas. The pipeline was also carrying hydrogen sulfide, a flammable and toxic gas. The pipeline failed on a steep embankment, which had recently subsided. Heavy rains are believed to have led to a landslide, which created axial strain on the pipeline and resulted in a full circumferential girth weld failure. The PHMSA investigation also revealed several contributing factors to the accident, including but not limited to: Denbury not addressing the risks of geohazards in its plans and procedures, underestimating the potential affected areas that could be impacted by a release in its CO_2 dispersion model, and not notifying local responders to advise them of a potential failure.

As the Satartia example highlights, appropriate pipeline safety and environmental standards in California are critical to minimize any risks from CO_2 transport in the future. As such, SB 905 also tasks CNRA, in consultation with the Public Utilities Commission, to, no later than February 1, 2023, provide a proposal to the Legislature to establish a state framework and standards for the design, operation, siting, and maintenance of intrastate pipelines carrying CO_2 fluids of varying composition and phase to minimize the risk posed to public and environmental health and safety. The recommended framework shall be designed to minimize risk to public health and environmental health and safety, to the extent feasible. Because SB 905 prohibits the transfer of CO_2 via pipeline until the PHMSA completes its current rulemaking to update existing CO_2 pipeline safety requirements, CCS or CDR projects that would require a pipeline to transfer CO_2 are not feasible at this time within California.

Ultimately, and in accordance with SB 905, the merits of each CCS or CDR project must be evaluated on a case-by-case basis.[411] Deployment of CCS and CDR could support skilled jobs and workforces, including those in traditional fossil energy communities. Other co-benefits could include criteria air pollutant reductions and water production. It will be important to design projects that do not exacerbate community health impacts, include early and ongoing community engagement, and are in compliance with local, state, and federal public health and environmental protection laws. It also should be noted that, as these types of projects are an emerging area of governance, additional coordination and discussion will be needed among the various levels of authorities involved. SB 905 has already initiated this process by assigning specific agencies with tasks related to their expertise and authority.

Chapter 2 includes a more detailed discussion about the proposed role of CO_2 removal in this Scoping Plan.

Sector Transition

State,[412] national,[413,414] and global decarbonization analyses[415] indicate a significant role for carbon management infrastructure, yet relatively few projects are operational. Around the world, about two dozen large CCS projects are capturing tens of millions of metric tons of CO_2 each year, with about a dozen operating in the United States.[416] The vast majority of capacity is at industrial facilities, such as ethanol and fertilizer plants, that would otherwise vent nearly pure CO_2 into the atmosphere as a by-product of normal, non-combustion processes. Future research, development, and demonstration projects must refine and commercialize capture systems for more complex applications, especially

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[411] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, F4.5. *finalejacrecs.pdf (arb.ca.gov)*.
[412] E3. October 2020. Achieving Carbon Neutrality in California Report: Final Presentation. *https://ww2.arb.ca.gov/sites/default/files/2020-10/e3_cn_final_presentation_oct2020_2.pdf*.
[413] World Resources Institute. January 31, 2020. CarbonShot: Federal Policy Options for Carbon Removal in the United States. Working paper. *https://www.wri.org/research/carbonshot-federal-policy-options-carbon-removal-united-states*.
[414] C2ES. No date. Getting to Zero: A U.S. Climate Agenda — Center for Climate and Energy Solutions. *https://www.c2es.org/getting-to-zero-a-u-s-climate-agenda-report/*.
[415] IPCC. Mitigation Pathways Compatible with 1.5°C in the Context of Sustainable Development. Chapter 2. *https://www.ipcc.ch/sr15/chapter/chapter-2/*. All analyzed pathways limiting warming to 1.5°C with no or limited overshoot use CDR to some extent to neutralize emissions from sources for which no mitigation measures have been identified and, in most cases, also to achieve net negative emissions to return global warming to 1.5°C following a peak (high confidence). The longer the delay in reducing CO_2 emissions toward zero, the larger the likelihood of exceeding 1.5°C, and the heavier the implied reliance on net negative emissions after mid-century to return warming to 1.5°C (high confidence).
[416] Congressional Research Service. 2021. Carbon Capture and Sequestration (CCS) in the United States. R44902. *https://crsreports.congress.gov/product/pdf/R/R44902?msclkid=e45e0012c25911ec8085ca575cb61e82*.

for those with limited decarbonization options. It has only been in the last few years that attention has seriously turned to mechanical CDR. As new information and modeling on climate change have been made available, the science has become clearer that avoiding the most catastrophic impacts of climate change requires both reducing emissions and deploying mechanical CDR.

California is paving a path forward on a science-based carbon management infrastructure policy that can serve as an example for other jurisdictions. The LCFS, which reduces the carbon intensity of transportation fuels, includes a protocol for select carbon management projects to become certified and generate LCFS credits.[417] CCS is not a new concept or technology. Twenty years of CCS testing show it is a safe and reliable tool.[418] As mentioned in Chapter 2, while no new CCS projects have been implemented or generated any credits under the CARB CCS protocol, CCS projects have been implemented elsewhere since the 1970s. Moreover, there has been a U.S. Department of Energy CCS research program underway for more than two decades. These all form a foundation of information for future efforts. Certified projects must successfully demonstrate adherence to rigorous pre-construction, operational, and site closure standards designed to strengthen environmental performance, as described in CARB's CCS Protocol. The protocol is designed to layer on top of existing federal carbon sequestration regulations designed to protect the environment. The protocol would need to be reevaluated if CCS were to be more broadly applied across sectors beyond transportation fuel production.

Direct air capture and carbon mineralization have high potential capacity for removing carbon, but direct air capture is currently limited by high cost. Carbon mineralization may also have high potential for removing carbon from the atmosphere, but understanding of the technology is still limited.[419] Direct air capture could also be deployed at higher rates to remove legacy GHG emissions from the atmosphere. Chapter 2 contains additional information on the current status of CCS and mechanical CDR projects globally, as well as federal support of such technologies.

Strategies for Achieving Success

- Implement SB 905.

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[417] CARB. 2018. Carbon Capture and Sequestration Protocol under the Low Carbon Fuel Standard. August 13. *https://ww2.arb.ca.gov/sites/default/files/2020-03/CCS_Protocol_Under_LCFS_8-13-18_ada.pdf*.

[418] National Energy Technology Laboratory. Permanence and Safety of CCS. *https://netl.doe.gov/coal/carbon-storage/faqs/permanence-safety*.

[419] Aines, Roger. No date. Options for Removing CO_2 from California's Air. Lawrence Livermore National Laboratory. *https://ww2.arb.ca.gov/sites/default/files/2021-08/llnl_presentation_sp_engineeredcarbonremoval_august2021.pdf*.

- Convene a multi-agency Carbon Capture and Sequestration Group comprised of federal, state, and local agencies to engage with environmental justice advocates, tribes, academics, researchers, and community representatives to identify the current status, concerns, and outstanding questions concerning CCS, and develop a process to engage with communities to understand specific concerns and consider guardrails to ensure safe and effective deployment of CCS.[420]
- Iteratively update the CARB CCS Protocol with the best available science and implementation experience.
- Incorporate CCS into other sectors and programs beyond transportation where cost-effective and technologically feasible options are not currently available and to achieve the 85 percent reduction in anthropogenic sources below 1990 levels as called for in AB 1279.
- Evaluate and propose, as appropriate, financing mechanisms and incentives to address market barriers for CCS and CDR.
- Evaluate and propose, as appropriate, the role for CCS in cement decarbonization (SB 596) and as part of hydrogen production pathways (SB 1075).
- Support carbon management infrastructure projects through core CEC research, development, and demonstration (RD&D) programs.
- Continue to explore carbon capture applications for producing or leveraging zero-carbon power for reliability needs as part of SB 100.
- Consider carbon capture infrastructure when developing hydrogen roadmaps and strategy, especially for non-electrolysis hydrogen production.
- Evaluate and streamline permitting barriers to project implementation while protecting public health and the environment.
- Explore options for how local air quality benefits can be achieved when CCS is deployed.
- Explore opportunities for CCS and CDR developers to leverage existing infrastructure, including subsurface infrastructure.
- Explore permitting options to allow for scaling the number of sources at carbon sequestration hubs.

Short-Lived Climate Pollutants (Non-Combustion Gases)

Short-lived climate pollutants (SLCPs) include black carbon (soot), methane (CH_4), and fluorinated gases (F-gases, including hydrofluorocarbons [HFCs]). They are powerful climate forcers and harmful air pollutants that have an outsized impact on climate change

[420] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, F4.9. *finalejacrecs.pdf (arb.ca.gov)*.

in the near term, compared to longer-lived GHGs, such as CO_2. According to the IPCC's *Climate Change 2021: The Physical Science Basis,* in the near-term (i.e., 10- to 20-year time scale) the warming influence of all SLCPs combined will be at least as large as that of CO_2.[421] The United Nations Environment Programme's Global Methane Assessment[422] advises that achieving the least-cost pathways to limit warming to 1.5°C requires global methane emission reductions of 40–45 percent by 2030 alongside substantial simultaneous reductions of all climate forcers, including CO_2 and SLCPs. Action to reduce these powerful emissions sources today will provide immediate benefits—both to human health locally and to reduce warming globally—as the effects of our policies to transition to low carbon energy systems and achieve carbon neutrality further unfold.

In 2017, the Board approved the comprehensive Short-Lived Climate Pollutant Reduction Strategy (Strategy).[423] This strategy explained how the state would meet the following SB 1383-established targets:

- 40 percent reduction in total methane emissions[424] (including a separate 40 percent reduction in dairy and livestock emissions)
- 40 percent reduction in hydrofluorocarbon gas emissions
- 50 percent reduction in anthropogenic black carbon emissions
- 50 percent reduction of organic waste disposal from 2014 levels by 2020, and 75 percent by 2025, including recovery of at least 20 percent of edible food for human consumption

The state is expected to achieve roughly half of the SB 1383 targeted emissions reductions by 2030 through strategies currently in place (See Figure 4-11). As directed by the Legislature under SB 1383, state agencies focused on voluntary, incentive-based mechanisms to reduce SLCP emissions in the early years of implementation to overcome technical and market barriers. Under this "carrot-then-stick" strategy, incentives are replaced with requirements as the solutions become increasingly feasible and cost-effective. To meet legislated targets, more aggressive action is needed.

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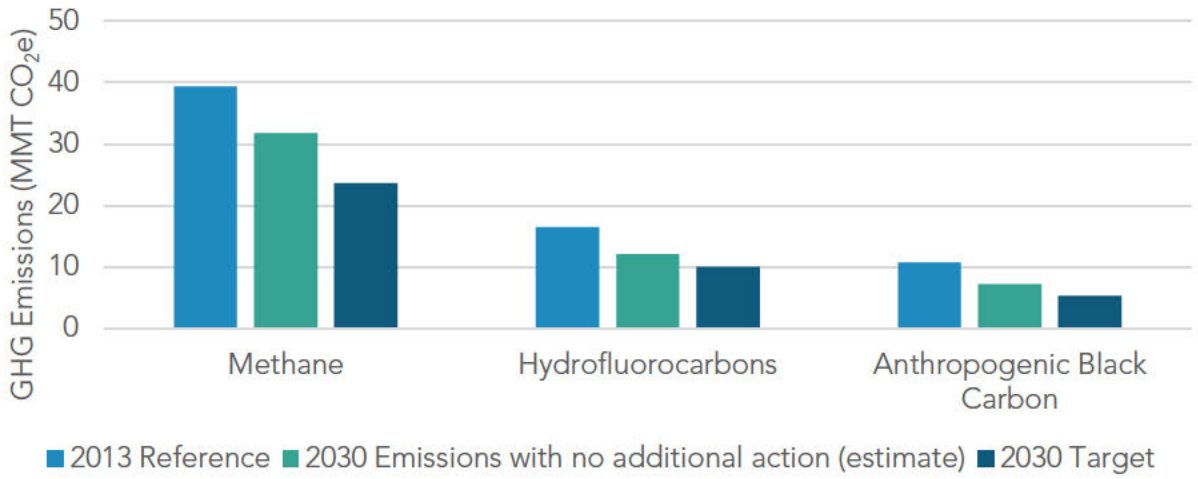
[421] IPCC. 2021. *Climate Change 2021:The Physical Science Basis.* https://www.ipcc.ch/report/ar6/wg1/.
[422] United Nations. Global Methane Assessment. Summary for Policymakers. https://wedocs.unep.org/bitstream/handle/20.500.11822/35917/GMA_ES.pdf.
[423] CARB. 2017. Short-Lived Climate Pollution Reduction Strategy. https://ww2.arb.ca.gov/sites/default/files/2020-07/final_SLCP_strategy.pdf.
[424] All SB 1383 emissions reductions are mandated to be realized by 2030 and are relative to 2013 levels.

Figure 4-11: Expected progress toward SB 1383 targeted emissions reductions by 2030 through strategies currently in place



While the state's overall GHG emissions have declined by 9 percent over the past decade, SLCP emissions reductions have not kept pace with broader progress toward decarbonization. After growing steadily in the preceding decade, methane emissions have remained relatively flat since 2013.

HFCs are the fastest growing source of GHG emissions, primarily driven by their use to replace ozone-depleting substances and an increased demand for cooling and refrigeration.[425] Since 2005, statewide HFC emissions have more than doubled. While the rate of increase has slowed in recent years due to the state's measures, HFC emissions are still on the rise in California, and have grown by over 50 percent since 2010.[426] Globally, as temperatures rise, adoption of cooling technologies (and refrigerants) is increasing rapidly. If no measures are taken, it is estimated that HFCs will account for 9 to 19 percent of the total global GHG emissions by 2050.[427]

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[425] CARB. 2022. *California Greenhouse Gas Emissions for 2000 to 2020: Trends of Emissions and Other Indicators*. https://ww2.arb.ca.gov/sites/default/files/classic/cc/inventory/2000-2020_ghg_inventory_trends.pdf.
[426] CARB. 2022. *California Greenhouse Gas Emissions for 2000 to 2020*. https://ww2.arb.ca.gov/sites/default/files/classic/cc/inventory/2000-2020_ghg_inventory_trends.pdf.
[427] Velders, G. J., D. W. Fahey, J. S. Daniel, M. McFarland, and S. O. Andersen. 2009. "The large contribution of projected HFC emissions to future climate forcing." *Proceedings of the National Academy of Sciences* 106(27), 10949–10954.

Methane

Human sources of methane emissions are estimated to be responsible for up to 25 percent of current warming.[428] Fortunately, methane's short atmospheric lifetime of ~12 years[429] means that emissions reductions will rapidly reduce concentrations in the atmosphere, slowing the pace of temperature rise in this decade. Further, a substantial portion of the targeted reductions can be achieved at low cost and will provide significant human health benefits. For example, the UN's *Global Methane Assessment* (2021)[430] found that over half of the available targeted measures have mitigation costs below \$21/MTCO_2e, and that each million metric tons of methane reduced would prevent 1,430 premature deaths annually due to ozone pollution caused by methane.

Following the Twenty Sixth Conference of Parties (COP26) (the United Nations Convention on Climate Change in 2021), over 110 nations have signed onto the Global Methane Pledge (Pledge)[431] to limit methane emissions by 30 percent relative to 2020 levels. The Pledge covers countries that emit nearly half of all methane and make up 70 percent of global GDP. The UN's Global Methane Assessment[432] shows that human-caused methane emissions can be reduced by up to 45 percent this decade, which would avoid nearly 0.3°C of global warming by 2045.

As shown in Figure 4-12, the three largest sources of California's methane emissions are the dairy and livestock industry, landfills, and oil and gas systems.

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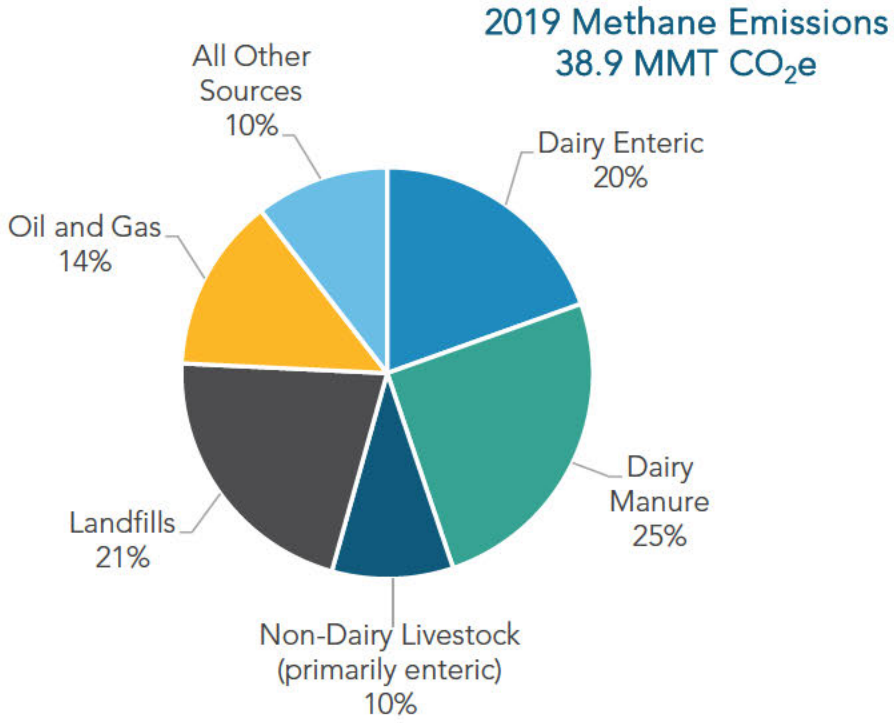
[428] IPCC. 2021. *Climate Change 2021:The Physical Science Basis.* https://www.ipcc.ch/report/ar6/wg1/.
[429] In contrast, the lifetime of CO_2 is hundreds of years. The IPCC Third Assessment Report concluded that no single lifetime can be defined for CO_2 because of the different rates of uptake by different removal processes. According to IPCC Fourth Assessment Report, the majority of an increase in CO_2 will be removed from the atmosphere within decades to a few centuries, while the remaining 20 percent may stay in the atmosphere for many thousands of years.
[430] United Nations. 2021. Global Methane Assessment. https://wedocs.unep.org/bitstream/handle/20.500.11822/35917/GMA_ES.pdf.
[431] Global Methane Pledge. https://www.globalmethanepledge.org/.
[432] United Nations Environment Programme. 2021. Global Methane Assessment: Benefits and Costs of Mitigating Methane Emissions. https://www.unep.org/resources/report/global-methane-assessment-benefits-and-costs-mitigating-methane-emissions?msclkid=00661370c85811eca078eb8fdbd603d1.

Figure 4-12: Sources of California methane emissions (2019)



Emissions from dairy and livestock operations come from two main sources: (1) enteric fermentation and (2) manure management operations, especially at dairies that employ open anaerobic lagoons that allow methane to escape into the atmosphere. Landfills, the second largest source of methane emissions, produce methane from the decomposition of organic waste. Although approximately 95 percent of all the waste that has been disposed of in the state has been deposited in a landfill that is equipped with a gas collection and control system, as required by California's Landfill Methane Regulation,[433] a portion of the methane still escapes into the atmosphere. Fugitive methane emissions can be intermittent and highly variable, both seasonally and spatially, particularly at landfills. Research has shown that landfills are complex systems and a wide range of conditions (e.g., atmospheric, operational, biological, chemical, and physical) may contribute to variability in rates of organic waste degradation, methane generation, and capture efficiency, so reducing the amount of organics deposited in landfills is critical to reducing overall landfill methane emissions. And despite the variability in individual landfill emissions, landfill gas collection and control systems remain the most effective strategy

[433] CARB. Landfill Methane Regulation. https://ww2.arb.ca.gov/our-work/programs/landfill-methane-regulation.

for reducing methane emissions from waste once it is placed in a landfill. Non-combustion methane emissions from the oil and gas sector are the third largest source of methane emissions in California. Almost three-quarters of the methane emissions from this sector come from leaks and venting from fossil gas transmission and distribution pipelines and equipment.

Hydrofluorocarbons

HFCs are synthetic GHGs that are powerful climate forcers. They are used mainly as refrigerants or heat transfer fluids in refrigeration, space conditioning, and heat pump equipment. Refrigerants are ubiquitous and are used everywhere from supermarkets, convenience stores, cold storage warehouses and wineries, to vending machines and residential and motor vehicle air-conditioners. Additionally, HFCs are also used as foam-blowing agents, solvents, aerosol-propellants, and fire suppressants. While HFCs remain in the atmosphere for a much shorter time than CO_2, the relative global warming potential (GWP) values of HFCs can be hundreds to thousands of times greater than CO_2. The mix of HFCs currently in use in California, weighted by usage (tonnage), have an average 100-year GWP of 1,700.[434] The average atmospheric lifetime of the mix of HFCs in use is 15 years.[435] Given the short average lifetimes, rapid reductions in HFC emissions can translate into near-term reductions in climate change effects.

As the global temperatures increase, the demand for cooling and refrigerants will continue to grow, as will the use of electric heat pumps to replace conventional fossil gas heating options. Unless addressed, continued use of high-GWP HFCs will perpetuate a feedback loop, where the cooling agents themselves cause additional warming.

In 2016, representatives from 197 nations signed the Kigali Amendment, which amended the existing Montreal Protocol (to reduce ozone-depleting substance production and consumption) to include a global phasedown in the production and consumption of HFCs beginning in 2019.[436] As of September 2022, 137 nations have either accepted, approved, or ratified the Kigali Amendment. On September 21, 2022, the U.S. Senate approved ratification of the Kigali Amendment, and it is expected that the United States

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[434] CARB. 2020. *Initial Statement of Reasons: Public Hearing to Consider the Proposed Amendments to the Prohibitions on Use of Certain Hydrofluorocarbons in Stationary Refrigeration, Chillers, Aerosols-Propellants, and Foam End-Uses Regulation.* October 20. https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2020/hfc2020/isor.pdf?_ga=2.164659835.592460318.1646664679-912670513.1542398285.

[435] Zhongming, Z., et al. 2011. *HFCs: A Critical Link in Protecting Climate and the Ozone Layer: A UNEP Synthesis Report.*

[436] United Nations Treaty Collection. Chapter XXVII, Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer. https://treaties.un.org/Pages/ViewDetails.aspx?src=IND&mtdsg_no=XXVII-2-f&chapter=27&clang=_en.

will soon join the 137 nations that have already ratified.[437] In the United States, Congress enacted the federal *American Innovation and Manufacturing (AIM) Act* in December 2020.[438] The AIM Act authorizes the U.S. EPA to address HFCs in several ways, including a national HFC phasedown that nearly mirrors the schedule of the global phasedown under the Kigali amendment.[439]

Nearly 90 percent of HFC emissions in California come from their use as refrigerants in the commercial, industrial, residential, and transportation sectors. The timescales over which the HFC emissions occur vary, depending on the type of application. Thus, strategies to reduce HFC emissions must be tailored by equipment type. CARB has several measures in place to tackle HFC emissions from the various sources shown in Figure 4-13 below. This includes the Refrigerant Management Program[440] that tracks and manages emissions from large commercial, industrial, and cold storage refrigeration facilities in the state. CARB has adopted regulations to reduce HFC emissions from consumer product aerosol propellants, semiconductor manufacturing, and small cans of automotive refrigerant.[441]

In 2018, California adopted HFC prohibitions via regulation and legislation for several sectors, including stationary refrigeration and foam end uses to backstop the partially vacated federal Significant New Alternatives Policy (SNAP) program.[442] Most recently, in 2020, CARB adopted additional measures that place GWP limits on refrigerants used in refrigeration and air conditioning equipment, which are the largest sources of HFC emissions, and are commonly used in residential, commercial, and industrial buildings. Additionally, CARB adopted a unique pilot program requiring the use of reclaimed refrigerant: the Refrigerant Recovery, Reclaim, and Reuse (R4) Program. The newly adopted HFC rules for the refrigeration and air conditioning sectors are the first of their kind in the nation.

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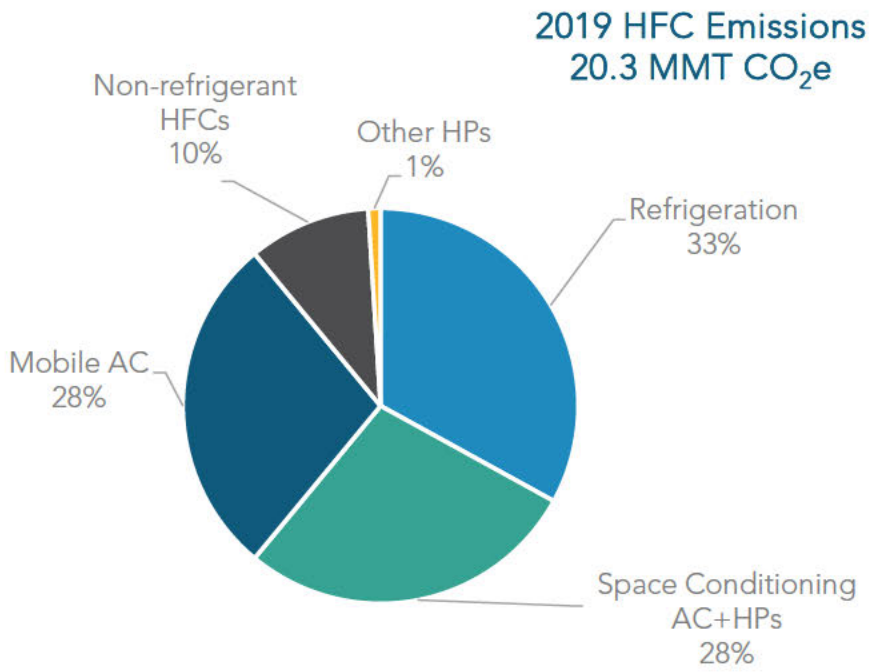
[437] U.S. Ratification of the Kigali Amendment - United States Department of State. *https://www.state.gov/u-s-ratification-of-the-kigali-amendment/*.
[438] 42 U.S.C § 7675, Pub. L. 116-260, § 103. *https://www.epa.gov/sites/default/files/2021-03/documents/aim_act_section_103_of_h.r._133_consolidated_appropriations_act_2021.pdf*.
[439] 42 U.S.C § 7675, Pub. L. 116-260, § 103.
[440] Cal. Code of Regs., tit. 17, §§ 95380, et seq.
[441] Contained in various sections, commencing with Cal. Code of Regs., tit. 13, §§ 1900 et seq.
[442] Cal. Code of Regs., tit. 17, §§ 95371, et seq.; California Cooling Act, Senate Bill 1013 (Lara, Stats. of 2018, Ch. 375, Health & Saf. Code § 39764).

Figure 4-13: Sources of hydrofluorocarbon (HFC) emissions (2019)

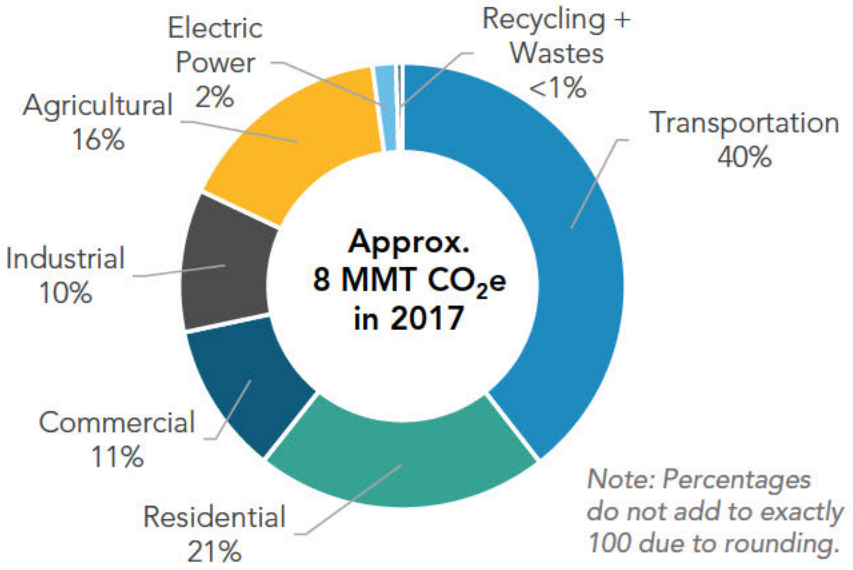


Anthropogenic Black Carbon

Black carbon is not included in AB 32 or the state's AB 32 GHG inventory that tracks progress toward the state's climate targets; however, it has been identified as a powerful climate forcer and is included California's Short-Lived Climate Pollutant Reduction Strategy. The majority of anthropogenic black carbon emissions come from transportation, specifically heavy-duty vehicles, and they have decreased since 2013 due to engine certification standards and in-use rules for on-road and off-road fleets, along with clean fuel requirements and incentives, including California Climate Investments and LCFS credits. Additionally, fuel combustion for residential, commercial, and industrial applications contribute significantly to overall black carbon emissions. Approximately 95 percent of residential black carbon emissions are due to wood combustion; these emissions are being reduced through programs like the Woodsmoke Reduction Program established by SB 563 (Lara, Chapter 671, Statutes of 2017). Alternatives to agricultural burning and policies that phase out agricultural burning will also result in agricultural black carbon emissions reductions. In 2021 CARB provided a preliminary estimate of 2017

black carbon emissions (Figure 4-14).[443] This estimate will be finalized as part of a future update to the Short-Lived Climate Pollutant Inventory.

Figure 4-14: Sources of anthropogenic black carbon (preliminary 2017 estimates; AR5 100-yr GWP 900)



Sector Transition

California has long recognized the importance of mitigating non-combustion SLCPs and took several early action measures as part of a comprehensive, ongoing program to reduce in-state GHG emissions under AB 32. The early action measures included CARB's Landfill Methane Regulation,[444] Refrigerant Management Program,[445] and Oil and Gas Methane Regulation.[446]

Methane

The methane abatement strategies currently in place are projected to achieve half of the methane emissions needed to meet the overall methane reduction target of SB 1383 (40 percent reduction by 2030). The reduction target translates to a limit of less than 24 $MMTCO_2e$ in 2030 (Figure 4-15). It is anticipated that, since some sectors have fewer

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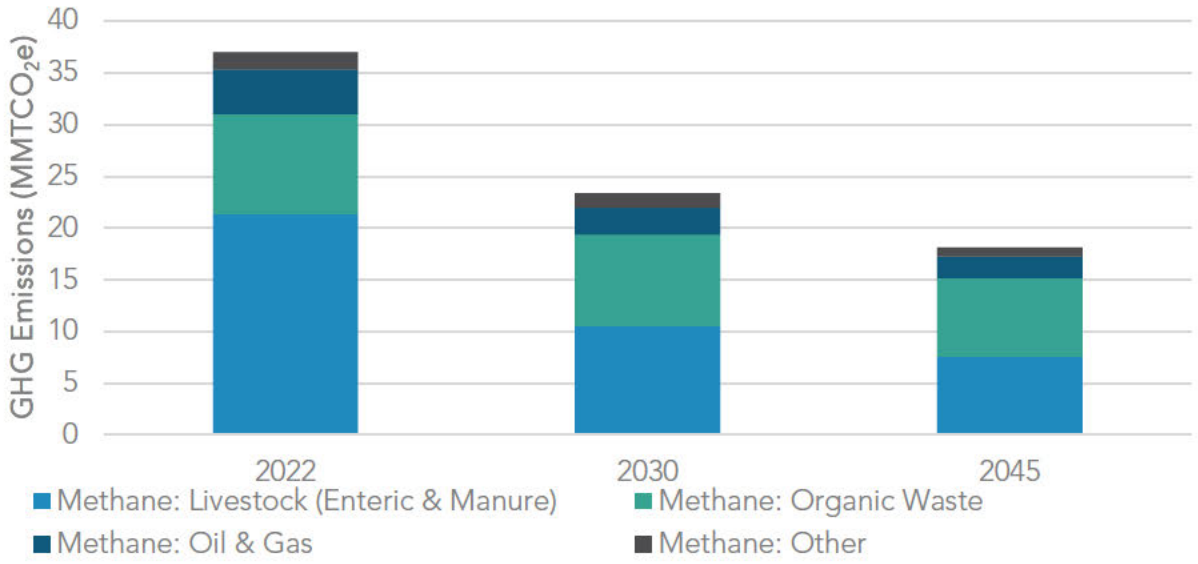
[443] CARB. 2021. 2022 Scoping Plan Update – Short-Lived Climate Pollutants Workshop Presentation, September 8. https://ww2.arb.ca.gov/sites/default/files/2021-09/carb_presentation_sp_slcp_september2021_1.pdf.
[444] Cal. Code of Regs., tit. 17, §§ 95460, et seq.
[445] Cal. Code of Regs., tit. 17, §§ 95380, et seq.
[446] Cal. Code of Regs., tit. 17, §§ 95665–77.

strategies that can be implemented to reduce methane in the near-term, other sectors will need to go beyond the 40 percent reduction to meet the target.

Figure 4-15: Methane emissions in 2022, 2030, and 2045 in the Scoping Plan Scenario[447]



Dairy and Livestock Methane

California is the largest dairy-producing state, home to one in five U.S. dairy cows. To date, methane emissions reductions from the dairy and livestock sector have mainly been driven by a decreasing animal population and the growing adoption of manure management strategies, including anaerobic digesters and conversion to dry manure systems and pasture systems. CARB recently completed a detailed analysis of the emission reductions expected by 2030 and the estimated additional investment needed to reach the dairy and livestock sector methane reduction target. [448]

Assuming no adoption of additional manure management and enteric mitigations strategies beyond the projects that have committed funding, and a continued annual animal population decrease of 0.5 percent per year through 2030, further reductions of approximately 4.4 $MMTCO_2e$ will be needed to achieve the 2030 methane emissions reduction target for the sector set by SB 1383. If the remaining reductions are met through

[447] The *Organic Waste* category includes methane from landfills, wastewater treatment, and compost facilities.
[448] CARB. 2021. Analysis of Progress toward Achieving the 2030 Dairy and Livestock Sector Methane Emissions Target. June. https://ww2.arb.ca.gov/sites/default/files/2021-06/draft-2030-dairy-livestock-ch4-analysis.pdf.

a mix of dairy projects in which half are dairy digesters and half are alternative manure management projects, then it is estimated that at least 420 additional projects will be necessary. Additional emissions reductions beyond this level will likely be necessary to ensure that the overall state methane emissions reduction targets are met.

Despite the considerable methane emissions mitigation potential of enteric strategies like feed additives, little progress has been made, as few products with proven mitigation potential have become commercially available, and unlike manure management strategies, there is a lack of financial incentives for their adoption.

Market conditions favoring farm consolidation and improved production efficiencies have driven reductions in the California and U.S. dairy population over the past decade. [449] These efficiency gains have allowed California to maintain production levels despite the decreasing population. If demand for dairy and beef products remains steady or increases, continued improvements in production efficiency and adoption of effective manure management and enteric mitigation strategies will be important to support dairy and livestock methane emission reductions.

Strategies for Achieving Success

- Install state of the art anaerobic digesters that maximize air and water quality protection, maximize biomethane capture, and direct biomethane to sectors that are hard to decarbonize or as a feedstock for energy.
- Increase alternative manure management projects, including but not limited to conversion to "solid," "dry," or "scrape" manure management; installation of a compost-bedded pack barn; an increase in the time animals spend on pasture; and implementation of solid-liquid separation technology into flush manure management systems.
- Implement enteric fermentation strategies that are cost-effective, scientifically proven, safe for animal and human health, and acceptable to consumers, and that do not impact animal productivity. Provide financial incentives for these strategies as needed.
- Accelerate demand for dairy and livestock product substitutes such as plant-based or cell-cultured dairy and livestock products to achieve reductions in animal populations.
- In consideration of pace of deployment of methane mitigation strategies and the scale of complimentary incentives, consider regulation development to ensure that the 2030 target is achieved, assuming the conditions outlined in SB 1383 are met.

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[449] MacDonald, James M., Jonathan Law, and Roberto Mosheim. 2020. *Consolidation in U.S. Dairy Farming.* ERR-274. July. https://www.ers.usda.gov/webdocs/publications/98901/err-274.pdf.

Landfill Methane

Achieving the 75 percent organic waste disposal reduction target[450] of SB 1383, and maintaining that level of disposal in subsequent years, would bring annual landfill emissions in 2030 to just below the 2013 baseline. Annual methane emissions will be higher through 2030 than originally anticipated by the SLCP Strategy because the state did not achieve the anticipated reductions in organic waste disposal of 50 percent below 2014 levels by 2020. SB 1383 prohibited the organic disposal regulations from taking effect until 2022,[451] and, as a result, emissions have continued to increase.

Due to the multidecadal time frame required to break down landfilled organic material, the emissions reductions from diverting organic material in one year are realized over the course of several decades. For example, one year of waste diversion in 2030 is expected to avoid 8 $MMTCO_2e$ of landfill emissions, cumulatively, over the lifetime of that waste's decomposition.[452] Near-term diversion efforts are critical to avoid locking in future landfill methane emissions.

CalRecycle's 2020 report, *Analysis of the Progress Toward the SB 1383 Waste Reduction Goals,*[453] estimated that 8 million short tons of composting and anerobic digestion capacity will be needed to manage organic wastes, above the existing and new capacity expected to be available by 2025. The 2019 report, *Co-Digestion Capacity in California,*[454] from the State Water Resources Control Board estimated that at least 2.4 million tons of digester capacity is available at urban wastewater treatment plants if sufficient incentives or funding for collection, receiving, and processing operations are provided to enable utilization of this capacity. The CPUC approved a decision in February 2022 implementing the biomethane procurement program, which will require investor-owned utilities by 2025 to procure 17.6 billion cubic feet (BCF) of biomethane produced from organic wastes to support the landfill disposal reduction and SLCP target and reduce fossil gas reliance for

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[450] The target is from 2014 levels by 2025.
Public Resources Code, § 42652.5. CalRecycle approved the SLCP: Organic Waste Reductions regulations (*https://calrecycle.ca.gov/organics/slcp/*) in 2020 and began implementing them in January 2022. These regulations are designed to achieve the 2025 disposal reduction and edible food recovery targets.

[452] The life cycle emissions reduction is based on anticipated diversion of 27 million short tons of organic waste from CalRecycle (2020) Analysis of the Progress Toward the SB 1383 Organic Waste Reduction Goals (*https://www2.calrecycle.ca.gov/Publications/Details/1693*). Under CalRecycle's SLCP regulations, an alternative to landfill disposal must achieve a life cycle GHG reduction of 0.3 $MTCO_2e$ per short ton of waste diverted.

[453] CalRecycle. 2020. *Analysis of the Progress Toward the SB 1383 Waste Reduction Goals.* *https://www2.calrecycle.ca.gov/Publications/Details/1693*.

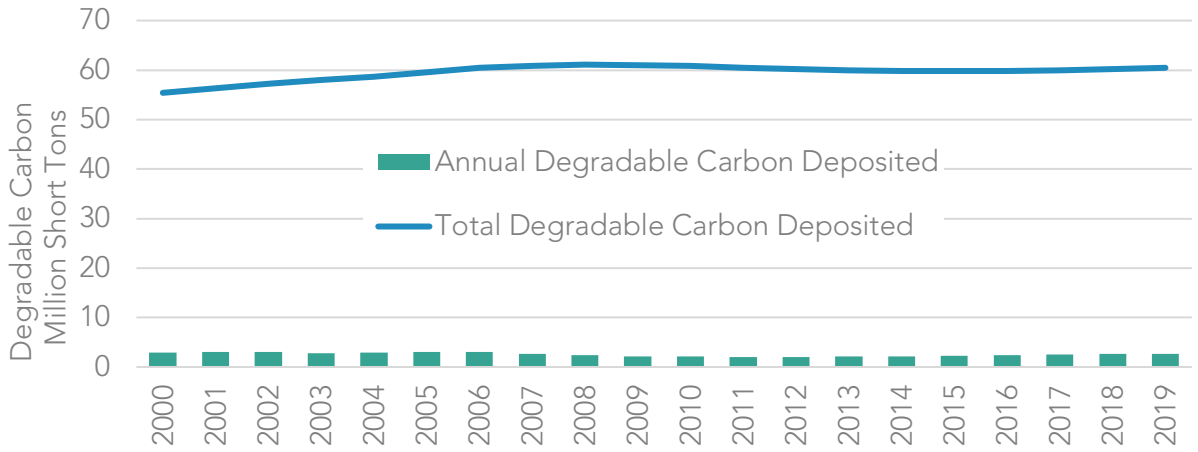
[454] State Water Resources Control Board. 2019. *Co-Digestion Capacity in California.* *https://www.waterboards.ca.gov/water_issues/programs/climate/docs/co_digestion/final_co_digestion_capacity_in_california_report_only.pdf*.

residential and commercial customers.[455] Additionally, the organic waste stream includes more than one million tons of edible food that could be recovered before it enters the waste stream through food rescue programs that combat hunger in communities throughout California.

While reducing organic waste disposal is the most effective means of achieving reductions in waste sector methane, strategies to reduce emissions from waste already in place in landfills also will play a role in achieving near-term reductions. As Figure 4-16 shows, the total degradable carbon (a measure of the amount of waste with potential to generate methane) that is accumulated from waste deposited in previous years is over 20 times greater than the amount added each year. This illustrates that even if we were able to entirely phase out landfilling of organic waste today, the existing waste in place at landfills would continue to generate methane for decades into the future.

Through a combination of improvements in operational practices, use of lower permeability covers, advanced landfill gas collection systems, and increased monitoring to detect and repair leaks, it is estimated that a direct emission reduction of 10 percent is achievable across the state's landfills by 2030. Technologies to utilize landfill gas efficiently can contribute further emission reductions in the energy sector.

Figure 4-16: Degradable carbon deposited in landfills



Strategies for Achieving Success

- Maximize existing infrastructure and expand it to reduce landfill disposal, with strategies including composting, anaerobic digestion, co-digestion at wastewater treatment plants, and other non-combustion conversion technologies.

[455] CPUC. 2022. Decision 22-02-025.

- Expand markets for products made from organic waste, including through recognition of the co-benefits of compost, biochar, and other products.[456]
- Recover edible food to combat food insecurity.
- Invest in the infrastructure needed to support growth in organic recycling capacity.
- Utilize existing digesters at wastewater treatment facilities to rapidly expand food waste digestion capacity.
- Direct biomethane captured from landfills and organic waste digesters to sectors that are hard to decarbonize.
- Implement improved technologies and best management practices at composting and digestion operations.
- Reduce emissions from landfills through improvements in operational practices, lower permeability covers, advanced collection systems, and technologies to utilize landfill gas.
- Leverage advances in remote sensing capabilities to quickly pinpoint large methane sources and mitigate leaks, improve understanding of the factors that lead to better capture efficiency, and explore new technologies and practices that can reliably improve methane control at landfills.

Upstream Oil and Gas Methane Reduction

For oil and gas production, processing, and storage, California is currently on track to achieve a 41 percent reduction in methane emissions by 2025 relative to 2013. The additional reductions needed to meet the 2030 target may be achieved by implementing additional regulatory requirements to further reduce intentional venting of fossil gas from equipment. If necessary, additional reductions from transmission and distribution facilities may be achieved by requiring the utilities to increase inspection and repair activities or further reduce emissions from pipeline blowdowns by implementing methods such as using portable compressors, using plugs to isolate sections of pipelines, flaring vented gas, routing gas to fuel gas systems, and installing static seals on compressor rods. Advances in methane detection technologies (e.g., satellites equipped to detect large methane sources) may also help to identify and mitigate methane emissions quickly across the oil and gas sector.

As California transitions away from fossil fuels, in-state oil and gas production will likely decline. This could result in an increase over time in the number of long-term idle and orphan wells (idle wells lacking a financially solvent, responsible owner) in the state. While California has regulations aimed at helping ensure operators manage their idle wells,

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[456] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, F4.4. finalejacrecs.pdf (arb.ca.gov).

there could likely be an increase in California's orphan well population. Plugging all orphan wells, of which there are currently over 5,000, could take decades due to the limited resources California has for orphan well plugging. The benefits from plugging wells include methane emission reductions and job creation; employment gains from well plugging and site remediation activities could help temporarily offset job losses from the oil and gas industry. The California Council on Science and Technology's 2018 report on orphan wells, *Orphan Wells in California: An Initial Assessment of the State's Potential Liabilities to Plug and Decommission Orphan Oil and Gas Wells,*[457] found that the potential cost to the state of plugging current orphan wells could be approximately $500 million, and the cost of plugging all active and idle wells could total over $9.1 billion. As oil and gas production in California declines due to reduced demand for fossil fuels, additional funding will likely be needed to cover the costs of plugging wells that have no viable operator.

Strategies for Achieving Success

- Mitigate emissions from leaks by regular leak detection and repair (LDAR) surveys at all facilities.
- Replace high emitting equipment with zero emission alternatives wherever feasible.[458]
- Have CARB and CalGEM lead a Task Force to identify and address methane leaks from oil infrastructure near communities.
- Pursuant to SB 1137, develop leak detection and repair plans for facilities in health protection zones, implement emission detection system standards, and provide public access to emissions data.
- Minimize emissions from equipment that must vent fossil gas by design (e.g., fossil gas powered compressors).
- Install vapor collection systems on high emitting equipment.
- Phase out venting and routine flaring of associated gas (gas produced as a by-product during oil production).
- Continuous ambient monitoring at fossil gas underground storage facilities to quickly detect large methane sources.
- Reduce pipeline and compressor blowdown emissions.

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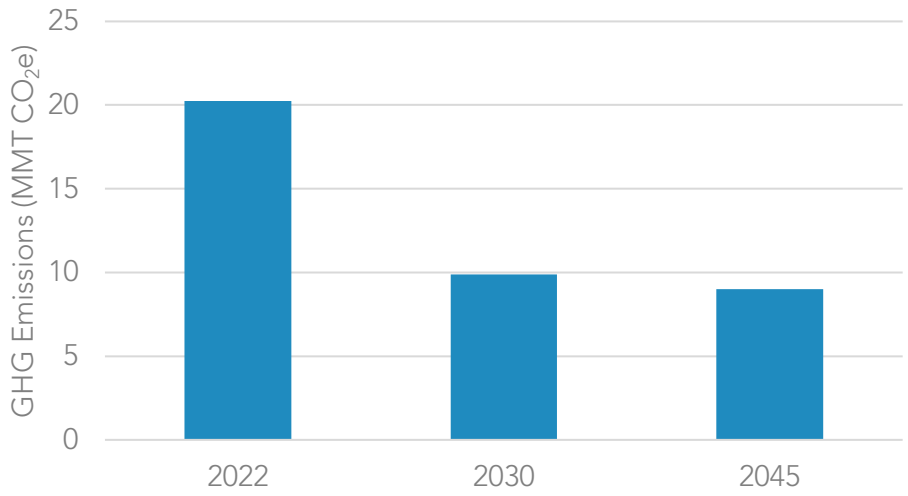
[457] The California Council on Science and Technology. 2018. *Orphan Wells in California: An Initial Assessment of the State's Potential Liabilities to Plug and Decommission Orphan Oil and Gas Wells.* https://ccst.us/wp-content/uploads/CCST-Orphan-Wells-in-California-An-Initial-Assessment.pdf.
[458] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, P5. finalejacrecs.pdf (arb.ca.gov).

- Leverage advances in remote sensing capabilities to quickly pinpoint large methane sources and mitigate leaks.[459]

Hydrofluorocarbons

In California, all the HFC measures currently in place will help achieve more than 70 percent of the reductions needed to achieve the 2030 HFC goal and provide very significant emissions reductions by 2045 and beyond. However, new targeted measures will be needed to maintain the pace of reductions, as demand for technologies that currently predominantly use high-GWP refrigerants is anticipated to grow. Despite decarbonization efforts, high-GWP HFCs are expected to be among the last remaining persistent GHG emission sources, as shown in Figure 4-17.[460]

Figure 4-17: Hydrofluorocarbon emissions in 2022, 2030, and 2045 in the Scoping Plan Scenario



HFC emissions from new and existing sources should be addressed in tandem with building decarbonization efforts to maximize reductions.[461] As buildings are electrified in an effort to decarbonize them, the use of heat pumps for space conditioning, water heaters, and clothes dryers is expected to increase significantly. Heat pumps, while using

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[459] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, CC17. finalejacrecs.pdf (arb.ca.gov).
[460] Energy and Environmental Economics, Inc. 2020. *Achieving Carbon Neutrality.* https://ww2.arb.ca.gov/sites/default/files/2020-10/e3_cn_final_report_oct2020_0.pdf.
[461] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, NF26. finalejacrecs.pdf (arb.ca.gov).

electricity, not fossil gas, currently rely predominantly on high-GWP refrigerants. Very low- or no-GWP technologies and solutions are either available or emerging for various heat pump technologies, and likely to develop further as international efforts to mitigate HFCs continue. However, most of these technologies are still nascent in the United States. In addition, some of the alternatives cannot be used until California building codes are updated, which is currently expected at the earliest in mid-2024 for some technologies based on the recently adopted provisions in AB 209[462] requiring the California Building Standards Commission to adopt the latest safety standards for refrigerant containing equipment into California's building codes. The current updates to the building codes will allow the use of many refrigerants with lower GWPs than HFCs currently in use. However, additional building code updates are needed to expand the choices of ultra-low-GWP alternatives, and that will need to happen in the next few years. The adoption of low-GWP refrigerants must occur in parallel with building decarbonization efforts; without such efforts, the vast GHG benefits of the latter will be partially offset, and the proportion of HFC emissions from buildings will continue to grow.

Leaks from existing air conditioning and refrigeration equipment are a major source of statewide and global HFC emissions. Once installed, refrigeration and air conditioning equipment can stay in place for decades, while leaking refrigerants into the atmosphere. This makes it very important that new installed equipment use refrigerants with a GWP as low as possible. The refrigerants inside existing equipment are sometimes collectively referred to as the *installed base* or *banks* of potential HFC emissions. If released spontaneously, the existing HFC banks would equal 60 percent of all annual statewide GHG emissions in California, as illustrated in Figure 4-18.[463]

The sales prohibitions on newly produced refrigerants set forth in SB 1206 (2022) and the national/international HFC phasedown will help in reducing HFC emissions from existing equipment by restricting the supply of and increasing the value of existing high-GWP HFCs, thus enabling a circular economy. In the 2022–2023 state budget, CARB received $45 million in incentive funding for climate-friendly refrigerant technologies; this funding will be critical in shifting the market toward the best available refrigerant technologies in various sectors.

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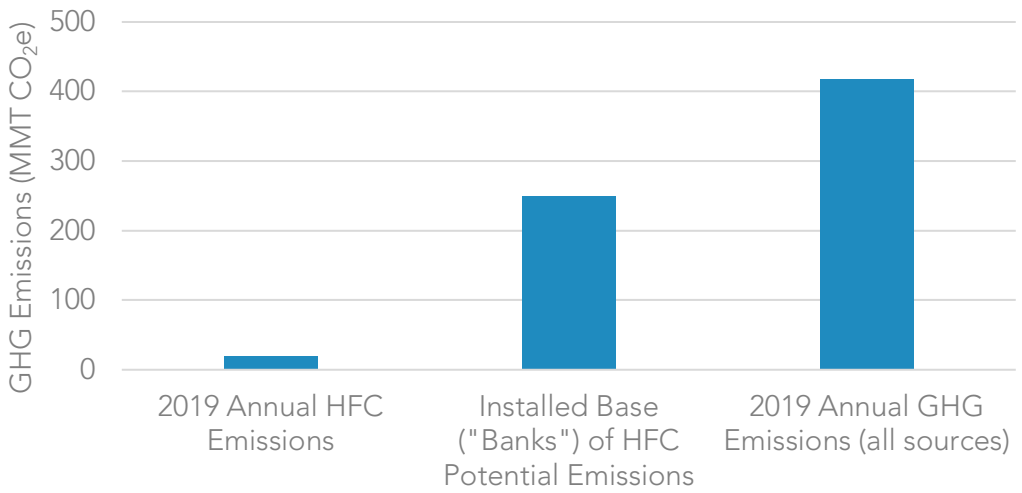
[462] AB 209: Energy and climate change. https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=202120220AB209.

[463] CARB. 2021. 2022 Scoping Plan Update – Short-Lived Climate Pollutants Workshop Presentation. September 8. https://ww2.arb.ca.gov/sites/default/files/2021-09/carb_presentation_sp_slcp_september2021_1.pdf.

Figure 4-18: Potential emissions from refrigerants in existing equipment



Strategies for Achieving Success

- Expand the use of very low- or no-GWP technologies in all HFC end-use sectors, including emerging sectors, like heat pumps for applications other than space conditioning, to maximize the benefits of building decarbonization.[464]
- Convert large HFC emitters such as existing refrigeration systems to the lowest practical GWP technologies.[465]
- Prioritize small-scale and independent grocers serving priority populations in addressing existing "banks" of high-GWP refrigerants.[466]
- Improve recovery, reclamation, and reuse of refrigerants by limiting sales of new or virgin high-GWP refrigerants and requiring the use of reclaimed refrigerants where appropriate.[467]
- Assist low-income and disadvantaged communities in obtaining low-GWP space conditioning units to protect vulnerable communities from heat stress and wildfire smoke.[468]

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[464] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, NF26. finalejacrecs.pdf (arb.ca.gov).
[465] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, NF22. finalejacrecs.pdf (arb.ca.gov).
[466] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, JT5 and JT6. finalejacrecs.pdf (arb.ca.gov).
[467] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, JT1. finalejacrecs.pdf (arb.ca.gov).
[468] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, NF28, JT5, and JT6. finalejacrecs.pdf (arb.ca.gov).

- Accelerate technology transitions in California and the U.S. overall by collaborating with international partners committed to taking action on HFCs under the Kigali Amendment to the Montreal Protocol; this includes addressing barriers to adoption of very low- or no-GWP refrigerant technologies such as high upfront costs, shortage of trained technicians, and lag in updating safety standards and building codes.

Anthropogenic Black Carbon

Significant progress has been made since 2013 to reduce anthropogenic black carbon emissions, primarily from decreased combustion of distillate fuels in the agricultural sector, as well as improvements to provide cleaner, on-road combustion technologies. Under current strategies, anthropogenic black carbon from transportation is expected to be reduced by over 60 percent in 2030. Continued reductions in combustion emissions across all sectors from both the state's climate and air quality programs will also help reduce anthropogenic black carbon emissions going forward.

Strategies for Achieving Success

- Reduce fuel combustion commensurate with state's climate and air quality programs, particularly from reductions in transportation emissions and agricultural equipment emissions.[469]
- Invest in residential woodsmoke reduction.

In addition to SLCP emissions, some remaining non-combustion emissions are anticipated to persist in the coming decades, as shown in Figure 4-19. These include CO_2 from industrial processes such as cement manufacturing, oil and gas extraction, and geothermal electric power; N_2O from wastewater treatment, fertilizers, and livestock manure applied to agricultural soils; and other industrial, non-HFC GHG emissions.

[469] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, F1A and Appendix A (Table Summary of Direct Emission Reduction Strategies). "Emissions reductions from energy consumed by California's agricultural sector, including post-harvest processing, use of tractors and other farm equipment, and water import and irrigation." *finalejacrecs.pdf (arb.ca.gov)*.

Figure 4-19: Remaining non-combustion emissions in 2022, 2030, and 2045 in the Scoping Plan Scenario

Natural and Working Lands

California's natural and working lands (NWL) cover approximately 90 percent of the state's 105 million acres,[470] and include forests, grasslands, shrublands and chaparral, croplands, wetlands, sparsely vegetated lands, and the green spaces in urban and built environments. These lands include California Native American tribes' ancestral and cultural lands, parks and green spaces in our cities and communities, and the waters and the iconic landscapes we know and love. The diverse landscapes and biodiversity found throughout California's NWL provide a multitude of benefits to the people of California, including clean water, clean air, biodiversity, food, economic prosperity, recreational opportunities, continuation of traditional tribal ways of life, mental health benefits, and many others.

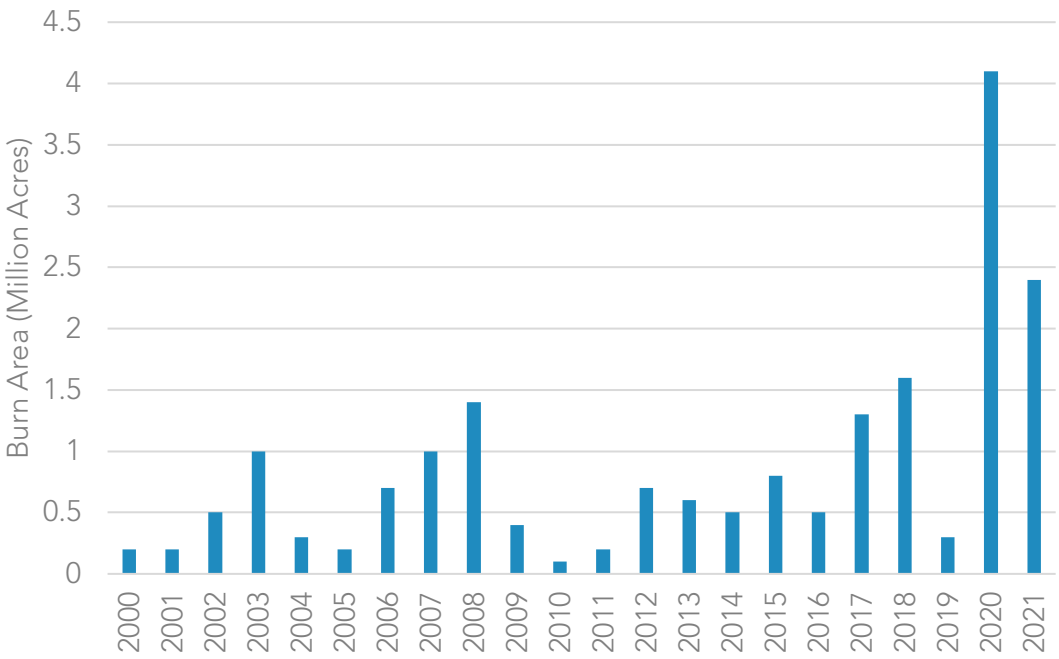
Our lands are a critical sector in California's fight to achieve carbon neutrality and build resilience to the impacts of climate change. Healthy land can sequester and store atmospheric CO_2. Healthy lands also can reduce emissions of powerful SLCPs, limit the release of future GHG emissions, protect people and nature from the impacts of climate change, and build our resilience to future climate risks. Creation of healthy lands through

[470] CNRA. 2022. Natural and Working Lands Climate Smart Strategy. *https://resources.ca.gov/-/media/CNRA-Website/Files/Initiatives/Expanding-Nature-Based-Solutions/CNRA-Report-2022---Final_Accessible_Compressed.pdf*.

multi-benefit and mitigation measures can also support tribal and local traditional lifeways. Unhealthy lands have the opposite effect—they release more GHGs than they store and are more vulnerable to future climate change impacts.

Climate change impacts have become more apparent in recent years and are having significant effects on communities throughout the state. One of these impacts is the much more frequent occurrence of unusually large, high-severity wildfires, which are being driven by climate change and by a recent history of fire-exclusion and land management practices that have resulted in forests with high levels of biomass. These recent large and high-severity wildfires have resulted in a significant amount of burned acreage and emissions in California (Figure 4-20).[471]

Figure 4-20: Acreage of burned wildland vegetation area



These wildfires deviate from the lower-severity fires that previously occurred at frequent intervals, around which California's forests evolved. As climate change accelerates, these large, uncharacteristic wildfires are likely to become more common and impact more of our landscapes. Climate change is also expected to have other significant effects on our lands, including more extreme droughts, floods, extreme heat, and the spread of invasive aquatic and terrestrial species, pests, diseases, and parasites. These impacts can lead

[471] CARB. 2022. Wildfire Emission Estimates for 2021. https://ww2.arb.ca.gov/sites/default/files/classic/cc/inventory/Wildfire%20Emission%20Estimates%202000-2021.pdf.

to negative feedback loops on human and ecological health; for example, increasing the spread of invasive species can lead to increases in pesticide use, if not managed through regulation or mitigation, which can pose risks to human health and the environment.

California's approach to climate action in the NWL sector is not solely focused on maximizing carbon stocks but instead on supporting carbon management that holistically fosters ecosystem health, resilience, provision of overall climate function, and other co-benefits.

Natural systems operate on a longer timescale than the energy and industrial sectors, and benefits from climate action on our lands can take decades to accrue. Scaling climate smart land management in California requires taking action now and playing the "long game" by establishing and maintaining consistent, patient approaches and programs.

Landscapes

For the first time, this Scoping Plan includes modeling for the NWL sector. The focus of the initial modeling is limited to seven land types that align with the those in the NWL Climate Smart Strategy.[472] Work will continue to incorporate more landscapes and management practices into the modeling over time. The initial landscapes included in the modeling for this Scoping Plan are:

- Forests
- Shrublands and Chapparal
- Grasslands
- Croplands
- Wetlands
- Developed Lands
- Sparsely Vegetated Lands

Each of these land types are a key component to the state's approach to increasing climate action in the NWL sector, as called for in Executive Order N-82-20 and AB 1757.[473] The Executive Order directs CARB to update the target for this sector in support of carbon neutrality by 2045 as part of this Scoping Plan, and to take into consideration the NWL Climate Smart Strategy. AB 1757 calls for the development of an

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[472] CNRA. 2022. *Natural and Working Lands Climate Smart Strategy. Appendix B.* https://resources.ca.gov/-/media/CNRA-Website/Files/Initiatives/Expanding-Nature-Based-Solutions/Appendix-B_04132022_ada.pdf.

[473] AB 1757 California Global Warming Solutions Act of 2006: Climate Goal: Natural and Working Lands. https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=202120220AB1757.

ambitious range of targets for the NWL sector to be integrated into the Scoping Plan and other state policies. It directs CARB and CNRA to work closely together to update the NWL Climate Smart Strategy, and establish an expert advisory committee to inform and advise on NWL modeling, targets, and implementation strategies.[474] Additionally, in 2021, the governor signed SB 27[475] (Skinner, Chapter 237, Statutes of 2021) into law. It directed CARB to establish CO_2 removal targets for 2030 and beyond and take into consideration the NWL Climate Smart Strategy. The governor's Executive Order, AB 1757, and SB 27 go beyond previous direction from the Legislature and past administrations. These directives emphasize the importance of quantifying land-based carbon both statewide,[476] and in programs and policies,[477] setting targets[478] for NWL to support the state's climate objectives, and advancing land management actions[479] that support the health and resiliency of these lands.

Blue carbon (also known as carbon captured and held in coastal vegetation and soils, such as seagrasses, seaweeds, and wetlands)—is also important to consider as we look at long-term climate goals. While this landscape is not currently covered by IPCC inventory guidelines or included in California's NWL Inventory, the United States was the first nation to include blue carbon in its national GHG emissions inventory. California's Ocean Protection Council and San Francisco Estuary Institute are partnering to create a new coastal wetlands, beaches, and watersheds inventory. CARB staff will utilize information from this effort and assess other available data to evaluate how this landscape may be integrated into our efforts in the future as more data become available.[480]

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[474] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, N20. *finalejacrecs.pdf (arb.ca.gov)*.
[475] SB 27 Carbon sequestration: state goals: natural and working lands: registry of projects. *https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=202120220SB27*.
[476] SB 859 Public resources: greenhouse gas emissions and biomass (SB 859, Committee on Budget and Fiscal Review, Chapter 368, Statutes of 2016). *https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201520160SB859*.
[477] SB 1386. Resource conservation: working and natural lands. (SB 1386, Chapter 545, Statutes of 2016). *https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201520160SB1386*.
[478] CARB. 2017. 2017 Climate Change Scoping Plan Update. Board Resolution 17-46. *https://ww2.arb.ca.gov/sites/default/files/barcu/board/res/2017/res17-46.pdf*.
[479] Executive Department. State of California. EO B-52-18. *https://www.ca.gov/archive/gov39/wp-content/uploads/2018/05/5.10.18-Forest-EO.pdf*.
[480] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, N2. *finalejacrecs.pdf (arb.ca.gov)*.

Trends of Carbon on Landscapes

CARB currently tracks the carbon stock changes though the Inventory of Ecosystem Carbon in California's Lands[481] (NWL Inventory), which is summarized in Chapter 1. The NWL Inventory is a key tool for tracking changes in carbon stocks across the state, and it will serve as the inventory of record for this sector, tracking sector-wide progress toward the target. The NWL Inventory provides a retrospective snapshot of the status of California's lands, and captures the gains or losses of carbon stocks that occur over time. In addition to tracking carbon stock changes, the NWL Inventory is an important tool for understanding the impacts of our efforts to increase climate action in this sector (such as those identified in this Scoping Plan and the NWL Climate Smart Strategy) on NWL carbon stocks. The inventory is also used as the foundation for Scoping Plan scenario modeling and target setting.

CARB's inventory shows that carbon stocks decreased in NWL lands from 2001 to 2011, releasing more carbon than they were storing, and then increased slightly from 2012 to 2014.[482] These trends highlight the interannual and interdecadal variability of lands and their ability to be both a source and a sink of carbon, and the importance of looking at NWL data and trends over multiyear and multidecadal time periods, as opposed to looking only at annual changes. This movement is part of the Earth's carbon cycle, where carbon transfers between the land, ocean, and atmosphere. As part of the carbon cycle, over decades or centuries, fire and plant respiration and decomposition move carbon from the land to the atmosphere, while plant growth and other processes move carbon from the atmosphere to the land. Emissions from fossil-fuel combustion are contributing to putting this cycle out of balance.

Additionally, some historic land management practices that have resulted in the loss of carbon from the soil are also contributing to the atmospheric rise of CO_2 while simultaneously exacerbating the imbalance of the water cycle, which is influenced by and linked to the carbon cycle. These emissions are also contributing to a feedback loop for California's lands: as CO_2 emissions accumulate in the atmosphere—and California experiences more warming, extreme heat events, and droughts—the risk and intensity of carbon losses also increases, which in turn transfers more carbon from the land to the atmosphere. And because forests and shrublands comprise approximately 85 percent of the carbon stocks in California, management strategies and disturbances in forest and

[481] CARB. *An Inventory of Ecosystem Carbon in California's Natural & Working Lands.* 2018 Edition. *nwl_inventory.pdf (ca.gov).* Accessed 3/2/2022.
[482] These trends are consistent estimates in the most recent AB 1504 reporting period.

shrubland carbon play an important role in determining whether California's lands are providing either net carbon sequestration or net emissions on an annual basis.

The gains and losses of carbon on our lands will fluctuate in the future; what is important is to restore carbon in places where it has been lost and reduce large carbon losses on our NWL through active, attentive, and adaptive management. For additional details on the nexus between NWL and GHGs, see pages 5–6 of the NWL Climate Smart Strategy.

Goals and Accelerating Nature-Based Solutions

The state's climate mitigation targets are traditionally identified by individual years, (i.e., tons of GHG emissions in 2020 or 2030). However, because NWL processes fluctuate year to year and because it can sometimes take decades for climate action to fully impact carbon in NWL, it is important to consider the statewide, long-term trends of carbon stock change when identifying how this sector contributes to California's pathway to achieving carbon neutrality. Tracking carbon stock change over a multi-decadal period is the best way to assess the full direct impact climate action has on carbon storage. Such an approach filters out fluctuations from year-to-year weather variations and multi-year natural climate cycles, such as El Niño patterns.

Current data sources and methods allow us to track only certain carbon stocks that exist on NWL. For target tracking to be successful, each carbon pool must be inventoried using a methodology that can detect changes due to management and climate change. Certain carbon pools lack the scientific data and methodologies necessary for target-setting and tracking. For example, soils in forests, shrublands, and grasslands are not included in the Scoping Plan carbon stock target because, currently, there is no way to track statewide soil carbon through time in a way that would capture the effects of increased climate action and climate change.

When considering how NWL contribute to the state's goal of carbon neutrality, all lands' carbon stock gains and losses must be considered, and the Scoping Plan target is set in these terms. It is not sufficient to aggregate climate benefits only within areas where projects, management, or climate action occur. Much of the state does not receive active or quantifiable management, but these areas still contribute to the state's overall carbon stock change and GHG emissions. To incorporate the entire carbon balance toward true carbon neutrality, the Scoping Plan target is set in terms of carbon stock change across the entire state. This incorporates all lands that both receive and do not receive active management, and includes the end result of all sequestration, emissions, and other changes to carbon on the landscape.

However, carbon stock change is not equivalent to emissions. Currently, the data and emission quantification science is not sufficient to enable inventories to comprehensively track all NWL emissions in a way that would enable us to set an NWL target in terms of

statewide emissions and sequestration. There is a great need, across the entire NWL sector statewide, for more empirical data, science, and tools to track all carbon stocks across each carbon pool, and to begin to track emission and sequestration rates. As California implements AB 1757, there is an opportunity to update the data, science, and tools to enable this level of tracking and target setting in the future.

As outlined in Chapter 2, California is projected to lose carbon stocks over the coming decades, but this Scoping Plan analysis also shows that increasing the pace and scale of climate smart land management in California will reduce the carbon stock losses and GHG emissions from the NWL sector. In response to EO N-82-20 and AB 1757, the proposed target for NWL is shown in Table 4-1.

Table 4-1: Scoping Plan modeled target for NWL, based on increasing action on NWL

	Total Carbon Stock % Change from 2014
2045	-4

Achieving this target will require significant expansion of the pace and scale of climate action on California's NWL, including the following:

- Increasing climate smart forest, shrubland, and grassland management to at least 2.3 million acres a year—an approximate 10x increase in management from current levels.
- Increasing climate smart agricultural practices by at least 78,000 acres adopted a year, annually conserving at least 8,000 acres a year of croplands, and increasing organic agriculture to comprise at least 20 percent of cultivated acres in California by 2045—an approximate 7.5x increase in healthy soils practices from previous levels and a 2x increase in total acres of organic agriculture.
- Increasing annual investment in urban trees in developed lands by at least 200 percent above historic levels and establishing defensible space on all parcels by 2045.
- Restoring at least 60,000 acres, or approximately 15 percent of all Sacramento–San Joaquin River Delta (Delta) wetlands, by 2045.
- Cutting land conversion of deserts and sparsely vegetated landscapes by at least 50 percent annually from current levels, starting in 2025.

If the carbon stock target above is met, and the management actions above are implemented, the modeling for NWL indicates that California's lands will be a net source of emissions, producing approximately 7 $MMTCO_2e$ of average annual emissions.

Additional climate smart management practices and additional landscapes, such as those included in the Climate Smart Strategy and discussed below in Additional Management Strategies, have the potential to increase carbon stocks and reduce GHG emissions from NWL beyond the levels modeled for this Scoping Plan.

The purpose of the NWL target and the above estimated outcomes is to provide a numerical guide that can support the state's efforts to accelerate both near-term and long-term climate action on California's lands, prioritizing durable solutions that deliver multiple outcomes. Taking these actions over the coming decades will reduce the potential carbon losses from NWL, reduce GHG emissions from some landscape types (such as croplands and Delta wetlands), and support sequestration of GHGs from NWL between 2025 and 2045. These actions will also deliver significant benefits to Californians beyond advancing our climate goals, such as reducing wildfire emissions and their associated health impacts, increasing habitat for biodiversity, reducing urban heat island effects, reducing harmful pesticide exposure, expanding economic opportunities, and others. Additional information on several economic and health outcomes from the Scoping Plan Scenario is included in Chapters 2 and 3.

Statewide planning and target setting for the NWL sector will only create meaningful change if followed by effective on-the-ground implementation. State government cannot accomplish this implementation alone. Effective large scale climate action is dependent on partnerships among tribal, federal, state, regional, and local partners, and across governmental, private, nonprofit, and commercial sectors. The NWL sector of the Scoping Plan sets a carbon target with climate action recommendations that can be used to achieve the quantified carbon, health, and economic outcomes. Implementation of these actions must be led by local or regional partnerships that plan and execute projects appropriate to the specific conditions. The technical expertise and local knowledge of land managers and stewards in all sectors must be elevated to ensure relevant, efficient, and effective climate action.

Implementation of climate action should contribute to state targets, maximize local benefits, and alleviate environmental injustices and other social inequities. On-the-ground action is largely executed and managed by local and regional actors, but state government agencies must support communities across the state in implementing nature-based climate solutions that address statewide objectives, such as the Scoping Plan carbon target. This includes providing resources and developing frameworks, while greatly increasing capacity and technical assistance to assist and empower local partners. Examples of how this can be done are the Regional Forest and Fire Capacity Program within the forestry sector, the UC Cooperative Extension in the agricultural and forestry sectors—as well as the work of the state's 10 regional Conservancies. These programs provide strong examples to emulate as they facilitate statewide coordination, and information and resource transfer from the state to the regional and local levels. The Regional Forest and Fire Capacity Program provides funding for local and regional groups

to build their organizational capacity to plan and implement wildfire and forest management projects that are informed by their own local expertise. The UC Cooperative Extension is an example of how the state provides technical assistance to local landowners and community organizations, helping them apply the latest science-based management strategies to their lands. California's regional Conservancies play a pivotal role in implementing regional conservation, restoration, and land management efforts through activities such as grant funding, science generation, and planning assistance.

The state also has identified the need to incorporate and elevate traditional indigenous knowledge into climate action on the regional and local scales. Accomplishing this requires close partnerships with tribes for mutual knowledge and resource sharing, while protecting culturally sensitive knowledge and resources. As Tribes are sovereign nations with specialized cultural knowledge and experience in managing lands, climate action on these lands that contribute to the State of California's climate targets can only be accomplished with the full participation and under the leadership of the Tribes that govern those lands.

Strategies for Achieving Success: Crosscutting Items for all NWL

- Implement AB 1757 and SB 27.
- Implement the Climate Smart Strategy.
- Accelerate the pace and scale of climate smart action, consistent with the management levels identified above, as part of a collective effort between federal, state, private, nonprofit, and individual land managers.
- Prioritize and practice equity, including through meaningful community engagement and prioritizing implementation of nature-based solutions that benefit the communities most vulnerable to climate change.[483]
- Advance multi-benefit, collaborative, landscape-level approaches that engage communities and landowners, and incorporate adaptive managements.
- Consult and partner with California Native American tribes to increase co-management and tribal management authority; restore, protect, and enhance natural cultural resources, traditional foods, and cultural landscapes; respect tribal sovereignty; and support tribes' implementation of tribal expertise and Traditional Ecological Knowledge and cultural easements.[484]

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[483] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, N8. *finalejacrecs.pdf (arb.ca.gov).*

[484] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, N1, N6, N16, N17, N18. *finalejacrecs.pdf (arb.ca.gov)*.

- Leverage existing innovative financial and market mechanisms, and explore new ones, between the public, private, and philanthropic sectors to secure funding of climate smart land management.
- In partnership with communities, tribes, and the private sector, expand and develop new infrastructure for manufacturing and processing of climate smart agricultural and biomass products.
- Leverage and support technical assistance providers: such as the UC Cooperative Extension and California's 98 Resource Conservation Districts, that have track records of providing technical assistance to local landowners and implementing agriculture, forestry, natural resource management, and restoration projects across the state.
- Establish and expand mechanisms that ensure NWL are protected from land conversion and parcelization (e.g., conservation easements or Williamson Act), in line with the strategies outlined in CNRA's Pathways to 30x30 California.[485,486] Pair land conservation projects with management plans that increase carbon sequestration, where feasible.
- Increase opportunities for private and philanthropic investments in nature-based climate solutions, utilizing existing voluntary and compliance carbon markets, existing state and local programs, and the California Carbon Sequestration and Climate Resiliency Project Registry established pursuant to SB 27.
- Expand monitoring and tracking of management actions and outcomes consistent with the tracking and monitoring recommendations of the Climate Smart Strategy.

Forests, Shrublands, and Chaparral

At roughly 29 million acres, forests cover 27 percent of California. Shrublands and chaparral cover 31 percent of the state; roughly 33 million acres. Both types are distinct, with their own ecological dynamics and management strategies, and are modeled within a single model that is calibrated to treat them uniquely.

Together, forests, shrublands, and chaparral support a high biodiversity of plants and animals, in addition to high levels of carbon stocks. They provide important air and water quality benefits to all Californians, as well as recreational opportunities and, for forests, harvested wood products for the state. These landscapes are fire-adapted, and historical tribal management of these lands has fostered ecosystem health and resilience. Over the past century, these lands have been impacted severely by fire exclusion, including

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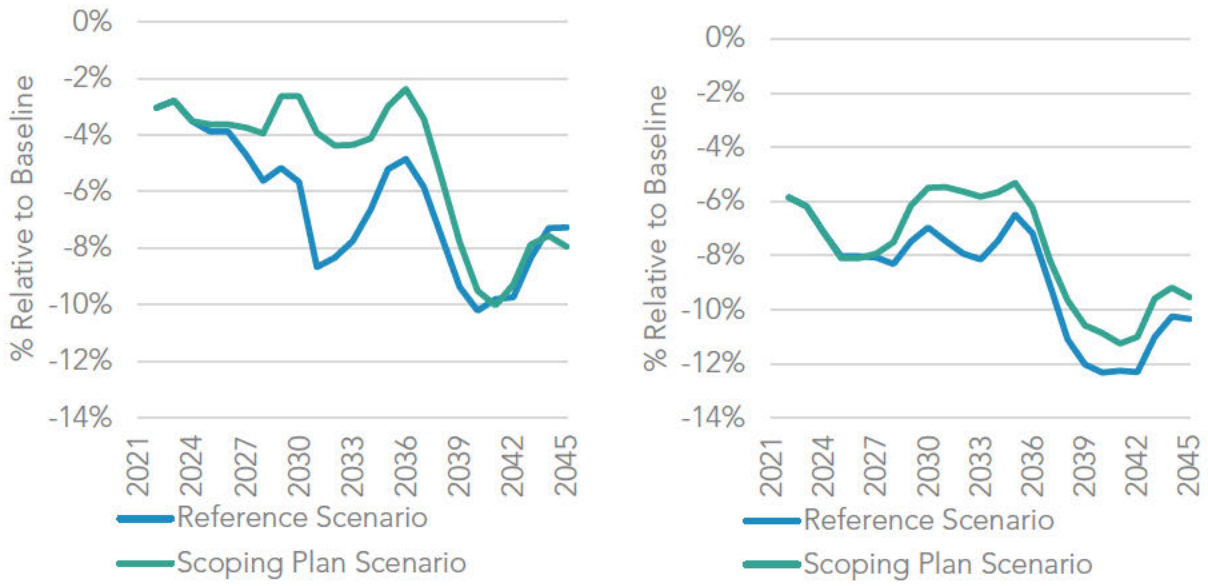
[485] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, N5, N26, N27. *finalejacrecs.pdf (arb.ca.gov)*.
[486] CNRA. 2022. *Pathways to 30x30 California*. *https://www.californianature.ca.gov/pages/30x30*.

exclusion of indigenous people's management and past management practices, which has resulted in less resilient ecosystems and communities and more destructive wildfires today. This, along with drought induced stress and mortality, has changed these landscapes from a carbon sink to a carbon source. Climate smart management can help make forests more resilient to climate change and less prone to catastrophic wildfire. Climate-smart management in shrublands and chaparral face additional challenges and uncertainty, but can still provide protection for threatened communities and natural resources. This management, if conducted on a regular basis to maintain forest health, can help reduce emissions from forests, shrublands, and chaparral, and help strengthen and maintain the co-benefits that Californians experience from them.

Under all management levels, forests and shrublands are expected to lose carbon over the next two decades due to climate change and wildfire (Figure 4-21).

Figure 4-21: Forest (left) and shrubland (right) carbon stocks by 2045[487,488]



While this decrease in carbon stocks may be inevitable, forest management under the Scoping Plan Scenario can help direct where and how carbon loss occurs. By proactively managing forests and shrublands, the loss of carbon from wildfire can be lessened as the risk of high severity fire is decreased, with the removed biomass going toward a more

[487] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, N13. finalejacrecs.pdf (arb.ca.gov).
[488] This analysis is the aggregation of all forests and shrublands from all ownerships across the entire state of California.

useful purpose such as harvested wood products, bioenergy, and engineered carbon removal. Managing for a diverse and resilient forest landscape also can help forests recover more quickly so that when climate change and wildfire impacts occur, forests will be less affected and can continue to thrive and sequester carbon. Additional details on the climate benefit potential of forests and shrublands/chapparal can be found in Section 2 of the NWL Climate Smart Strategy.

Strategies for Achieving Success

- Accelerate the pace and scale of climate smart forest management to at least 2.3 million acres annually by 2025, in line with the climate smart management strategies identified in this Scoping Plan, the NWL Climate Smart Strategy, and the Wildfire and Forest Resilience Action Plan.[489]
- Establish and expand mechanisms that ensure forests, shrublands, and grasslands are protected from land conversion and that support ongoing, rather than one-time, management actions.
- In collaboration with state and local agencies, accelerate the deployment of long-term carbon storage from waste woody biomass residues resulting from climate smart management, including storage in durable wood products, underground reservoirs, soil amendments, and other mediums.
- Expand infrastructure to facilitate processing of biomass resulting from climate smart management.
- Expand permit streamlining in collaboration with state and local agencies to accelerate implementation of climate smart forest management while protecting natural resources.

Grasslands

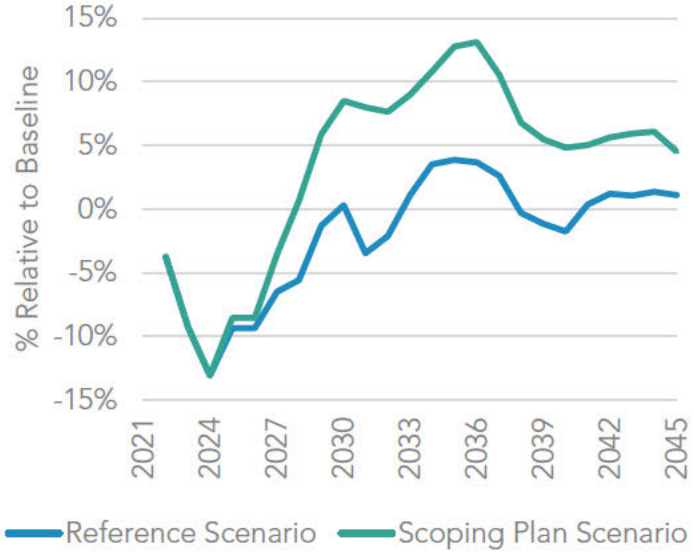
Grasslands cover 9 percent of California, roughly 10 million acres, and are found throughout the state in various landscapes, with concentrations in the foothills surrounding the Sacramento and San Joaquin Valleys. In addition to carbon storage (primarily in the soil), grasslands provide open space, wild habitat, grazing land, and important water filtration and recharge benefits. The protection of grasslands provides an opportunity to reduce sprawl and complement VMT reduction strategies. As grasslands are susceptible to invasive species, climate smart strategies can increase grassland

[489] Forest Management Task Force. 2021. *California's Wildfire and Forest Resilience Action Plan: Recommendations of the Governor's Forest Management Task Force.* https://www.fire.ca.gov/media/ps4p2vck/californiawildfireandforestresilienceactionplan.pdf.

resilience to climate change by improving species diversity and maintaining or increasing soil carbon stocks.

Modeling results show that increased fuels treatments and avoided land conversion can increase carbon stocks on grasslands by 2045, but sequestration rates fluctuate annually. Grasslands are capable of high carbon sequestration rates but are susceptible to carbon losses from wildfire and land conversion. Soil carbon is the major carbon pool on these lands, and continued future improvement of the monitoring and modeling of soil carbon is needed. Similar to forests and shrubland/chaparral, modeling alternatives that include fuels treatments resulted in greater carbon stocks compared to no management, and had lower wildfire emissions. Unlike forests and shrubland/chaparral, which have a general declining carbon stocks trend, the modeling results (Figure 4-22) show grasslands can maintain or increase carbon stocks with active management. Details on the climate benefit potential of grasslands can be found in Section 2 of the NWL Climate Smart Strategy.

Figure 4-22: Grassland carbon stocks by 2045



Strategies for Achieving Success

- Establish and expand mechanisms that ensure grasslands are protected from land conversion/parcelization and that support ongoing, rather than one-time, management actions that improve carbon sequestration.
- Deploy grassland management strategies, like prescribed grazing, compost application, and other regenerative practices, to support soil carbon sequestration, biodiversity, and other ecological improvements.

- Increase adoption of compost production on farms and application of compost in appropriate grassland settings for improved vegetation and carbon storage, and to deliver waste diversion goals through nature-based solutions.

Croplands

Croplands cover 9 percent of the state, roughly 9.5 million acres. This land is some of the most productive agricultural land in the world, and enables California to be a global leader in agriculture. Aside from developed lands, croplands are the most intensively managed landscapes in the state, and are closely tied to society through the food they produce and the constant, direct contact that people have with croplands through the course of management. In addition to food security, croplands provide considerable carbon storage in the soil and, in perennial croplands, in aboveground biomass. Climate smart practices can improve public health; for example, by reducing synthetic fertilizer and pesticide use. They also help to maintain or increase the climate resilience of cropland productivity through improved soil conditions and increased pollinator habitat.

There is also significant potential to transform this sector to increase soil carbon storage, reduce GHG emissions (Figure 4-23), and reduce pesticide exposure and health impacts. Moving to an agricultural system that improves soil health and water holding capacity reduces over-application of nitrogen, reduces the use of pesticides and fumigants, and increases biodiversity and pollinator habitat, supporting California's pathway to carbon neutrality while simultaneously improving the lives of those who live and work in the agricultural community. Croplands are intricately tied to people, communities, and their health, and through climate smart practices and cropland conservation, these lands have the potential to contribute more to society than just food.[490] The implementation of climate smart agricultural practices and diversified organic agriculture can help California achieve social and environmental benefits, like improving water use efficiency, increasing pollinator habitat, and reducing synthetic fertilizer and pesticide use.[491] Additional details on the climate benefit potential of croplands can be found in Section 2 of the NWL Climate Smart Strategy.

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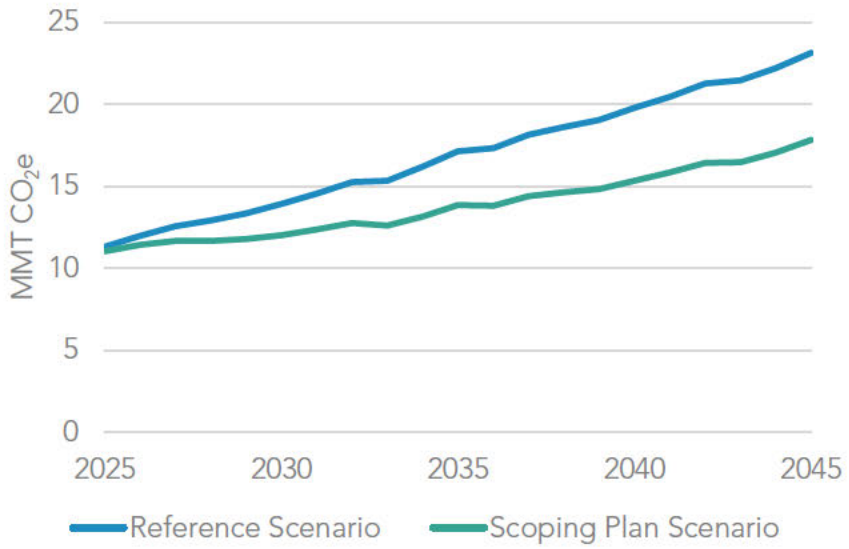
[490] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations In-part (N3, N4, N22), N5, N21. *finalejacrecs.pdf (arb.ca.gov)*.
[491] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, N11. *finalejacrecs.pdf (arb.ca.gov)*.

Figure 4-23: Cumulative CO_2e emissions from annual croplands in 2045[492]



CARB recognizes the complex nature of croplands, cross-sector relationships, and the need to build on this analysis to further our understanding of cropland dynamics. Many more aspects of cropland management need to be explored for potential climate benefits, such as water and nutrient use management, pest control methods, crop rotations, and other management practices. The impacts of climate change on water availability, annual/perennial crop growth, and future carbon sequestration trends are uncertain, and recent policies such as the Sustainable Groundwater Management Act may also influence cropland management in unforeseen ways. Nonetheless, it is clear that greater climate smart practice implementation can prepare California for the future and yield tangible benefits for the state.

Strategies for Achieving Success

- Accelerate the pace and scale of healthy soils practices to 80,000 acres annually by 2025, conserve at least 8,000 acres of annual crops annually, and increase organic agriculture to 20 percent of all cultivated acres by 2045.

[492] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, N11. *finalejacrecs.pdf (arb.ca.gov)*.

- Utilize the recommendations included in CDFA's Farmer and Rancher-Led Climate Change Solutions[493] report to accelerate deployment of healthy soils practices, organic farming, and climate smart agriculture practices.
- Establish or expand financial mechanisms that support ongoing deployment of healthy soils practices and organic agriculture.[494]
- Support strategies that achieve co-benefits of safer, more sustainable pest management practices and the health and preservation of ecosystems, such as implementing the California Department of Pesticide Regulation's (DPR's) Sustainable Pest Management Work Group recommendations.[495]
- Conduct research on the intersection of pesticides, soil health, GHGs, and pest resiliency via a multi-agency effort with DPR, CDFA, and CARB.[496]
- Conduct outreach and education to develop and facilitate the increased adoption of safer, more sustainable pest management practices and tools; reduce the use of harmful pesticides; promote healthy soils; improve water and air quality; and reduce public health impacts.
- In collaboration with state and local agencies, accelerate the deployment of alternatives to agricultural burning that increase long-term carbon storage from waste agricultural biomass, including storage in durable wood products, underground reservoirs, soil amendments, and other mediums.
- Work across state agencies to reduce regulatory and permitting barriers around some healthy soils practices (e.g., composting), where appropriate.
- Utilize innovative agriculture energy use and carbon monitoring and planning tools to reduce on-farm GHG emissions from energy and fertilizer application or to increase carbon storage, as well as to promote on-farm energy production opportunities.

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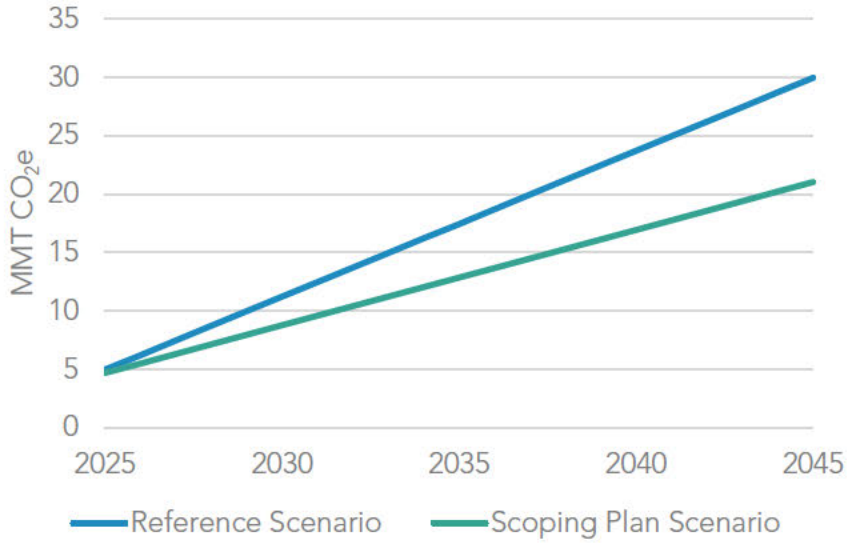
[493] California Department of Food and Agriculture. 2021. Farmer and Rancher Led Climate Change Solutions. *https://www.cdfa.ca.gov/oefi/climate/docs/cdfa_farmer_and_rancher-led_climate_solutions_meetings_summary.pdf*.
[494] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, N5, N7. *finalejacrecs.pdf (arb.ca.gov).*
[495] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations N3, N4, N5, N7, N22. *finalejacrecs.pdf (arb.ca.gov)*.
[496] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, N11. *finalejacrecs.pdf (arb.ca.gov)*.

Wetlands

Wetlands cover 2 percent of the state (roughly 1.7 million acres) and include inland and coastal wetlands, such as vernal pools, peatlands, mountain meadows, salt marshes, and mudflats. These lands are essential to California's communities as they serve as hotspots for biodiversity, contain considerable carbon in the soil, are critical to the state's water supply, and protect upland areas from flooding due to sea level rise and storms. Wetlands have been severely degraded through reclamation, diking, draining, and dredging practices in the past, resulting in the emissions of the carbon stored in the soils and the loss of ecosystem benefits. Climate smart strategies to restore and protect all the types of wetlands can reduce emissions while simultaneously improving the climate resilience of surrounding areas and improving the water quality and yield for the state. Restored wetlands also can reduce pressure on California's aging water infrastructure. These benefits beyond emissions reductions will help in the future, as climate change is predicted to negatively affect water supply.

Avoided conversion and restoration of Delta wetlands reduces CO_2 and methane emissions from wetlands, with GHG reductions scaling with implementation rates (Figure 4-24). Expansion of conservation and restoration efforts will generate benefits such as the conservation of biodiversity, improved water quality and supply, and reduced flood risk. Additional details on the climate benefit potential of wetlands can be found in Section 2 of the NWL Climate Smart Strategy.

Figure 4-24: Cumulative CO_2e emissions from Delta wetlands by 2045



Strategies for Achieving Success

- Restore 60,000 acres of Delta wetlands annually by 2045 to reduce methane emissions from wetlands and reverse the resulting subsidence.

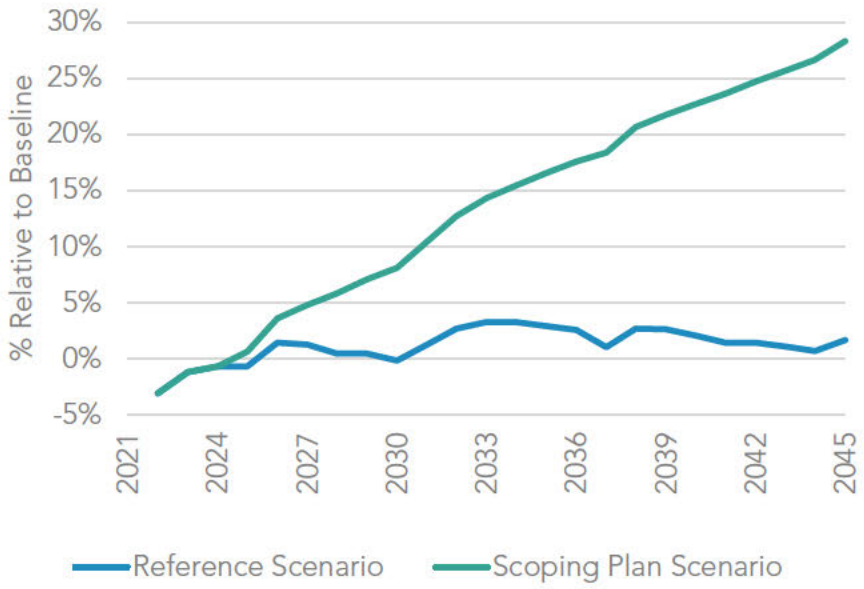
- Identify and prioritize wetland restoration efforts around climate vulnerable communities.
- Leverage other funding and institutions to support wetland restoration projects, including land trusts, local funding (e.g., San Francisco Measure AA), federal funding, and private and philanthropic funding to support wetlands restoration projects.
- Work across state agencies to reduce regulatory and permitting barriers around wetland restoration projects, where appropriate.

Developed Lands

Developed lands cover 6 percent of the state (roughly 6.8 million acres) and include urban, suburban, and rural areas, as well as transportation and supporting infrastructure throughout California. This area encapsulates the land on which the vast majority of Californians reside and call home. The vegetation within cities and communities, and along infrastructure, are all part of developed lands. This vegetation provides numerous benefits to surrounding areas, including carbon storage, air and water filtration, reduced urban heat island effect, and access to nature, aesthetics, and mental health, among others. These areas are susceptible to climate change as well, and climate smart strategies to protect and expand the urban forests, landscaping, green spaces, parks, and associated vegetation can increase their climate resilience and the benefits Californians derive from them. These strategies also have a significant opportunity to benefit disadvantaged communities, who may not have equitable access to these practices or the benefits they provide. Additional details on the climate and equity benefit potential of developed lands can be found in Section 2 and the Introduction of the NWL Climate Smart Strategy.

Urban forests have a significant potential to sequester carbon (Figure 4-25). They are vastly different from wildland forests, as they require investments to maintain and irrigate. This results in the need for a significant increase in investment to increase urban forest carbon. As urban forests become denser and management difficulty increases, the carbon stock returns on investment diminish, making it expensive to maximize carbon in urban forests. Water availability and irrigation efficiency are also an important consideration for increasing urban forest cover. As water becomes scarcer, the prioritization of irrigating trees over lawns or gardens may be required to achieve increases in urban forest carbon.

Figure 4-25: Carbon stocks in urban forests by 2045



Within wildland-urban interface (WUI) areas, defensible space can protect urban and rural communities from wildfire. Analysis results show that 48 percent of parcels are currently fully compliant with defensible space requirements. This highlights how much work needs to be done to protect communities and homes. Defensible space results in a decrease in carbon stocks, as expected when reducing fuels for wildfire.

Strategies for Achieving Success

- Increase urban forestry investment annually by 200 percent, relative to business as usual.
- Increase public awareness of urban forest benefits and, where appropriate, prioritizing irrigation of trees over lawns.
- Provide technical assistance and resources to disadvantaged communities to implement community urban greening projects to provide equitable access to the benefits of urban greening projects.[497]
- Work with state and local agencies to expand technical assistance for and enforcement of the defensible space requirements of PRC 4291 to reduce wildfire risk to homes and structures.

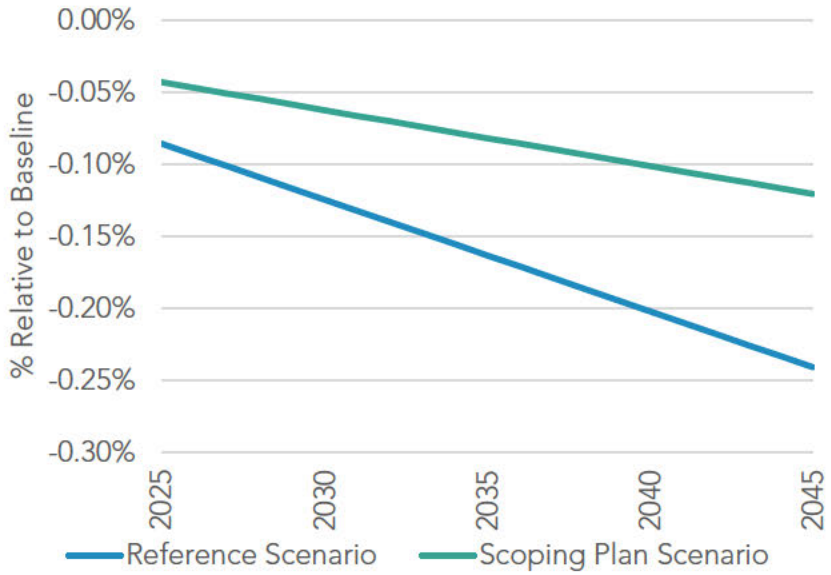
[497] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, N8. *finalejacrecs.pdf (arb.ca.gov)*.

Sparsely Vegetated Lands

Sparsely vegetated lands cover 10 percent of the state, roughly 10.2 million acres, primarily in the east and southern parts of California. These lands include deserts, beaches, dunes, bare rock, and areas covered in ice and snow (e.g., higher mountain elevations). The limited carbon storage of these lands varies from bare rock and mineral soil to more vegetated areas, though severe climate limits the amount of biomass. Nonetheless, sparsely vegetated lands are important for open space and provide rare and unique habitats for endemic species and a diversity of wildlife. These lands present important recreational opportunities for Californians and serve as important protective buffers in coastal and low-lying areas. Land use change threatens these lands, and conservation efforts are important for protecting these unique areas of California.[498]

Avoided conversion of sparsely vegetated lands reduces the organic carbon lost from the soil, which is the major carbon pool in this land type (Figure 4-26). In identifying the outcomes for sparsely vegetated lands, CARB modeled avoided land conversion to another land use.

Figure 4-26: Carbon stocks in sparsely vegetated lands by 2045



Strategies for Achieving Success

- Establish and expand mechanisms that ensure sparsely vegetated lands are

[498] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, N26. finalejacrecs.pdf (arb.ca.gov).

protected from land conversion, prioritizing those areas most vulnerable to climate change and loss.

Additional Management Strategies

Additional nature-based climate solutions beyond those management strategies modeled for this Scoping Plan are available for implementation, but either cannot currently be modeled and/or affect carbon and the landscape in ways that cannot currently be tracked. Nevertheless, it is important to take action even where these technical gaps exist. Some of these actions, such as cultural burning and indigenous farming practices, have been used on large scales for decades or even centuries, while others are relatively new concepts. The state nevertheless recommends implementing the additional solutions listed here to achieve potential additional climate benefits, as well as other co-benefits. These additional solutions were drawn from the NWL Climate Smart Strategy and stakeholder, tribal government, and interagency feedback.[499]

Considerations

Although these practices are recommended, because of the lack of in-depth modeling and analysis available, several considerations must be addressed when implementing them. These considerations also apply to the management strategies included in the Scoping Plan Scenario.

- Future climate change impacts are uncertain: The negative impact that climate change can have on the ability of these practices to maintain expected climate benefits is uncertain and may significantly change in the future. Climate change is expected to further diminish the already constricting growing conditions in California, with increasing droughts, more extreme weather events, and expanding disturbances from fire, insects, and disease. It is estimated that suitable habitat for many native plant and animal species could shift, creating novel ecosystems without historical precedent. Close monitoring of all practices, including no management, across our NWL will be critical to understand if and how future climate change affects outcomes and how to adapt management to meet the needs of the system under climate change.[500]

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[499] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, N24. *finalejacrecs.pdf (arb.ca.gov)*.
[500] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, N15. *finalejacrecs.pdf (arb.ca.gov)*.

- Local conditions: Not every practice is applicable, feasible, or even desirable in every location across California. Implementation of these practices should account for local conditions and needs that may affect the appropriateness of that practice.
- Long-term carbon storage: The ability to sequester additional carbon into NWL is only beneficial to the climate if that carbon stays out of the atmosphere. Many of the additional practices listed here may require continual incentives or interventions to ensure permanence of carbon storage in the soil and biomass. For example, in croplands, it is difficult to estimate how much of the carbon stored by no-tillage can be released by a single subsequent tillage, but a return to conventional tillage would usually be expected to erase most gains.[501,502]
- Scaling actions: There are uncertainties on how these practices may impact both the environment and communities when significantly expanded. For this reason, it is best to take a cautious and measured approach to ramping up actions to a larger scale.
- Infrastructure and operational needs: Scaling up the implementation of some of these practices demands transformational change in the supporting infrastructure and operational frameworks. For example, increasing forest management to the degree included in the Scoping Plan Scenario will require significant changes to wood-processing infrastructure, workforce capacity, permitting processes, technical assistance, and other operational constraints. The increased application of compost to croplands, and potentially to rangelands, will require a significant increase in organic waste and dairy manure collection to increase compost supply, in line with SB 1383. This will also require additional compost production facilities as well as compost/organic waste transportation and application methods.
- Co-benefits: Many co-benefits from these practices exist beyond the climate benefits. These co-benefits include improved public and worker health; improved microbial, insect, and wildlife habitat; enhanced biodiversity; greater labor demand in the nature-based economy; and improved climate resilience.
- Labor and Economics: Many of these practices require additional labor, and an evaluation of how many more jobs are needed to carry out many of these practices

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[501] Muñoz-Romero, V., R. J. Lopez-Bellido, P. Fernandez-Garcia, R. Redondo, S. Murillo, and L. Lopez-Bellido. 2017. "Effects of tillage, crop rotation and N application rate on labile and recalcitrant soil carbon in a Mediterranean Vertisol." *Soil Tillage Res.* 169, 118–123.
[502] Mitchell, J. P., A. Shrestha, W. R. Horwath, R. J. Southard, N. Madden, J. Veenstra, and D. S. Munk. 2015. "Tillage and cover cropping affect crop yields and soil carbon in the San Joaquin Valley." *California. Agron. J.* 107, 588–596.

is currently unknown. There will also be the need to explore the costs and economic benefits of implementing these additional practices.

- Retreatments: All of these practices have limits on how long they can enhance carbon sequestration. Many of these practices need to be periodically repeated, followed by complementary practices, or maintained through time. This increases costs and requires diligence and long-term stewardship.

Additional NWL Actions and Strategies

Below is a set of additional actions that should be taken on California's natural and working lands. Again, these practices were not modeled for this Scoping Plan, and all of the considerations listed above should be taken into account before implementing the following actions.

- Conservation of all NWL types (in line with the NWL Climate Smart Strategy and CNRA's Pathways to 30x30 California) is critical to ensuring continued carbon sequestration and provision of co-benefits from these lands for all Californians.[503]
- Reforestation following disturbance, using appropriate species, is an impactful practice that can help prevent conversion away from forestland and establish new trees to sequester carbon. The number of acres that may need reforestation following high severity wildfires is estimated to continue to increase into the future.
- Restoration of shrublands, chaparral, riparian zones, and oak woodlands across California includes a variety of practices to alter their structure and return endemic species to the areas. These unique habitats provide multiple co-benefits to the state, such as clean water, reduced wildfire risk, and biodiverse habitats for flora and fauna.
- Conservation and restoration of wetlands, beyond the Delta wetlands included in the NWL modeling, can protect these unique habitats and the climate benefits they provide. These wetland types can include but are not limited to coastal wetlands, mountain meadows, vernal pool complexes, alkali sinks and meadows, and floodplains.
- Conservation and restoration of seagrasses and seaweeds provide a number of benefits, including carbon storage and sequestration, habitat provision for many culturally and commercially important species of fishes and invertebrates, shoreline protection, and tourism opportunities.[504]

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[503] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, N26, N27. finalejacrecs.pdf (arb.ca.gov).
[504] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, N2. finalejacrecs.pdf (arb.ca.gov).

- Prescribed herbivory utilizes various livestock to consume vegetation to reduce fuel loads across an area. This fuel management practice can be used in forests, grasslands, and shrublands as an effective alternative to herbicide use, and should be considered wherever local conditions allow.
- Urban and community greening efforts such as green schoolyards, urban farms, rain gardens, community gardens, community composting, and many more provide numerous health benefits to communities.
- Additional Healthy Soils Program practices on annual croplands such as conservation cover and crop rotation, biomass planting for borders, wind barriers, riparian areas, and improved nutrient management can improve soil health, water retention, and increase carbon stocks.
- Healthy Soils Program practices on perennial croplands and rangelands, such as compost application and alley cropping/cover cropping to improve soil health, water retention, erosion control, and biomass growth.[505]
- Stacking of these Healthy Soils Program practices, where appropriate, in perennial and annual systems, can synergistically improve soil health and provide multiple benefits.
- Mulching adds high carbon materials to croplands or fallowed lands to reduce competing vegetation and retain moisture. This practice can support other benefits such as reduced water use and reduced synthetic pesticide and fertilizer use, as well as provide a use for suitable forest and agricultural waste biomass.
- Reductions in the use of synthetic fertilizers in cropland management, generally supported by the implementation of new management tools or technologies, can lead to reductions in GHG emissions from the production and application of fertilizers. This benefit is in addition to the co-benefits of reduced chemical runoff into waterways and reduced exposure of human populations to their harmful effects.

[505] Various types of organic amendments are being researched for application to particular landscape types. For example, compost application to rangelands is a relatively new practice that has been shown to improve soil health and increase carbon sequestration in the short term, though the science on the long-term impacts of this practice is still developing and the supply of available compost may be limiting.

Chapter 5: Challenge Accepted

This chapter provides an overview of the next steps and partnerships that will be needed to successfully implement this Scoping Plan. The path forward is not dependent on one agency, one state, or even one country. It will take action on a global level to address the threat climate change poses. But, the work begins at home.[506] The state can lead by engaging Californians and demonstrating how action at the state, regional, and local levels of government, as well as action at community and individual levels, can contribute to addressing the challenge before us. We must build partnerships with academic institutions, private industry, and others to support and accelerate the transition to carbon neutrality. Ultimately, the success of this Scoping Plan will be measured by our ability to implement the actions modeled in the Scoping Plan Scenario at all levels of government and society. This will depend on a mix of legislative action, regulatory program development, incentives, institutional support, workforce and business development, education and outreach, community engagement, and research and development and deployment. Optimizing this mix will help to ensure that clean energy and other climate mitigation strategies are clear, winning alternatives in the marketplace and in communities—to promote equity, drive innovation, and encourage consumer adoption. Bold institutional action will catalyze continued research and push private investment to create jobs and bring innovative ideas to reality.

State-level Action

Achieving the targets described in this Scoping Plan will require continued commitment to and successful implementation of existing policies and programs and identification of new policy tools and technical solutions to go further, faster. California's Legislature and state agencies will continue to collaborate to achieve the state's climate, clean air, equity, and broader economic and environmental protection goals. It will be necessary to maintain and strengthen this collaborative effort, and to draw upon the assistance of the federal government, regional and local governments, tribes, communities, academic institutions, and the private sector to achieve the state's near-term and longer-term emission reduction goals and a more equitable future for all Californians.

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[506] This "polycentric" approach to climate challenges, engaging many levels of government, was articulated in leading papers by Nobel laureate Elinor Ostrom. See, for example, Ostrom, E. 2014. "A Polycentric Approach to Coping with Climate Change." *Annals of Economics and Finance* 15-1, 97–134.

Regulations and Programmatic Development

Meeting the AB 32 2020 GHG emissions reduction target several years earlier than mandated demonstrated that developing mitigation strategies through a public process, where all stakeholders have a voice, leads to effective actions that address climate change and yields a series of additional economic and environmental co-benefits to the state. Following adoption of this Scoping Plan, state agencies will continue to update and implement new and existing programs to align with the outcomes in the plan. Community, tribal, and stakeholder engagement will be a critical part of this work. Several state agencies, including CARB, the CEC, the California State Transportation Agency (CalSTA), the CPUC, and others will need to be part of various subsequent rulemaking processes. Each of these agencies' leadership and technical staff will engage with the public through public meetings, written and oral comment, and other methods of engagement. This work will be informed by evaluations of the health, air quality, environmental, equity, and economic benefits and impacts of regulations, including an assessment of the societal cost of carbon, as required under AB 197.

Incentive Programs

As described in Chapter 1, incentive programs are one of the most important tools the state has in advancing our low carbon future, especially for climate vulnerable communities. The programs ensure clean technology and energy are accessible and are critical to closing ongoing opportunity gaps. These programs also leverage private-sector investment and build sustainable, growing markets for clean and efficient technologies, and they are particularly necessary to support GHG emission reduction strategies for priority sectors, sources, and technologies. Clean technologies are often already the best and lowest cost option over their lifetimes but incentive funding is critical to ensure that they are broadly available, especially in climate vulnerable communities. Incentives also build on California's long track record of driving innovative technology developments, and creating new industries, with targeted investment. The Inflation Reduction Act also provides a new source of funding and tax incentives that must be leveraged to help achieve the state's climate goals.

Many state funding programs are designed to achieve multiple objectives simultaneously: reduce emissions from GHGs, criteria pollutants, and toxic air contaminants; manage natural and working lands for carbon sequestration; and address health and opportunity gaps in disadvantaged communities. California's incentive programs focused on jump-starting the transition to a zero emission transportation future are a good example of this "stacked" approach. The state is investing billions of dollars through programs such as the On-Road Heavy-Duty Voucher Incentive Program and Clean Cars 4 All in order to replace the light- and heavy-duty vehicles most responsible for the state's GHG emissions and poor air quality, all while bolstering the nascent ZEV market. Further strategies aid in developing new technologies, in ramping up access for all, and in shifting to cleaner

modes of transport; for instance, by supporting investments in walkable, bikeable communities and transit, as well as in vehicles. This funding strategy is, of course, paired with the regulatory approach described above.

Local Action

Local action by cities can support and amplify efforts to reduce GHGs. For example, the City of Oakland requires all new construction to be all-electric and is currently working on electrifying existing buildings.[507] In addition, starting in 2023, the City of Sacramento will require all new buildings under three stories to be all-electric, and it extends the mandate to all new construction by 2026 with some limited exemptions. The City of Sacramento also requires levels of EV charging infrastructure in new construction starting in 2023, higher than the minimum state requirements, and provides parking incentives for zero-emission carsharing and EV charging.[508] Local governments asserting this type of leadership are critical partners in supporting state-level measures to contain the growth of GHG emissions associated with the transportation system and the built environment.

California must accommodate population and economic growth in a far more sustainable and equitable manner than in the past. Good climate policy can and should create affordable and pleasant places to live, with effective transport and clean air for all—a future in which local governments and communities are central partners. Local governments have the primary authority to plan, zone, approve, and permit how and where land is developed to accommodate population growth, economic growth, and the changing needs of their jurisdictions. They also make critical decisions on how and when to deploy transportation infrastructure, and can choose to support transit, walking, bicycling, and neighborhoods that do not force people into cars. Local governments also have the option to adopt building ordinances that exceed statewide building code requirements, and play a critical role in facilitating the rollout of ZEV infrastructure. As a result, local government decisions play a critical role in supporting state-level measures to contain the growth of GHG emissions associated with the transportation system and the built environment—the two largest GHG emissions sectors over which local governments have authority.

Local governments are also frequently the source of innovative and practical climate solutions that can be replicated in other areas. Their efforts to reduce GHG emissions within their jurisdictions are vital to achieving the state's near-term air quality and long-term climate goals. Local governments must continue to take action that affirmatively

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[507] City of Oakland. Building Electrification. *https://www.oaklandca.gov/projects/building-electrification*.

[508] City of Sacramento. Electrification of New Construction. *http://www.cityofsacramento.org/SacElectrificationOrdinance*.

builds the projects and expend the funds needed to further the state's collective path toward equitable emissions reductions. As such, aligning local jurisdiction action with state-level priorities to tackle climate change and the outcomes called for in this Scoping Plan is critical to achieving the statutory targets for 2030 and 2045. Local governments can implement climate strategies that can effectively engage residents by addressing local conditions and issues that also deliver local economic benefits.

Local Climate Action Planning and Permitting

California encourages local jurisdictions to take ambitious, coordinated climate action at the community scale; action that is consistent with and supportive of the state's climate goals.[509] As discussed in more detail in Appendix D (Local Actions), local jurisdictions can do much to enable statewide priorities, such as taking local action to help the state develop the housing, transport systems, and other tools we all need. Indeed, state tools—such as the Cap-and-Trade Program or zero-emission vehicle programs—do not substitute for these local efforts. Multiple legal tools are open to local jurisdictions to support this approach, including development of a climate action plan (CAP), sustainability plan, or inclusion of a plan for reduction of GHG emissions and climate actions within a jurisdiction's general plan. Any of these can help to align zoning, permitting, and other local tools with climate action.

Once adopted, the GHG emissions reductions plans detailed in CAPs can provide local governments with a valuable tool for coordinated climate planning in their community. When a local CAP complies with CEQA requirements, individual projects that comply with the CAP are allowed to streamline the project-specific GHG analysis.[510,511] Effectively, local governments that adopt a CEQA-compliant CAP enable project developers to use this streamlined approach. This saves time and resources and provides more consistent expectations for how GHG reduction measures are applied across projects in the jurisdiction. While the state encourages local governments to follow this approach, we acknowledge not all jurisdictions have the resources to develop a CAP that meets the CEQA requirements.

In addition to being required for a local CAP to comply with CEQA, local GHG reduction targets have long been recommended as part of the process of developing a climate

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[509] This plan provides more detailed guidance and tools to local governments in Appendix D (Local Actions).

[510] Cal. Code of Regs., tit. 14, § 15183.5.

[511] California Governor's Office of Planning and Research. n.d. "General Plan Guidelines - Chapter 8 Climate Change."

action plan.[512] One challenge local jurisdictions have faced is how to evaluate and adopt quantitative, locally appropriate goals that align with statewide goals. An effective response to this challenge is to focus on goals that can help implement overall state priorities—enabling the key transformations California needs.

There are many ways that local governments can make key contributions to this transformation, depending on the characteristics of their jurisdiction and community. For example, some jurisdictions will inherently have more land capacity to remove and store carbon, whether through natural and working lands or by other means. Other jurisdictions will be host to GHG-emitting facilities that serve necessary functions and will take time to transition to clean technology (e.g., municipal wastewater treatment plants, landfills, and energy generation and transmission facilities). It is important to recognize that we will need to build new energy production and distribution infrastructure, and repurpose existing ones, for clean technology and energy before we are able to phase down existing fossil sources. There also will be a need to handle the significant amount of biomass resulting from sustainable forest management for catastrophic wildfire prevention, agricultural waste, and landfill diversion.

Regional efforts can support change too: energy and transportation systems that serve Californians do not stop at jurisdictional boundaries, and some local decisions can have ramifications for other communities. For instance, Metropolitan Planning Organizations (MPOs) can help to integrate local efforts by planning consistent with the Scoping Plan and Climate Action Plan for Transportation Infrastructure, including by removing polluting roadway capacity expansions from project pipelines and instead focusing on climate-friendly solutions. These varied capabilities and needs should be taken into account in setting targets for local climate plans. For instance, although net zero targets can often be valuable and achievable, and mitigation is important, targets should be considered in the larger context of these goals. This all means any GHG targets on a local scale should take into consideration the actions and outcomes included in this Scoping Plan. Jurisdictions considering “net zero” targets should carefully consider the implications such targets may have on emissions in neighboring communities and the ability of the state to meet our collective targets.

Jurisdictions without formal CAPs also have important opportunities within this context. These jurisdictions can still take actions that effectively translate key state plans, goals, and targets, including those articulated in this Scoping Plan for local action. For instance, state ZEV targets can advance local efforts to promote broad and equitable access to charging and fueling. Similarly, local jurisdictions can enable reduced dependence on

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[512] Climate Smart Communities. 2014. Climate Action Planning Guide. https://cdrpc.org/wp-content/uploads/2015/05/CAP-Guide_MAR-2014_FINAL.pdf.

single-occupancy vehicles by supporting dense infill housing and transit, among other actions. Such actions can be reflected in particular project plans, in general plans, or through other local policies. Regional partnerships among these jurisdictions can also help tap resources and provide for more effective overall action.

Unlocking CEQA Mitigation for Local Success

The California Environmental Quality Act also provides important tools for lead agencies to support the achievement of the state's GHG and VMT reduction goals. Although many climate-friendly local government actions already fall into categories that may not require a full CEQA analysis, thanks to streamlining or other tools, and although certain product types (such as affordable infill housing) are generally clearly consistent with state climate goals, CEQA analyses may still sometimes be required. CEQA can be a powerful and useful tool to engage the public, identify additional opportunities to support climate efforts, and localize change. It is important that lead agencies look for ways to use CEQA to support these core purposes, ensuring that these processes do not become sources of delay but instead unlock more opportunities. The uncertainty analysis in Chapter 2 evaluates how project implementation delays can lead to missed state climate targets and continued dependence on fossil energy. Mitigation measures applied in the communities affected by projects subject to CEQA have the added benefit of improving health, social, and economic resiliency as climate impacts worsen.

Appendix D (Local Actions) explores the role of local government action and CEQA in detail. As discussed there, an important CEQA-related tool is mitigation—which can be used to further drive local action consistent with state climate goals. When a lead agency determines that a proposed project would result in potentially significant GHG impacts due to its GHG emissions or a conflict with state climate goals, the lead agency must impose feasible mitigation measures to minimize the impact. Appendix D (Local Actions) provides suggestions for prioritizing the various types of mitigation, starting with on-site GHG-reducing design features[513] and mitigation measures, such as methods to reduce VMT and support building decarbonization, access to shared mobility services or transit, and EV charging. After exhausting all the on-site GHG mitigation measures, CARB recommends prioritizing local, off-site GHG mitigation measures, including both direct investment and voluntary GHG reduction or sequestration projects, in the neighborhoods impacted by the project. This could include, for example, development of a neighborhood green space, investment in street trees, or expansion of transit services. Implementing GHG mitigation measures in the project's vicinity would allow the project proponent and the lead agency to work directly with the affected community to identify and prioritize the

[513] Cal. Code of Regs., tit. 14, § 15126.4(c)(2) and (3).

mitigation measures that meet their needs while minimizing multiple environmental and societal impacts.

Once all potential on-site and local off-site GHG mitigation measures have been incorporated to the extent feasible, Appendix D (Local Actions) provides further suggestions for prioritizing other mitigation types, including non-local off-site mitigation, and voluntary offsets issued by a recognized and reputable voluntary carbon registry (as listed on CARB's website[514]) may be appropriate. Additional in-state mitigation also may be available in the upcoming SB 27[515] (Skinner, Chapter 237, Statues of 2021) registry, which will serve as a database of projects in the state that drive climate action on natural and working lands. Lead agencies should use substantial evidence to demonstrate that the project proponent explored and prioritized investments in feasible, local mitigation prior to moving mitigation to a geography located farther away from the project.

Communities and Environmental Justice

As noted in Board Resolution 20-33,[516] it is incumbent on CARB to function as an agent of responsible social change, especially when it is clear that environmental injustices continue to persist for low-income communities, tribes, and communities of color.

State law defines *environmental justice* as the fair treatment of all people of all races, cultures, and incomes with respect to the development, adoption, implementation, and enforcement of environmental laws, regulations, and policies.[517] Government Alliance for Race and Equity (GARE)[518] defines *racial equity* as when race can no longer be used to predict life outcomes and outcomes for all groups are improved.

For this Scoping Plan to be successful, it must address environmental justice and advance racial equity. Implementation of the plan needs to address the needs of those communities that are disproportionately burdened by climate impacts and continue to face significant health and opportunity gaps. Now, we need to ensure our actions allow these communities to not only have a seat at the table, but also inform and shape the policies

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[514] CARB. 2022. Offset Project Registries. https://ww2.arb.ca.gov/our-work/programs/compliance-offset-program/offset-project-registries.

[515] SB 27. Carbon sequestration: state goals: natural and working lands: registry of projects. (SB 27, Skinner, Chapter 237, Statutes of 2021). https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=202120220SB27.

[516] CARB. 2020. Resolution 20-33: A Commitment to Racial Equity and Social Justice. October 22. https://ww2.arb.ca.gov/sites/default/files/barcu/board/res/2020/res20-33.pdf.

[517] Gov. Code, § 65040.12, subd. (e).

[518] Local and Regional Government Alliance on Race and Equity. 2015. *Advancing Racial Equity and Transforming Government: A Resource Guide to Put Ideas into Action.* Page 9. https://racialequityalliance.org/wp-content/uploads/2015/02/GARE-Resource_Guide.pdf.

to ensure their communities thrive. With this Scoping Plan, the state also adds a new tool to identify which communities will be the least resilient in the face of selected climate impacts and will see disproportionate economic impacts as a result. As described in Chapter 3, the CVM will enable the state to target programs and policies to build resiliency in the specific regions that will feel climate impacts more acutely due to existing health and opportunity disparities leading to disproportionate economic impacts. This tool will be critical in the state's efforts to address climate impacts while accounting for environmental injustices and racial inequities. CARB will incorporate the CVM into its work as it moves forward and will share this new tool with other agencies to align our efforts. The goal is to keep expanding the CVM to incorporate additional climate impacts to better identify disproportionate economic impacts as community level data becomes available.

AB 617 is another important tool for both Air Districts and CARB to bring resources to communities that have long been disproportionately burdened by poor air quality. While AB 617 does not require local agencies to participate in the Community Air Protection Program, several AB 617 communities are finding ways to bring local land use agencies to the table to respond to community priorities. We look forward to more opportunities to foster relationships with local authorities and continued collaboration between state and air district programs.

In alignment with AB 32, and to ensure environmental justice and racial equity were integrated into this Scoping Plan, CARB reconvened the AB 32 Environmental Justice Advisory Committee (EJ Advisory Committee) to advise CARB on the development of this Scoping Plan. Since reconvening in May 2021, the EJ Advisory Committee has engaged in the following activities:

- In October 2021, the EJ Advisory Committee sent a letter to the governor requesting a timeline extension for the Scoping Plan process. In response to the EJ Advisory Committee's letter, CARB modified this Scoping Plan process[519] and committed to an active engagement with the EJ Advisory Committee following the approval of this Scoping Plan. The EJ Advisory Committee also presented to the CARB Board[520] at its October 2021 Board meeting, reiterating its request for a timeline extension, as well as sharing additional concerns about process.

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[519] Randolph, L. M. 2021. LMR October 19 response to Environmental Justice Advisory Committee Letter. https://ww2.arb.ca.gov/sites/default/files/2021-10/LMR%20October%2019%20response%20to%20EJAC%20Letter%20Final.pdf.

[520] Argüello, M. D., K. Hamilton, S. Taylor, and P. Torres. 2021. EJ Advisory Committee Co-Chair Informational Presentation to CARB Board. October 28. https://ww2.arb.ca.gov/sites/default/files/barcu/board/books/2021/102821/21-11-4pres.pdf.

- In December 2021, the EJ Advisory Committee shared its responses to Scenario Input Questions,[521] as well as a narrative document outlining their concerns[522] around the process, the need for evaluation, and the need for a tribal representative. In response to the EJ Advisory Committee Scenario Input Questions, CARB incorporated the EJ Advisory Committee responses into the Scenario Assumptions document,[523] and modeled results from PATHWAYS.[524] In response to the EJ Advisory Committee's concerns, CARB worked diligently to appoint a tribal representative[525] in February 2022, and to outline additional opportunities for the EJ Advisory Committee to engage in the Scoping Plan process.[526]
- In March 2022, the EJ Advisory Committee presented at the joint EJ Advisory Committee / CARB Board meeting[527] and walked through their preliminary draft recommendations to inform this Scoping Plan. In April, the EJ Advisory Committee shared its revised preliminary draft recommendations[528] to inform this Scoping Plan.
- In September 2022, the EJ Advisory Committee presented at the joint EJ Advisory Committee / CARB Board meeting[529] and engaged in discussion about priority items as they relate to incorporating environmental justice into the Scoping Plan. By the end of September, the EJ Advisory Committee shared its final

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[521] EJ Advisory Committee. 2021. EJ Advisory Committee Final Responses to CARB Scenario Inputs. December 2. https://ww2.arb.ca.gov/sites/default/files/2021-12/EJAC%20Final%20Responses%20to%20CARB%20Scenario%20Inputs_12_2_21.pdf.
[522] EJ Advisory Committee. 2021. EJ Advisory Committee Responses to Scenario Input Questions. EJ Advisory Committee narrative document regarding scenario input recommendations. December 1. https://ww2.arb.ca.gov/sites/default/files/2021-12/EJAC%20Narrative%20Document%20re%20Scenario%20Input%20Recommendations%2012_1_2021.pdf.
[523] CARB. 2021. PATHWAYS Scenario Modeling. https://ww2.arb.ca.gov/sites/default/files/2021-12/Revised_2022SP_ScenarioAssumptions_15Dec.pdf.
[524] E3. 2022. CARB Draft Scoping Plan AB32 Source Emissions Initial Modeling Results. March 15. https://ww2.arb.ca.gov/sites/default/files/2022-03/SP22-Model-Results-E3-ppt.pdf.
[525] CARB. AB32 EJ Advisory Committee Meeting, February 28, 2022 CARB Update. https://ww2.arb.ca.gov/sites/default/files/2022-02/CARB%20EJAC022822presentation.pdf.
[526] Fletcher, C. 2021. CARB Response to EJ Advisory Committee Narrative. CARB. December 15. https://ww2.arb.ca.gov/sites/default/files/2021-12/CARB%20response%20to%20EJAC%20Narrative.pdf.
[527] EJ Advisory Committee. 2022. EJ Advisory Committee Presentation: Preliminary Draft Recommendations. March 10. https://ww2.arb.ca.gov/sites/default/files/barcu/board/books/2022/031022/ejacpres.pdf.
[528] AB 32 EJ Advisory Committee. Draft Recommendations. https://ww2.arb.ca.gov/sites/default/files/barcu/board/books/2022/031022/ejacrecsrevised.pdf.
[529] EJ Advisory Committee. 2022. EJAC Presentation. September 1. https://ww2.arb.ca.gov/sites/default/files/barcu/board/books/2022/090122/ejacpres.pdf

recommendations[530] to inform this Scoping Plan. To the extent possible, CARB has incorporated and cited these recommendations through this Scoping Plan.

In addition to the activities listed above, Central Valley EJ Advisory Committee members hosted a successful community engagement workshop[531] in San Joaquin Valley in February 2022 with over 100 attendees. Members of EJ Advisory Committee hosted a statewide community engagement workshop[532] in June 2022 with more than 165 attendees. Throughout the EJ Advisory Committee's process, members of the Committee continued to work with their communities to ground truth their recommendations to inform the development of the Scoping Plan. The EJ Advisory Committee worked hard to ensure the voices of those communities most burdened by climate impacts were reflected in the plan. The EJ Advisory Committee will continue to play an ongoing role in the implementation of this Scoping Plan to ensure environmental justice and racial equity are prioritized in our effort to address the climate challenge before us.

To the extent possible, the EJ Advisory Committee's recommendations were integrated throughout the plan. This plan directly cites instances where there is alignment between the plan and the EJ Advisory Committee recommendations. This approach seeks to ensure there is more transparency and identify consensus that exists, as well as relevant ways equity and environmental justice are addressed in this plan and in the planning for future related implementation activities. CARB is dedicated to its efforts to ensure this plan does not leave communities behind.

As this Scoping Plan moves into the implementation phase, there will be a need to better understand how to address EJ Advisory Committee recommendations on the following topics:

- Actions under the jurisdiction of other agencies: there are certain EJ Advisory Committee recommendations that are outside of CARB's jurisdiction. As the EJ Advisory Committee continues to convene, it would be helpful to understand the

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[530] EJ Advisory Committee. 2022. EJAC 2022 Scoping Plan Recommendations. September 30. https://ww2.arb.ca.gov/sites/default/files/barcu/board/books/2022/090122/finalejacrecs.pdf

[531] San Joaquin Valley Climate Justice & the Scoping Plan. 2022. https://ww2.arb.ca.gov/sites/default/files/2022-07/SJV%20Climate%20Justice%20%26%20the%20Scoping%20Plan%20Workshop%20Report%20out%20%26%20Recommendations_5.2022.pdf

[532] EJAC. 2022. *EJAC/Community Engagement Synthesis Report '22.* https://ww2.arb.ca.gov/sites/default/files/2022-07/EJAC-CommunityEngagement-SynthesisReport-2022-English%26Spanish.pdf.

role that CARB can play as it relates to the EJ Advisory Committee's recommendations for actions outside CARB's jurisdiction and coordinates with sister agencies.

- Actions that require legislative direction: there are certain EJ Advisory Committee recommendations that would require legislative action. As the EJ Advisory Committee continues to convene, it will be helpful to understand how CARB can work with the EJ Advisory Committee to share these recommendations with the appropriate members of the Legislature.
- Actions directly tied to implementation activities: This Scoping Plan is not an implementation document; it is a plan to chart a course to continue to reduce GHG emissions and achieve carbon neutrality. Once the Scoping Plan is approved, there will be follow-up action at CARB, as well as at other agencies. In these follow-up efforts, there will be a role for ongoing EJ Advisory Committee engagement.
- Actions to implement recent legislation, such as SB 905.

CARB proposes to continue to work with the EJ Advisory Committee to better understand how to move forward on EJ Advisory Committee recommendations that fall into the topics listed above and any other recommendations that were not included in this plan. It is also important to note that there are numerous recommendations where CARB shares the goals of the EJ Advisory Committee and can assist in implementation steps. Examples include the following:

- CARB shares the goal of prioritizing non-fossil energy generation and supports non-fossil projects and opportunities to locate behind-the-meter clean resources in communities of concern in programs such as the Solar on Multifamily Affordable Housing program.
- CARB will engage with agencies and academic institutions to further workforce development.
- Many other recommendations related to financial support for various energy projects, such as microgrids, are within the purview of the CPUC or local publicly owned utilities. Similarly, utility scale projects are within the jurisdiction of other agencies. However, CARB supports strategies identified in the recommendations such as offshore wind to reduce the reliance on fossil fuel generation.
- CARB is supportive of rooftop solar, although it is not within CARB's jurisdiction to determine how incentives for those projects are structured.
- CARB is supportive of strong energy decarbonization goals, recognizing that increased reliance on electrification in transportation and other sectors will create significant demand for electricity, and therefore ensuring reliability of a decarbonized grid is a critical need for the state.
- In the transportation sector, CARB is supportive of the EJ Advisory Committee's recommendations to maintain aggressive zero emission vehicle goals consistent

with its statutory mandate to ensure regulations are technologically feasible and in alignment with Governor Newsom's ZEV Executive Order (EO N-79-20). CARB looks forward to continued engagement on rulemakings that will implement these goals.

- As noted elsewhere in this plan, CARB is supportive of the Caltrans California Transportation Plan 2050 and the California Climate Action Plan for Transportation Infrastructure.
- CARB is supportive of additional public support for transit. CARB is supportive of locating EV charging in low-income communities and communities of color.
- CARB is supportive of prioritizing funding incentives for transit and heavy- and medium-duty vehicles, although CARB does believe there is an important role for incentives that support adoption of light-duty vehicles for the time being. CARB will also be opening a rulemaking on the Low Carbon Fuel Standard to ensure it continues to support clean fuels that will displace petroleum fuels and will consider the EJ Advisory Committee recommendations on this program.
- In the industrial sector, in addition to the strategies discussed more fully in this Scoping Plan, CARB continues to work with the Legislature, local agencies, and air districts to support, implement, and enforce effective reductions in emissions of GHGs and air pollutants in stationary sources. The air districts have the authority to directly issue permits addressing a facility's criteria pollutant and toxics emissions levels. These levels are set after careful permit review, under district regulation and statute. However, AB 617 directs and authorizes CARB to take several actions to improve data reporting from facilities, air quality monitoring, and pollution reduction planning for communities affected by a high cumulative exposure burden. CARB will continue to implement AB 617 and look for ways to strengthen the Community Air Protection Program.
- Considerations around the phaseout of oil and gas extraction and refining, and the role of carbon capture are discussed more thoroughly in Chapter 2.

As CARB continues to engage with the EJ Advisory Committee—in addition to the EJ Advisory recommendations that have been integrated throughout this plan—below are the following commitments that CARB is making to ensure that environmental justice is integrated in this plan and its implementation:

- Building decarbonization is a pillar of this Scoping Plan and CARB commits to working closely with state and local agencies to implement the EJ Advisory Committee recommendations that call for prioritization for residents in low-income communities and communities of color in this transition.
- CARB commits to sharing the EJ Advisory Committee's recommendations with the CEC, CPUC, and other agencies administering funds to support building

decarbonization, and to work closely with those agencies as they engage in public processes to further building decarbonization.

- CARB has committed to review the Cap-and-Trade program and determine what potential legislative or regulatory amendments could be necessary to ensure the program continues to deliver GHG reductions needed to achieve the statutory climate goals. In that process, CARB will consider the recommendations of the EJ Advisory Committee[533] and Independent Emissions Market Advisory Committee,[534] as well as others.

Critically, the EJ Advisory Committee makes numerous recommendations centered around tracking progress of the various strategies in this Scoping Plan. Currently, progress is tracked and reported in numerous ways, including the annual GHG inventory and reports to the Legislature. Part of the ongoing work of implementation, however, will include consideration of ways to provide more data and information to the public, such as rates of deployment of clean energy and technology as described in Chapter 1. CARB will also continue to collaborate with CDPH and OEHHA on health metrics to track cumulative benefits of air pollution and climate programs, especially in low-income communities and communities of color.

As noted earlier in this document, the EJ Advisory Committee will continue to play a vital role in the Scoping Plan and its implementation to ensure environmental justice and racial equity are prioritized in our effort to address the climate challenge before us. This includes ongoing EJ Advisory Committee engagement to advise CARB on the development of the Scoping Plan and any other pertinent matters in implementing AB 32. The ongoing EJ Advisory Committee will help to ensure integration of environmental justice in implementation efforts as it relates to AB 32, and also help CARB as we work toward a future where race is no longer a predictor for life outcomes.

Academic Institutions and the Private Sector

Academic institutions produce and present the latest science on both the impacts of, and actions to reduce, climate change damages. They are also leading the way by

[533] California Legislative Information. Bill Text – AB 32. Air pollution: greenhouse gases: California Global Warming Solutions Act of 2006. (AB 32, Nuñez, Chapter 488, Statutes of 2006). https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=200520060AB32.

[534] California Legislative Information. Bill Text – AB 398. California Global Warming Solutions Act of 2006: market-based compliance mechanisms: fire prevention fees: sales and use tax manufacturing exemption. (AB 398). https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201720180AB398.

establishing their own climate goals and GHG emissions reductions targets.[535, 536, 537] They are incubators for innovation and knowledge in clean energy and technology and play an important role in adding to the wealth of robust information to inform policies and programs. Academic institutions have the ability to fill knowledge gaps and push us toward new frontiers. As we move forward, we will continue to see these institutions as partners and resources that can help CARB look for ways to accelerate and introduce actions to reduce GHG emissions and remove and store carbon.

As such, it will be important to maintain and enhance relationships with academic institutions, including community colleges. Community colleges are more likely to have a large proportion of first generation students or students that come from low-income communities or communities of color. The perspective of this diverse student body will be critical to inform discussions on climate change damages and mitigation efforts. This student body is also a future workforce, and courses to teach the skills for a sustainable economy are a chance to close historical opportunity gaps. Importantly, many of the students at community colleges are local residents and community members. This engagement provides another way to invest in communities across our state. The Foundation for California Community Colleges is already leading the way through innovate programs such as their Good Jobs Challenge - California Resilient Careers in Forestry.[538] These types of programs could be replicated across other sectors. CARB will evaluate how to leverage the requirements in AB 680 on workforce development in the California Climate Investments programs with the work at the Foundation for California Community Colleges.

As noted in Chapter 1, public and private partnerships will be important as we move forward in the great energy transition. But the private sector is also important in the context of research and development and deployment. Many of these companies have the resources and expertise to build and produce the clean technology and energy we will need. It was through the efforts of several private companies (Bell, Exxon, Telecom

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[535] University of California. Our Commitment. *https://www.universityofcalifornia.edu/initiative/carbon-neutrality-initiative/our-commitment*.

[536] California State University. Energy, Sustainability, & Transportation. *https://www.calstate.edu/csu-system/doing-business-with-the-csu/capital-planning-design-construction/operations-center/Pages/energy-sustainability.aspx*.

[537] California Community Colleges Chancellor's Office. Climate Action and Sustainability. *https://www.cccco.edu/About-Us/Chancellors-Office/Divisions/College-Finance-and-Facilities-Planning/Facilities-Planning/Climate-Action-and-Sustainability?msclkid=4a72350ec4f511ecaf292c6b14ac9a4f*.

[538] Foundation for California Community Colleges. 2022. Good Jobs Challenge. Developing Resilient Careers in Forestry for Californians. *https://foundationccc.org/What-We-Do/Workforce-Development/Good-Jobs-Challenge*.

Australia) that the photovoltaic solar panels in use today were developed.[539] Similarly, it was companies such as General Electric and Texas Instruments that contributed to the development of hydrogen fuel cells.[540] This Scoping Plan includes the known and emerging clean technologies and fuels available today. The private sector spirit of invention, improvement, and innovation must continue to deliver new tools in the fight against climate change.

Individuals

This Scoping Plan not only projects ambitious availability of clean technology and energy, but also includes aggressive assumptions about consumer adoption of ZEVs, heat pumps, and other energy efficiency practices, among others. When it comes to climate change mitigation, the sum of the parts matters. Only when we add up the impacts of the choices we make do we understand the true impact on GHG emissions. Today, many Californians have opportunities to choose between driving a car, taking a bus, biking, or walking. Many can choose to install a heat pump or buy an electric cooktop. Together, we can increase these opportunities and pick the future we want. We can start or transform businesses that create clean jobs, innovate new technologies, or introduce new systems. We can engage with fellow workers to support durable paths for labor in a clean economy. And we can choose to engage with our community, tribes, and our governments to advocate for change, call out challenges, and propose solutions. Our choices will help determine California's climate future. Down one path is a future of climate impacts that will continue to worsen and further increase disparities across communities. Down the other is a future that avoids the worst impacts of climate change, improves air quality—especially for the most burdened communities—and fosters new economic and job opportunities to support a sustainable economy.

Importantly, we must acknowledge that historical decisions have resulted in health and opportunity gaps for residents in low-income communities and communities of color. Not everyone has the resources or access to make these choices—to buy a ZEV, install a heat pump, or use public transit to get to work. It is here that government can help. Government, at multiple levels, can fund programs and structure policies to provide consumers with more choice and to support them in adopting cleaner technology options. Whether through affordable energy rates or assistance in purchasing zero emission vehicles and appliances, we can use the transition to a carbon neutral economy as an opportunity to close some of these persisting opportunity gaps. By acting now, we can

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[539] Californiasolarcenter.org. Passive Solar History. http://californiasolarcenter.org/old-pages-with-inbound-links/history-pv/.
[540] Fuel Cell Store. History of Fuel Cells. https://www.fuelcellstore.com/blog-section/history-of-fuel-cells?msclkid=04a19450c50211ec8d20f2afff4039fe.

change our planet’s fate and build a more resilient, healthier, and equitable future for all Californians.

Attachment M

APPENDIX D
LOCAL ACTIONS

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1. Local Government Actions are Crucial for Supporting Attainment of the State's Climate Goals

Local government efforts to reduce greenhouse gas (GHG) emissions within their jurisdiction are critical to achieving the State's long-term climate goals, and can also provide important co-benefits, such as improved air quality, local economic benefits, healthier and more sustainable communities, and improved quality of life. Indeed, a substantial portion of California's GHG reduction potential comes from activities over which local governments have authority or influence.[1] Since the enactment of Assembly Bill (AB) 32 (Nuñez and Pavley, Chapter 488, Statutes of 2006), many local jurisdictions have sought to identify their role in implementing State-level decarbonization efforts. With increasing severity and occurrence of droughts, wildfires, extreme heat, and other conditions, the need for action is urgent.

Local governments have responsibility and authority over the built environment, transportation networks, and provision of local services. For example, local governments have primary authority to plan, zone, approve, and permit how and where land is developed to accommodate population and employment growth and the changing needs of their jurisdictions. They make decisions on how and when to deploy transportation infrastructure and can promote residential and commercial development that supports transit, bicycling, and walking. Local governments have the authority to adopt building ordinances that exceed statewide building code requirements and facilitate the implementation of zero-emission vehicle (ZEV) infrastructure.

Many jurisdictions have demonstrated bold climate leadership, yet meeting the challenge of climate change requires bolder actions from local governments across the state. For example, the City of Oakland requires all new construction to be all-electric and is currently working on electrifying existing buildings.[2] Starting in 2023, the City of Sacramento will require all new buildings under three stories to be all-electric. By 2026 the city will extend this requirement to all new construction, regardless of height, with some limited exemptions. The City of Sacramento also provides parking incentives for zero-emission carsharing and electric vehicle (EV) charging and will require higher than minimum State-required levels of EV charging infrastructure in new construction starting in 2023.[3] This type of leadership by local governments is critical to implementing State-level measures to address GHG emissions associated with transportation and the built environment.

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[1] Wheeler, S. M., Jones, C. M., & Kammen, D. M. 2018. Carbon Footprint Planning: Quantifying Local and State Mitigation Opportunities for 700 California Cities. *Urban Planning, 3(2), 35-51.* Available at: *https://www.cogitatiopress.com/urbanplanning/article/view/1218*.

[2] City of Oakland. *Building Electrification*. Available at: *https://www.oaklandca.gov/projects/building-electrification .*

[3] City of Sacramento. *Electrification of New Construction.* Available at: *http://www.cityofsacramento.org/SacElectrificationOrdinance.*

This appendix includes recommendations intended to build momentum for local government actions that align with the State's climate goals, with a focus on local GHG reduction strategies (commonly referred to as climate action planning) and approval of new land use development projects, including through environmental review under the California Environmental Quality Act (CEQA). This appendix is not regulatory but is instead intended to provide clarification on specific topics requested by planners, CEQA practitioners, and community groups in response to challenges local jurisdictions face when implementing GHG reduction strategies or approving much-needed housing projects. It is not exhaustive and does not include everything local governments can implement to support the State's climate goals. It focuses primarily on climate action plans (CAPs) and local authority over new residential development. It does not address other land use types (e.g., industrial) or air permitting.

Recommendations in this appendix are meant to be used in combination with other planning and CEQA guidance documents including Chapter 8 of the General Plan Guidelines published by the Governor's Office of Planning and Research (OPR),[4] the State CEQA Guidelines,[5] OPR's CEQA Technical Advisories,[6] as well as guidance from local air districts and the California Air Pollution Control Officers Association (CAPCOA).[7]

The following sections discuss the implications for sustainable development on equity and environmental justice as part of a strategy to combat climate change and provide recommendations to local governments for:

- Developing local CAPs and strategies consistent with the State's GHG emission reduction goals;
- Incorporating State-level GHG priorities into their processes for approving land use plans and individual projects;
- Implementing CEQA mitigation, as needed, to reduce GHG emissions associated with new land use development projects; and
- Leveraging opportunities for regional collaboration.

1.1 Centering Equity in Local Government Action is Key to Addressing the Climate Crisis

Local government action to reduce GHG emissions is not only essential for meeting the State's climate goals; it can build better places for everyone in ways that begin to address the

[4] OPR. *General Plan Guidelines - Chapter 8 Climate Change.* Available at: *https://opr.ca.gov/planning/general-plan/guidelines.html.*
[5] Cal. Code Regs., tit. 14, §§ 15000 et seq.
[6] OPR. *Technical Advisories.* Available at: *https://opr.ca.gov/ceqa/technical-advisories.html.*
[7] CAPCOA. 2021. Handbook for Analyzing Greenhouse Gas Emissions Reductions, Assessing Climate Vulnerabilities, and Advancing Health and Equity: Designed for Local Governments, Communities, and Project Developers. Available at: *https://caleemod.com/handbook/index.html*.

entrenched inequities experienced by the most overburdened Californians (e.g., Black, Indigenous, People of Color [BIPOC] and low-income communities). Local policies that make it easier for people to afford homes in places with good access to jobs, services, open space, and education, as well as a variety of transportation options that reduce the need to drive, advance equity and reduce GHG emissions.

Ensuring that vulnerable communities benefit from efforts to reduce GHG emissions is crucial to the State's climate strategy. For example, Senate Bill (SB) 32 (Pavley, Chapter 249, Statutes of 2016) recognized that efforts to meet the State's climate goals must be done in an equitable manner by directing CARB to achieve more stringent GHG emission reductions in a way that benefits disadvantaged communities, who often bear the burden of climate impacts. AB 32 also directs that CARB "ensure that the greenhouse gas emission reduction rules, regulations, programs, mechanisms, and incentives under its jurisdiction, where applicable and to the extent feasible, direct public and private investment toward the most disadvantaged communities in California and provide an opportunity for small businesses, schools, affordable housing associations, and other community institutions to participate in and benefit from statewide efforts to reduce greenhouse gas emissions."[8] To address the State goals for housing affordability, social equity, and climate simultaneously, local government institutions are well-positioned to take on a portfolio of integrated strategies such that housing policies are designed to address climate goals and climate policies are designed to meet the State's housing needs. In many cases, land use strategies that support more compact development in infill areas, particularly those already displaying efficient resident travel patterns, have the greatest potential to reduce emissions while also reducing combined housing and transportation costs for Californians and infrastructure costs for local governments due to avoided new roads, public schools, and other sprawl supporting infrastructure. Infill housing development alleviates pressure to develop on the urban periphery, preserving natural and working lands and areas often at risk of wildfire.

The issues that shape where development goes are complex, but the location and type of new housing that is developed matters for climate, health, and equity. Accelerating housing production to meet the extraordinary need for more homes can help reduce vehicle miles traveled (VMT) and GHG emissions and advance health and equity objectives when new housing is developed in types and locations that align with these goals, and particularly when accompanied by complementary policies and investments to create sustainable communities and prevent displacement of existing residents. See Appendix E, Sustainable and Equitable Communities, for strategies to foster sustainable development.

Fostering transportation-efficient, resource-rich, accessible, and inclusive communities is a key strategy for climate, equity, health, and affordability. Climate-smart locations include neighborhoods, commercial corridors, town centers, downtowns, and other areas where

[8] Health & Saf. Code, § 38565.

residents have access to a broad range of mobility options in addition to private automobiles (such as transit, walking, and biking), as well as where residents have access to housing, jobs, and other key destinations. Such communities make it possible for residents to live, work, and recreate without dependence on a personal car. For trips where driving is required, car trips can be relatively short and public infrastructure should support the use of zero-emission vehicles. The predominant historical land use development paradigm that centers on mobility (how far you can go in a given amount of time) over accessibility (how many key destinations, including jobs, housing, and other services, you can reach in that time) has not resulted in equitable outcomes for BIPOC and low-income households, and, in fact, has exacerbated barriers to access and upward economic progress. Increasing housing opportunities in transportation-efficient locations is a necessary paradigm shift and is part of the State's GHG emission reduction strategy.

However, ensuring that the households that would benefit most from living in more accessible areas are not displaced by new investments requires that State, regional, and local governments proactively anticipate and avoid potential unintended equity and social consequences, including gentrification and displacement of historically underserved and disadvantaged communities. The most recent wave of displacement stems from a variety of factors and policies: exclusionary zoning, job growth and reinvestment, changing housing preferences among higher-income households, local policies and local opposition to new housing development proposals, lack of funding for new affordable housing, increased costs of building new housing, and a dearth of policies to preserve existing affordable housing and protect tenants.[9] These variables interact to drive up housing prices and rents for all households—particularly low-income and BIPOC households—increasing displacement pressures in established neighborhoods and forcing people to live in car-dependent neighborhoods away from community support systems and economic opportunities and increase households' combined housing and transportation costs.[10] Policies to facilitate both market rate and subsidized affordable housing production in infill neighborhoods should, over time, stabilize housing costs, minimize displacement, and create new housing opportunities in transportation-efficient locations.

Communities and local jurisdictions have a range of tools and strategies that they can utilize to proactively avoid displacement while facilitating much-needed new infill housing development. The State encourages local jurisdictions and communities to cooperatively develop strategic anti-displacement and neighborhood stabilization plans. Some California jurisdictions have developed these strategic plans (e.g., the City of Oakland's Roadmap to Promote Housing

[9] See resources posted at the Urban Displacement Project: *https://www.urbandisplacement.org/about/what-are-gentrification-and-displacement/*.
[10] Ewing, R., & Hamidi, S. 2017. *Costs of Sprawl.* Taylor & Francis.

Equity[11] and the City of San Jose's Citywide Anti-Displacement Strategy[12]). Jurisdictions and communities that have not implemented localized anti-displacement strategies can review lessons from other jurisdictions and refer to a 2021 literature review funded by CARB that examines the real-world effectiveness of various strategies to curb displacement.[13] In addition to documenting the efficacy of different strategies, the literature review also examines the potential of each strategy to prevent displacement, the type of regional housing market where the strategy is most effective, the most appropriate scale to implement different strategies, and the timeframe for preventing displacement.

The Department of Housing and Community Development's (HCD) recently established Prohousing Designation Program also recognizes local jurisdictions that take actions to accelerate housing production while promoting holistic land use planning that reflects the State's climate goals and helps to reduce VMT.[14] Local governments that earn the prohousing designation are effective at simultaneously promoting multiple objectives, including: increasing housing supply, affirmatively furthering fair housing, preserving existing affordable housing, and supporting VMT reduction. Communities that earn the prohousing designation can receive additional points or preference in the scoring of competitive State housing, community development, and infrastructure funding programs.

2. The Role of Local Climate Action Planning in Supporting the State's Climate Goals

Local governments across the state have developed different types of plans to tackle climate change, including CAPs, sustainability plans, or GHG reduction plans incorporated into a general plan.[15] While CAPs have become an important avenue for climate action at the local level, 47 percent of California cities and counties have no known CAP.[16] Many jurisdictions find that performing or hiring consultants to perform a GHG inventory and developing a CAP is

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[11] City of Oakland. 2015. *A Roadmap Toward Equity: Housing Solutions for Oakland, California.* Available at: *https://www.policylink.org/sites/default/files/pl-report-oak-housing-070715.pdf.*

[12] City of San Jose. 2019. *Community Strategy to End Displacement.* Available at: *https://www.sanjoseca.gov/your-government/departments-offices/housing/resource-library/housing-policy-plans-and-reports/citywide-anti-displacement-strategy*.

[13] Karen Chapple & Anastasia Loukaitou-Sideris. 2021. White Paper on Anti-Displacement Strategy Effectiveness. CARB Research Contract Number 19RD018. Available at: *https://ww3.arb.ca.gov/research/single-project.php?row_id=68795*.

[14] Department of Housing and Community Development. 2022. *Prohousing Designation Program*. Available at: *https://www.hcd.ca.gov/planning-and-community-development/prohousing-designation-program*.

[15] CARB's Climate Action Portal Map compiles information about local GHG reduction plans and strategies throughout the state. Available at: *https://webmaps.arb.ca.gov/capmap/*.

[16] Boswell et al. 2019. 2019 Report on the State of Climate Action Plans in California. CARB Research Contract Number 17RD033. Available at: *https://ww2.arb.ca.gov/sites/default/files/2020-03/17RD033.pdf*.

costly and time-consuming, regardless of their desire to take action on climate.[17] This section seeks to identify the most effective GHG reduction actions at the local level and other barriers to local climate action to help ensure that local climate efforts align with the State's climate goals.

For purposes of this appendix, a CAP that has been adopted through the CEQA review process and meets the criteria specified in CEQA Guidelines section 15183.5(b) for a "plan for the reduction of greenhouse gas emissions" will be referred to as a "CEQA-qualified CAP." These CEQA-qualified CAPs allow eligible projects to streamline their determination of significance for GHG emissions. Pursuant to CEQA Guidelines section 15183.5(b), CEQA-qualified plans must:

(A) Quantify greenhouse gas emissions, both existing and projected over a specified period, resulting from activities within a defined geographic area;
(B) Establish a level, based on substantial evidence, below which the contribution to greenhouse gas emissions from activities covered by the plan would not be cumulatively considerable;
(C) Identify and analyze the greenhouse gas emissions resulting from specific actions or categories of actions anticipated within the geographic area;
(D) Specify measures or a group of measures, including performance standards, that substantial evidence demonstrates, if implemented on a project-by-project basis, would collectively achieve the specified emissions level;
(E) Establish a mechanism to monitor the plan's progress toward achieving the level and to require amendment if the plan is not achieving specified levels;
(F) Be adopted in a public process following environmental review.

Once adopted, CEQA-qualified CAPs provide local governments with a valuable tool for 1) coordinated climate planning in their community and 2) streamlining the CEQA GHG analysis for projects consistent with a CEQA-qualified CAP. When jurisdictions have a CEQA-qualified CAP, an individual project that complies with the strategies and actions within a CEQA-qualified CAP can tier and streamline its project-specific CEQA GHG analysis to make a determination "that a project's incremental contribution to a cumulative [GHG] effect is not cumulatively considerable" (CEQA Guidelines Sections 15064.4 (b)(3) and 15183.5).[18, 19] Guidance for preparing a CEQA-qualified CAP and using it to tier and streamline CEQA GHG

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[17] Deborah Salon, Sinott Murphy & Gian-Claudia Sciara. 2014. Local climate action: motives, enabling factors and barriers. *Carbon Management, 5:1,67-79, DOI 10.4155/cmt.13.81.* Available at: *https://www.tandfonline.com/doi/full/10.4155/cmt.13.81*.

[18] The guidelines implementing CEQA (or "CEQA Guidelines") were amended in 2009 to include criteria for the analysis and mitigation of GHG emissions. The CEQA Guidelines acknowledge the use of plans to reduce GHG emissions in a cumulative impacts analysis. (CEQA Guidelines Section 15183.5(b)).

[19] Cal. Code Regs., tit. 14, § 15183.5.

analysis for future projects can be found in Section 15183.5(b)(2) of the CEQA Guidelines, as well as Chapter 8 of OPR's General Plan Guidelines.[20] Typically, this tiering and streamlining evaluates whether the proposed project would demonstrate consistency with 1) the adopted plans, as well as the growth and land use assumptions that underlie the CEQA-qualified CAP, and 2) all applicable GHG reduction measures identified in the CAP. This includes determining whether the growth associated with the proposed project was accounted for in the CAP's projects and whether the project's GHG reduction measures were identified to help meet the CAP target.

To assist with using a CEQA-qualified CAP for future CEQA streamlining, some jurisdictions have prepared CAP compliance checklists that future projects may use to identify and document the CAP measures that are applicable to the proposed project and how the project is consistent with the CAP measures.[21] The CAP compliance checklists are then included as part of the proposed project's CEQA analysis documenting the project's consistency with the CEQA-qualified CAP. The use of the CEQA-qualified CAP also provides greater clarity in the environmental analysis and more consistent expectations for how GHG reduction measures are applied across projects in the jurisdiction.

Because CEQA-qualified CAPs are voluntary and not subject to any legislative criteria nor requirements, the CEQA Guidelines provide that a plan should include the measures or a group of measures that would collectively achieve the plan's emissions reduction target (Section 15183.5(b)(1)(D)). As the CEQA Guidelines are silent on what measures or groups of measures a CEQA-qualified CAP should contain, this appendix identifies three priority areas that address the State's largest sources of emissions that local governments have authority or influence over. Local jurisdictions should focus on these three priority areas when preparing a CEQA-qualified CAP:

1. Transportation electrification
2. VMT reduction
3. Building decarbonization

By prioritizing climate action in these three priority areas, local governments can address the largest sources of GHGs within their jurisdiction. Local governments that prepare CEQA-

[20] OPR. *General Plan Guidelines - Chapter 8 Climate Change.* Available at: *https://opr.ca.gov/planning/general-plan/guidelines.html.*

[21] Examples of CEQA-qualified CAPs include San Francisco's GHG compliance checklists for private development and municipal projects. These checklists are available at: *https://sfplanning.org/permit/environmental-consultant-pools-guidelines-and-resources*.

qualified CAPs that include strategies in these areas are contributing to alignment between local climate action and the State's climate goals.

The State encourages local governments to follow this approach and adopt a CEQA-qualified CAP addressing the three priority areas. However, as not all jurisdictions have sufficient resources (e.g., political capital, staffing, funding) to do so, jurisdictions that wish to take meaningful climate action (such as preparing a non-CEQA-qualified CAP or as individual measures) aligned with the State's climate goals in the absence of a CEQA-qualified CAP should also look to the three priority areas when developing local climate plans, measures, policies, and actions.

To assist local jurisdictions with developing local climate plans, measures, policies, and actions aligned with the State's climate goals, Table 1 presents a non-exhaustive list of impactful GHG reduction strategies that can be implemented by local governments. The strategies in Table 1 are not applicable to all local jurisdictions, nor are they the only strategies that local governments can adopt, but they represent the core strategies that most jurisdictions in California can implement to reduce GHG emissions regardless of whether they have developed a CEQA-qualified CAP. Reaching the outcomes of these priority GHG reduction strategies requires a locally appropriate, comprehensive adoption of policies in support of these objectives. When developing local climate plans, measures, policies, and actions, local jurisdictions should incorporate the recommendations described in Table 1 to the extent appropriate to ensure alignment with State climate goals.

Table 1 – Priority[22] GHG Reduction Strategies

Priority Areas	Priority GHG Reduction Strategies
Transportation Electrification	Convert local government fleets to ZEVs and provide EV charging at public sites
	Create a jurisdiction-specific ZEV ecosystem to support deployment of ZEVs statewide (such as building standards that exceed state building codes, permit streamlining, infrastructure siting, consumer education, preferential parking policies, and ZEV readiness plans)
VMT Reduction	Reduce or eliminate minimum parking standards[23]
	Implement Complete Streets policies and investments, consistent with general plan circulation element requirements[24,25]
	Increase access to public transit by increasing density of development near transit, improving transit service by increasing service frequency, creating bus priority lanes, reducing or eliminating fares, microtransit, etc.
	Increase public access to clean mobility options by planning for and investing in electric shuttles, bike share, car share, and walking
	Implement parking pricing or transportation demand management pricing strategies

[22] These areas and strategies are designated as "priority" because they are the GHG reduction opportunities over which local governments have the most authority and that have the highest GHG reduction potential.
[23] AB 2097, adopted by the Legislature and signed by the Governor in September 2022 eliminates parking requirements for residential and commercial development within a half-mile of transit. Government Code, § 65863.2. "Residential, commercial, or other development types: parking requirements." Available at: *https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=202120220AB2097*
[24] U.S. Department of Transportation. *Complete Streets.* Available at: *https://www.transportation.gov/mission/health/complete-streets.*
[25] OPR. *General Plan Guidelines - Chapter 4 Circulation Element.* Available at: *https://opr.ca.gov/planning/general-plan/guidelines.html.*

Priority Areas	Priority GHG Reduction Strategies
	Amend zoning or development codes to enable mixed-use, walkable, transit-oriented, and compact infill development (such as increasing the allowable density of a neighborhood)[26]
	Preserve natural and working lands by implementing land use policies that guide development toward infill areas and do not convert "greenfield" land to urban uses (e.g., green belts, strategic conservation easements)
Building Decarbonization	Adopt all-electric new construction reach codes for residential and commercial uses[27]
	Adopt policies and incentive programs to implement energy efficiency retrofits for existing buildings, such as weatherization, lighting upgrades, and replacing energy-intensive appliances and equipment with more efficient systems (such as Energy Star-rated equipment and equipment controllers)
	Adopt policies and incentive programs to electrify all appliances and equipment in existing buildings such as appliance rebates, existing building reach codes, or time of sale electrification ordinances
	Facilitate deployment of renewable energy production and distribution and energy storage on privately owned land uses (e.g., permit streamlining, information sharing)
	Deploy renewable energy production and energy storage directly in new public projects and on existing public facilities (e.g., solar photovoltaic systems on rooftops of municipal buildings and on canopies in public parking lots, battery storage systems in municipal buildings)

[26] AB 2011, adopted by the Legislature and signed by the Governor in September 2022 streamlines multifamily housing development that meet affordability, labor, and other objective standards in parcels zoned for office, retail, or parking uses. Government Code, § 65912.100. "Affordable Housing and High Road Jobs Act of 2022." Available at: *https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=202120220AB2011*
[27] California Energy Commission. Local Ordinance Exceeding the 2019 Energy Code. Available at: *https://www.energy.ca.gov/programs-and-topics/programs/building-energy-efficiency-standards/2019-building-energy-efficiency-3.*

2.1 Setting Local GHG Targets

Historically, local climate action planning by California cities and counties has primarily focused on adopting supportive measures, such as replacing incandescent traffic lights with LED traffic lights, for reaching the State GHG emission reduction targets mandated by law. Initially, targets were based on consistency with meeting AB 32's 2020 GHG reduction target. More recently, local jurisdictions have looked to consistency with the longer-term targets in following the adoption of SB 32 and issuance of various executive orders (e.g., EO B-30-15 and EO B-55-18) to look beyond 2020 (e.g., 2030, 2045, 2050, etc.), when setting longer-term targets. In September 2022, Governor Newsom signed AB 1279 (Muratsuchi and Garcia, Chapter 337, Statutes of 2022), which codifies a statewide target to achieve carbon neutrality by no later than 2045. The State's climate strategy and the role of local governments continue to evolve as climate goals become more refined and ambitious, and as we advance our understanding of GHG emission sources. To be consistent with science-based statewide targets, local GHG reduction targets should evolve as well. In addition to being required for a local CAP to comply with CEQA, local targets have long been recommended as part of the process of developing, monitoring, and updating a CAP regardless of whether it is CEQA-qualified.[28]

The agency preparing a local GHG reduction target is responsible for determining the precise method for doing so. This appendix is not intended to limit or to provide an exhaustive list of options for setting a local GHG reduction target. Any target should be supported by substantial evidence and meet the criteria in CEQA Guidelines Section 15183.5. Ultimately, a jurisdiction's GHG reduction efforts and target(s) should help to better inform decision-makers and the public about the sources of GHG emissions under a jurisdiction's control (also known as a GHG emissions "inventory") that would be affected by a proposed project and provide a basis for identifying ways to avoid or reduce potentially significant GHG emission impacts. It can be challenging to localize and sub-allocate an individual jurisdiction's share of the GHG reductions needed to curb a global crisis. Developing a localized GHG reduction target requires an adequate local GHG inventory from which to calculate a target, which most jurisdictions have not developed. The 2017 Scoping Plan Update suggested some non-binding options for setting GHG reduction targets.[29] In recognition of different sources of, and opportunities to reduce, GHG emissions, this appendix recognizes the complexities involved in local GHG target-setting and, as a result, does not recommend a specific GHG target or target-setting method for local governments. However, the appendix presents some considerations for various target-setting approaches below.

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[28] Climate Smart Communities. 2014. Climate Action Planning Guide. Available at: *https://cdrpc.org/wp-content/uploads/2015/05/CAP-Guide_MAR-2014_FINAL.pdf.*

[29] In the 2017 Scoping Plan, CARB recommended per capita, plan-level GHG targets of 6 MTCO2e per capita in 2030 and 2 MTCO2e per capita in 2050. Because the State is now pursuing carbon neutrality no later than 2045, CARB recommends that jurisdictions focus on developing locally appropriate, plan-level targets that align with the trajectory to carbon neutrality instead of focusing on a per capita 2050 target.

GHG reduction targets should typically be estimated for specific years aligned with the State's long-term climate targets established through existing laws or policy guidance. Various target years that are often, but not always, used in climate action planning include 2020 (for AB 32, SB 375, and EO S-3-05 consistency), 2030 (for SB 32 and EO B-30-15 consistency), 2035 (for SB 375 consistency), 2045 (for EO B-55-18 consistency, and there is now a statutory 2045 target in AB 1279), and 2050 (for EO S-3-05 and EO B-30-15 consistency),[30] as well as horizon years of local planning documents, such as general plans.

When establishing GHG reduction targets, jurisdictions should consider their respective share of the statewide reductions necessary to achieve the State's long-term climate target for each target year, and how they can best support those overall goals. Jurisdictions should also evaluate their specific inventory profile when establishing targets consistent with the State's long-term climate targets and should tailor their specific inventory profile to ensure the sectors included in the State's targets align with those included in the local jurisdiction's inventory and target, recognizing each region's distinctive sources and profile. For example, as the State's long-term climate targets address all emissions sectors within the state, a jurisdiction without an airport or port should "factor out" and remove these sectors from the State's long-term climate target when establishing local reduction targets. In essence, local governments should focus on sources and actions within their control, and set targets that support overall state goals.

Generally, a city or county that periodically examines their long-term GHG reduction trajectory is in a better position to determine whether GHG emission levels contemplated in their CAP are sustainable. This type of long-term approach benefits from interim reduction targets rather than a single target. Local governments that choose to adopt a single target year or opt to use a different method (e.g., project-by-project analysis, adopted significance thresholds, specific regional emissions targets, other State-related climate programs, etc.) should explain why their approach reflects sensible long-range planning horizons and should provide substantial evidence to support a conclusion that GHG emissions would decline along a trajectory consistent with the State's climate goals.

One approach to setting targets is to align local GHG-reducing strategies and actions with the respective State policies that will deliver GHG emission reductions, if successfully implemented and supported at the local level.[31] The CAP target-setting process should

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[30] AB 32 calls for California to reduce GHG emission to 1990 levels by 2020; SB 375 requires CARB to develop and set regional targets, indexed to years 2020 and 2035, for emission reductions from passenger vehicles; EO S-3-05 established a statewide interim target to reduce GHG emissions to 1990 levels by 2020 and 80 percent below 1990 levels by 2050; SB 32 requires the state to reduce statewide GHG emissions to 40% below 1990 levels by 2030; EO B-55-18 and AB 1279 call for carbon neutrality as soon as possible, but no later than 2045; and EO B-30-15 established a statewide interim GHG reduction target of 40 percent below 1990 levels by 2030 and 80 percent below 1990 levels by 2050.

[31] OPR. *General Plan Guidelines - Chapter 8 Climate Change.* Available at: *https://opr.ca.gov/planning/general-plan/guidelines.html.*

account for projected GHG emission reductions from State policies, programs, and strategies implemented over time. However, when using statewide data, local governments should avoid double-counting GHG emission reductions that are achieved through State-level efforts and should ensure that their target focuses on GHG emission reductions within the scope of the CAP. Local jurisdictions should refer to Table 2-2 in Chapter 2 of the 2022 Scoping Plan Update, which summarizes the key State actions (as well as supportive statutes, executive orders, and outcomes) under the Scoping Plan Scenario and identifies approaches to help guide setting targets that align with the State's GHG-reducing strategies. [32]

A number of these key State actions are directly relevant to the priority strategies described in this appendix and should be accounted for in local target-setting, including zero-emission light-duty vehicles (relevant to transportation electrification); smart growth/VMT reduction (relevant to vehicle miles traveled reduction); and new and existing residential and commercial buildings (relevant to building decarbonization). Table 2 summarizes these actions with milestones and benchmarks.[33] Local jurisdictions should consider these recommendations as a starting point when contextualizing the State's climate goals, GHG emissions inventory sectors, and actions for a CAP target-setting process to help align local targets with the State's climate goals.

[32] The Proposed Scenario is the Scoping Plan alternative that most closely aligns with existing statute and Executive Orders and assumes carbon neutrality by 2045 the deployment a broad portfolio of existing and emerging fossil fuel alternatives and clean technologies.

[33] The information in this table should be viewed as a general reference and may serve multiple uses, including providing resources that act as an aid to local governments when developing localized GHG targets for CAPs. The applicability of data, actions, and recommendations may vary across regions and should not be viewed or interpreted as official guidance, as thresholds of significance, or as dictating requirements for GHG target-setting processes. This is not considered an exhaustive list and does not represent the complete list of data resources and tools available. Not every recommendation provided will be relevant to, or appropriate for, a given area or plan.

Table 2 –Summary of Priority Key Actions[34] and Recommendations for CAP Target-Setting Processes

Priority Areas	Related Actions in the Proposed Scenario	Recommendations for Local CAP Target-Setting
Transportation Electrification	100 percent of light-duty vehicle sales are ZEVs by 2035	Potential data sources and tools to localize this for target-setting include EMFAC *Fleet Database* (by county) and *Scenario Analysis Tool* and *Department of Motor Vehicles Database* (by fuel type and registration)
VMT Reduction	VMT per capita reduced 25 percent below 2019 levels by 2030 and 30 percent below 2019 levels by 2045	Potential data sources to localize this for target-setting include VMT modeling outputs prepared for, or consistent with, the travel outcomes associated with the adopted SCS or other applicable regional plan
Building Decarbonization	All electric appliances in new construction beginning 2026 (residential) and 2029 (commercial)	Potential data sources to localize these for target-setting include: *Commercial Building Energy Consumption Survey*

[34] These areas and strategies are designated as "priority" because they are the GHG reduction opportunities over which local governments have the most authority and that have the highest GHG reduction potential.

Priority Areas	Related Actions in the Proposed Scenario	Recommendations for Local CAP Target-Setting
	For existing residential buildings, 80 percent of appliance sales are electric by 2030 and 100 percent of appliance sales are electric by 2035 (appliances replaced at end of life) For existing commercial buildings, 80 percent of appliance sales are electric by 2030 and 100 percent of appliance sales are electric by 2045 (appliances replaced at end of life)	*California Commercial End Use Survey* *Residential Appliance Saturation Survey*

California's overall state goal of achieving carbon neutrality no later than 2045 can also inform GHG reduction targets at individual community levels, and some communities or regions may be able to reach neutrality themselves. However, it is important to design targets in ways that support overall state goals, recognizing that each region has distinctive sources and systems. For instance, energy and transportation systems that serve Californians do not stop at jurisdictional boundaries, and some decisions can have ramifications for other communities (e.g., by inadvertently exporting emissions from a jurisdiction with a net-zero target to another jurisdiction with less stringent or no target). Jurisdictions considering a net-zero target should carefully consider the implications it may have on emissions in neighboring communities and beyond. Jurisdictions should also avoid creating targets that are impossible to meet as a basis to determine significance. For example, a net-zero target may imply that the GHG emissions of any project that are not reduced or offset to zero would be considered potentially significant. This may lead to undue burdens and frustrate project approval processes, which may be particularly problematic for residential development in climate-smart, infill areas. In addition, some jurisdictions have more land capacity to remove and store carbon, while others host GHG-emitting facilities that serve necessary functions and will take time to transition to new technology (e.g., municipal wastewater treatment plants, landfills, energy generation facilities). In those cases, jurisdictions that work together on a regional framework to rapidly decarbonize together may have better success in maximizing both emission reductions and other co-benefits. Ultimately, a net-zero target that makes it more difficult to achieve statewide goals by prohibiting or complicating projects that are needed to support the State's climate goals, like infill development or solar arrays, is not consistent with the State's goals. The scale of GHG reductions needed across all communities will be substantial. Local governments have the discretion to adopt targets that apply to their jurisdictions and may utilize the streamlining functions afforded in CEQA[35] so long as those targets are supported by substantial evidence.

3. The Role of Land Use Plans and Development Projects in Supporting the State's Climate Goals

3.1 Housing Demand and GHG Efficiency

Local governments are responsible for adopting and updating land use plans and related implementing ordinances, such as zoning and other development codes, as well as evaluating and making decisions regarding a development project's impact on the environment. The adoption of, or update to, local plans, as well as local discretionary approvals for new development, are subject to environmental review under CEQA, which requires public agencies, including local governments, to evaluate and disclose potential environmental effects from their discretionary decisions and actions and implement feasible mitigation. This environmental review process must address whether GHG emissions from a proposed project,

[35] Cal. Code Regs., tit. 14, § 15183.5.

as defined in Section 15378 of the CEQA Guidelines, would result in a cumulatively considerable contribution to climate change. As part of this review, lead agencies must consider whether a proposed project or plan would be consistent with, and supportive of, the State's climate goals.[36] Section 15064.4(b)(3) of the CEQA Guidelines states that lead agencies should evaluate whether a proposed project would "[c]onflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of greenhouse gases." Moreover, CEQA Guidelines Section 15125(d) requires a discussion "of any inconsistencies between the proposed project and applicable general plans, specific plans, and regional plans…regional transportation plans …[and]…plans for the reduction of greenhouse gas emissions," among others.

However, the discretionary processes through which local jurisdictions permit land use development projects vary widely across California and are sometimes not uniformly applied within the same jurisdiction.[37] O'Neill et al. (2022) found that restrictive local zoning and development approval processes are the chief regulatory contributors to California's housing crisis. Local governments have a clear opportunity to eliminate these barriers by reforming their local laws to facilitate dense development in infill areas, particularly those in high-resource and/or low-VMT communities. Local jurisdictions can also choose to adopt ministerial entitlement processes[38] for housing instead of imposing discretionary review processes (some jurisdictions currently even impose multiple layers of discretionary review) that provide project opponents opportunities to slow or stop projects, sometimes without advancing legitimate environmental goals.

The literature review conducted by O'Neill et al. (2022) does not find a consensus among CEQA experts on the impact of litigation (or the threat thereof) on new housing construction. The report finds that litigation rates among entitled housing projects in the jurisdictions studied were low (less than three percent overall). Of the relatively small percentage of projects that were litigated, approximately two-thirds were challenged based on claimed deficiencies in their GHG or VMT analysis. (Note, however, that this statistic in itself is not particularly revealing, since attorneys frequently include in their lawsuits a range of claims regarding various CEQA resource areas to maximize chances of prevailing.) Thus, among other bases for CEQA challenges, CEQA GHG impact analyses and mitigation measures can to be sources of

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[36] See, e.g., *Cleveland Nat'l Forest Found. v. San Diego Assn. of Governments* (2017) 3 Cal. 5th 497, 519 (holding that CEQA requires planning agencies to ensure their CEQA GHG analysis stays in step with evolving scientific knowledge and state regulatory schemes).

[37] O'Neill et al. 2022. "Final Report: Examining Entitlement in California to Inform Policy and Process: Advancing Social Equity in Housing Development Patterns." Available at: *https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3956250.*

[38] CEQA environmental review requirements only apply to discretionary project approvals; ministerial approvals are not subject to CEQA review. (Cal. Code Regs., tit. 14, § 15002(i).)

litigation and delay for projects, especially for housing projects in high-resource areas.[39] While the State has long been clear that urban infill projects, particularly in high-resource and low-VMT areas, would be generally supportive of the State's climate and regional air quality goals, such claims can persist. Although CEQA litigation can present additional complexity for housing development, restrictive local zoning and development approval processes are clearly the primary hurdles for housing development in California. Local jurisdictions have clear discretion to remove these barriers.

California continues to experience a severe housing shortage. The State must plan for more than 2.5 million residential units over the next eight years, and no less than one million of those residential units must be affordable to lower-income households.[40] This represents more than double the housing planned for during the last eight years.[41] The housing crisis and the climate crisis must be confronted simultaneously, and it is possible to address the housing crisis in a manner that supports the State's climate and regional air quality goals.[42] The following section includes recommendations to make doing so easier.

3.2 Evaluating Plan-Level and Project-Level Alignment with the State's Climate Goals in CEQA GHG Analyses

CEQA requires lead agencies to analyze the potential GHG-related impacts from their proposed projects.[43] As part of these analyses, agencies consider the extent to which their projects are consistent with the State's climate goals and requirements.[44] Land use plans (e.g., general plans, specific plans, area plans) and development projects have long operational lifespans, potentially locking in GHG emissions for decades. Some agencies have improperly attempted to use compliance with statewide regulatory programs to determine that their projects' GHG impacts are mitigated or are otherwise consistent with the Scoping Plan. While CARB has developed programs such as the State vehicle emissions standards (e.g., Advanced Clean Cars), the Low Carbon Fuel Standard, and the Cap-and-Trade program to reduce sector-wide GHG emissions, these programs were not designed to directly mitigate individual land use development project emissions from a CEQA perspective. Therefore, claimed consistency with these programs should not be used to conclude that motor vehicle

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[39] O'Neill et al. 2022. Final Report: Examining Entitlement in California to Inform Policy and Process: Advancing Social Equity in Housing Development Patterns. CARB Research Contract 19STC005. Available at: *https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3956250*.
[40] California Department of Housing and Community Development. 2022. *Statewide Housing Plan.* Available at: *https://www.hcd.ca.gov/docs/statewide-housing-plan.pdf*.
[41] Ibid.
[42] Elkind, E. N., Galante, C., Decker, N., Chapple, K., Martin, A., & Hanson, M. 2017. Right Type, Right Place: Assessing the Environmental and Economic Impacts of Infill Residential Development through 2030. Available at: *https://ternercenter.berkeley.edu/research-and-policy/right-type-right-place/*.
[43] Cal. Code Regs., tit. 14, § 15064.4.
[44] Cal. Code Regs., tit. 14, § 15064.4(b)(3).

emissions from a land use development project are fully mitigated or that such projects are definitively consistent with the Scoping Plan—particularly where the project at issue is not itself directly regulated by these programs.[45]

This section outlines three distinct approaches that lead agencies may consider for evaluating alignment of proposed plans and residential and mixed-use[46] development projects with the State's climate goals and, therefore, may have a less-than-significant impact on GHG emissions. These approaches are recommendations only and are not requirements. They do not supplant lead agencies' discretion to develop their own evidence-based approaches for determining whether a project would have a potentially significant impact on GHG emissions.[47]

The recommendations outlined in this section apply only to residential and mixed-use development project types. California currently faces both a housing crisis and a climate crisis, which necessitates prioritizing recommendations for residential projects to address the housing crisis in a manner that simultaneously supports the State's GHG and regional air quality goals. CARB plans to continue to explore new approaches for other land use types in the future.

3.2.1 Project Attributes for Residential and Mixed-Use Projects to Qualitatively Determine Consistency with the Scoping Plan

Absent consistency with an adequate, geographically specific GHG reduction plan such as a CEQA-qualified CAP, as described in Section 2, the first approach the State recommends for determining whether a proposed residential or mixed-use residential development would align with the State's climate goals is to examine whether the project includes key project attributes that reduce operational GHG emissions while simultaneously advancing fair housing. Consistent with the Priority Strategies shown in Table 1, empirical research shows that the following project attributes result in reduced GHG emissions from residential and mixed-use development. Residential and mixed-use projects that have all of the key project attributes in Table 3 should accommodate growth in a manner consistent with State GHG reduction and equity prioritization goals.

[45] CEQA Guidelines section 15064.4(b)(3) allows compliance with "regulations or requirements adopted to implement a statewide, regional, or local plan for the reduction or mitigation of greenhouse gas emissions" as an approach for the determination of significance for GHG emissions.
[46] Mixed use residential is defined as development including both residential and nonresidential uses with at least two-thirds of the square footage designated for residential use per Cal. Gov. Code., tit. 7, § 65589.5(h)(2)(B)).
[47] Cal. Code Regs., tit. 14, § 15064.4.

Table 3 – Key Residential and Mixed-Use Project Attributes that Reduce GHGs

Priority Areas	Key Project Attribute
Transportation Electrification	Provides EV charging infrastructure that, at minimum, meets the most ambitious voluntary standard in the California Green Building Standards Code at the time of project approval[48]
VMT Reduction	Is located on infill sites that are surrounded by existing urban uses and reuses or redevelops previously undeveloped or underutilized land that is presently served by existing utilities and essential public services (e.g., transit, streets, water, sewer)[49]
	Does not result in the loss or conversion of natural and working lands
	Consists of transit-supportive densities (minimum of 20 residential dwelling units per acre),[50] or Is in proximity to existing transit stops (within a half mile),[51] or Satisfies more detailed and stringent criteria specified in the region's SCS[52]
	Reduces parking requirements[53] by: Eliminating parking requirements or including maximum allowable parking ratios (i.e., the ratio of parking spaces to residential units or square feet); or Providing residential parking supply at a ratio of less than one parking space per dwelling unit; or

[48] Cal. Code Regs., tit. 24, Part 11.
[49] Government Code, § 65041.1. "Statewide Environmental Goals and Policy Report." Available at: *https://leginfo.legislature.ca.gov/faces/codes_displaySection.xhtml?lawCode=GOV&sectionNum=65041.1*.
[50] Federal Transit Administration. 2014. *Planning for Transit-Supportive Development: A Practitioner's Guide*. Available at: *https://www.transit.dot.gov/funding/funding-finance-resources/transit-oriented-development/planning-transit-supportive*.
[51] Washington Department of Transportation. 2013. *Tools for Estimating VMT Reductions from Built Environment Changes*. Available at: *https://www.wsdot.wa.gov/research/reports/fullreports/806.3.pdf*.
[52] One example of an evaluation of consistency with the region's SCS is from the 2013 draft EIR for The Cannery in Davis, p. 3.7-26. Available at: *https://www.cityofdavis.org/home/showpublisheddocument/650/635607772224000000*.
[53] CAPCOA. 2021. Handbook for Analyzing Greenhouse Gas Emissions Reductions, Assessing Climate Vulnerabilities, and Advancing Health and Equity: Designed for Local Governments, Communities, and Project Developers. Available at: *https://caleemod.com/handbook/index.html*.

Priority Areas	Key Project Attribute
	For multifamily residential development, requiring parking costs to be unbundled from costs to rent or own a residential unit.[54]
	At least 20 percent of units included are affordable to lower-income residents[55, 56]
	Results in no net loss of existing affordable units
Building Decarbonization	Uses all-electric appliances without any natural gas connections and does not use propane or other fossil fuels for space heating, water heating, or indoor cooking[57, 58]

These project attributes are intended as a guide to help local jurisdictions qualitatively identify those residential and mixed-use projects that are ***clearly*** consistent with the State's climate goals, since these attributes address the largest sources of operational emissions for residential projects. In general, residential and mixed-use development projects that incorporate ***all*** of these key project attributes are aligned with the State's priority GHG reduction strategies for local climate action as shown in Table 1 and with the State's climate and housing goals. As such, they are considered to be consistent with the Scoping Plan or other plans, policies, or regulations adopted for the purposes of reducing GHGs; therefore, the GHG emissions associated with such projects may result in a less-than-significant GHG impact under CEQA. Lead agencies may determine, with adequate additional supporting evidence,

[54] AB 2097, adopted by the Legislature and signed by the Governor in September 2022 eliminates parking requirements for residential and commercial development within a half-mile of transit. Government Code, § 65863.2. "Residential, commercial, or other development types: parking requirements." Available at: *https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=202120220AB2097*

[55] Newmark, G. and Haas, P. 2015. Income, Location Efficiency, and VMT: Affordable Housing as a Climate Strategy. Available at: *https://chpc.net/wp-content/uploads/2016/05/CNT-Working-Paper-revised-2015-12-18.pdf*.

[56] California Housing Partnership Corporation and TransForm. 2014. Why Creating and Preserving Affordable Homes Near Transit is a Highly Effective Climate Protection Strategy. Available at: *https://1p08d91kd0c03rlxhmhtydpr-wpengine.netdna-ssl.com/wp-content/uploads/2015/11/4-AffordableTODResearchUpdate070114.pdf*.

[57] Energy and Environmental Economics. 2019. Residential Building Electrification in California: Consumer economics, greenhouse gases and grid impacts. Available at: *https://www.ethree.com/wp-content/uploads/2019/04/E3_Residential_Building_Electrification_in_California_April_2019.pdf*.

[58] Energy and Environmental Economics. 2021. Achieving Carbon Neutrality in California: PATHWAYS Scenarios Developed for CARB. Available at: *https://ww2.arb.ca.gov/sites/default/files/2020-10/e3_cn_final_report_oct2020_0.pdf*.

that projects that incorporate some, but not all, of the key project attributes are consistent with the State's climate goals.

This qualitative approach to determining the significance of GHG impacts is only intended for residential and mixed-use development projects. CARB will continue to explore this qualitative approach for evaluating the significance of GHG impacts for other types of land uses and encourages CEQA practitioners and lead agencies to do the same. The following two sections describe additional approaches lead agencies may employ in CEQA analyses.

3.2.2 Net-Zero Threshold of Significance

Absent consistency with an adequate, geographically specific GHG reduction plan, as described in Section 2 or consistency with the project attributes approach identified in Table 3 for residential and mixed-use development project types, lead agencies can make a significance determination, consistent with Section 4 below, based on whether the project would result in net-zero GHG emissions. (Note that lead agencies can also use other valid significance thresholds, as described in subsection 3.2.3 below.) Although achieving net-zero GHG emissions may be an appropriate overall objective, it should be noted this approach may not be feasible or appropriate for every project. Furthermore, in determining a project's net GHG impacts, agencies should carefully consider how to view the GHG emissions implications of changes to existing land uses at the project site, particularly where such uses may simply relocate to another location. Lead agencies should consider whether there is substantial evidence that the GHG emissions generated by existing uses of the project site will cease to exist as a direct result of the proposed project and will not merely occur at a different location after the proposed project is developed. If substantial evidence demonstrates that emissions from existing sources currently operating or generating emissions at the project site would continue elsewhere, lead agencies should account for those emissions when calculating the net change in emissions associated with the proposed project.

However, there are recent examples of land use development projects in California that have demonstrated that it is feasible to design projects of nearly any scale that achieve net-zero GHG emissions. Several projects have received certification from the Governor under AB 900, the Jobs and Economic Improvement through Environmental Leadership Act (Buchanan, Chapter 354, Statutes of 2011) and a similar program authorized under SB 7 (Atkins, Chapter 19, Statutes of 2021), demonstrating an ability to design economically viable projects that create jobs while contributing net-zero GHG emissions.[59] These projects have included mixed-use housing and commercial developments, large-scale residential projects, sports arenas, a medical center, and business campuses.

As discussed in Section 3.2.1, "Project Attributes for Residential Projects to Qualitatively Determine Consistency with the Scoping Plan," development in infill and transit-oriented areas

[59] OPR. 2021. *Judicial Streamlining*. Available at: *https://www.opr.ca.gov/ceqa/judicial-streamlining/*.

helps to reduce or avoid increasing GHG emissions. Although, while land use development patterns in California have become, in general, more compact than in the past, new low-density, auto-oriented development is still being planned for and built.[60] Despite this continuing challenge, several large and mixed-use projects within California have ultimately committed to achieving net-zero GHG emissions. For example, as part of the Downtown West Mixed Use Plan,[61] the applicant, Google LLC, ultimately committed to achieving net-zero GHG emissions for an approximately 80-acre mixed-use property, including almost 6,000 residential units, as well as retail, office, and other land uses, located in downtown San Jose, California. This commitment will be achieved through a combination of on-site measures and the purchase and retirement of carbon offset credits from CARB-approved registries in the voluntary market. Similarly, the Oakland Athletics, the applicant for the Oakland Waterfront Ballpark District Project located in Oakland, California, also committed its development to result in no net increase of GHG emissions through a combination of on-site and local mitigation measures and the purchase and retirement of carbon offset credits from CARB-approved registries in the voluntary market.[62] Design and local reduction measures[63] were employed by the developers to reduce 54 percent of total non-residential emissions, while 49 percent of operational emissions were reduced via carbon offset credits from the voluntary market.

Even California's largest, most sprawl-intensive housing developments have ultimately committed to achieving net-zero GHG emissions, even if only after intense legal battles. For example, under the Newhall Ranch Resource Management and Development Plan and Spineflower Conservation Plan,[64] the applicant, Newhall Land and Farming Company, ultimately committed to achieving net-zero GHG emissions for an almost 12,000-acre plan area in the Santa Clarita Valley. This commitment will be achieved through a combination of on-site and local mitigation measures and the purchase and retirement of carbon offset credits from the voluntary market. Similarly, as a result of a recent settlement agreement, Tejon Ranch Company, the developer for the Centennial Specific Plan located in northern Los

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[60] CARB. 2022. Draft 2022 Progress Report California's Sustainable Communities and Climate Protection Act. P. 22-25. Available at: *https://ww2.arb.ca.gov/sites/default/files/2022-07/2022_SB_150_Main_Report_Draft_ADA.pdf*.

[61] OPR. 2022. *Judicial Streamlining: Archived Applications*. Available at: *https://opr.ca.gov/ceqa/judicial-streamlining/archive.html*.

[62] Ibid.

[63] Local reduction measures include measures to reduce VMT and trips (including reduced parking and transportation network surcharges), installing EV chargers at 10 percent of onsite parking spaces, electrification (i.e., prohibition of non-electric energy, such as natural gas) of 50 percent of residential units, and either converting an existing jet-fueled peaker plant to battery storage or installing 1,013 EV charging stations in the community.

[64] California Department of Fish and Wildlife. 2021. Newhall Ranch Resource Management and Development Plan and Spineflower Conservation Plan: Final EIS/EIR Documents. Available at: (*https://nrm.dfg.ca.gov/documents/ContextDocs.aspx?cat=NewhallRanchFinal*).

Angeles County,[65] also committed its development to result in no net increase of GHG emissions.[66] Mitigation measures employed by these developers include the prohibition of natural gas in residential and commercial properties; the requirement of on-site solar photovoltaic energy systems on residential and commercial properties; the installation of almost 30,000 EV chargers within and outside the plan area; funding incentives for the purchase of 10,500 passenger EVs and electric school buses and trucks; and procuring and retiring carbon offset credits from the voluntary market.

Although the projects in San Jose and Oakland may not meet all of the key project attributes for qualitatively determining project consistency with statewide GHG goals, as shown in Table 3, and the Newhall and Tejon Ranch projects do not necessarily represent the type of development that California most needs to simultaneously tackle the housing and climate crises, they do demonstrate the feasibility of a net-zero approach for other large and complex residential development projects.

3.2.3 Recommended Thresholds of Significance

Lead agencies may also analyze the GHG impact of proposed projects by employing a threshold of significance recommended by the applicable air district[67] or other lead agencies.[68] As stated in CEQA Guidelines section 15064.7(b), "a lead agency may consider thresholds of significance previously adopted or recommended by other public agencies or recommended by experts, provided the decision of the lead agency to adopt such thresholds is supported by substantial evidence." However, thresholds for analyzing a project's GHG emissions can become outdated if they are not aligned with the State's most recent GHG reduction goals.[69] To be defensible, CEQA significance thresholds must be supported by substantial evidence.[70] Mitigating GHG emissions below an applicable GHG threshold of significance is one way lead agencies may demonstrate that a project's GHG emissions would have a less-than-significant impact on the environment. For lead agencies that pursue this approach, CAPCOA, which

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[65] Los Angeles County Department of Regional Planning. 2019. *Specific Plan No. 02-232 / Centennial Specific Plan.* Available at: *https://planning.lacounty.gov/case/view/specific_plan_no_02_232_centennial_specific_plan*.

[66] Tejon Ranch. 2021. *Settlement Agreement Reached in Centennial lawsuit.* Available at: *https://tejonranch.com/settlement-agreement-reached-in-centennial-lawsuit/*.

[67] CARB research indicates that less than 20 percent of California's population is located in an area with CEQA GHG thresholds of significance addressing SB 32 reduction goals adopted by an air district (Bay Area Air Quality Management District and Sacramento Metropolitan Air Quality Management District).

[68] As with all CEQA significance thresholds, GHG significance thresholds must be supported by substantial evidence. Some lead agencies, such as the City of San Luis Obispo and County of Santa Barbara, have adopted CEQA GHG thresholds of significance due to the absence of a local air district-adopted threshold or because a local CEQA-qualified CAP used to tier and streamline its project-specific CEQA GHG analysis (per CEQA Guidelines Sections 15064.4 (b)(3) and 15183.5) may not be available or applicable.

[69] CEQA GHG analyses (including significance determinations) "must reasonably reflect evolving scientific knowledge and state regulatory schemes." (Cal. Code Regs., tit. 14, §§ 15064.4(b))

[70] Cal. Code Regs., tit. 14, § 15064.7(b).

provides a forum for the sharing of knowledge, experience, and information between air districts throughout the state, has developed tools and guidance for CEQA practitioners, such as the California Emissions Estimator Model[71] (CalEEMod) and guidance for developing and quantifying project-level GHG mitigation measures.[72]

4. Mitigating Greenhouse Gas Emissions Pursuant to CEQA

If a lead agency determines that a proposed project's GHG emissions would result in a significant impact and a cumulatively considerable contribution to climate change, the lead agency must impose feasible mitigation measures to reduce the project's GHG impact to a less-than-significant level.[73] According to the CEQA Guidelines, mitigation measures must be feasible, roughly proportional, not inappropriately deferred, capable of being monitored or reported, fully enforceable, and based on substantial evidence. They must also have a nexus to a legitimate governmental interest.[74] Any GHG offsets used as CEQA mitigation must not be otherwise required (e.g., by regulation or by existing permitted CEQA projects).[75] Lead agencies should present substantial evidence to document that a given mitigation measure would actually serve to mitigate the proposed project's GHG emissions.[76]

CAPCOA has developed tools and guidance for CEQA practitioners for developing and quantifying project-level GHG mitigation measures. These include CAPCOA's Handbook,[77] which it published in 2021 along with the mitigation module in CalEEMod.[78]

As the severe impacts of climate change become better understood and the State's climate goals become more stringent over time, local, off-site CEQA GHG mitigation measures will become increasingly necessary. However, several factors often hinder the adoption of local, off-site GHG mitigation under CEQA, including confusion about CEQA's requirements for GHG mitigation, a focus on carbon offset credits and lack of awareness of local GHG mitigation

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[71] CAPCOA. 2022. *California Emissions Estimator Model.* Available at: *www.caleemod.com*.
[72] CAPCOA. 2021. Handbook for Analyzing Greenhouse Gas Emissions Reductions, Assessing Climate Vulnerabilities, and Advancing Health and Equity: Designed for Local Governments, Communities, and Project Developers. Available at: *https://caleemod.com/handbook/index.html*.
[73] Cal. Code Regs., tit. 14, § 15126.4(c).
[74] Cal. Code Regs., tit. 14, § 15126.4(a)(4)(A).
[75] Cal. Code Regs., tit. 14, § 15126.4(c)(3)).
[76] Cal. Code Regs., tit. 14, § 15126.4(c)).
[77] CAPCOA. 2021. Handbook for Analyzing Greenhouse Gas Emissions Reductions. Assessing Climate Vulnerabilities and Advancing Health and Equity: Designed for Local Governments, Communities, and Project Developers. Available at: *https://caleemod.com/handbook/index.html*.
[78] CAPCOA. 2022. *California Emissions Estimator Model.* Available at: *www.caleemod.com*.

opportunities, and a perception of high costs (e.g., mitigation costs for project sponsors, administrative costs for lead and responsible agencies).

This section seeks to assist in overcoming barriers to GHG mitigation under CEQA and reduce the use of statements of overriding considerations by lead agencies by establishing a hierarchy of mitigation opportunities that reflect the State's priorities for mitigation. In doing so, this section encourages project applicants and local governments to use local and non-local off-site GHG mitigation approaches (including carbon offset credits) consistent with CEQA's requirements. This section also seeks to clarify how CEQA's mitigation requirements apply to GHG mitigation (including carbon offset credits).

While this section identifies ways to overcome some common barriers to local CEQA GHG mitigation, other barriers may take longer to remove and may even require legislative or other State-level action. Through appropriate application of local GHG mitigation under CEQA, lead agencies have an opportunity to benefit their communities while addressing the climate crisis. Local, off-site mitigation measures implemented in the communities in which project impacts occur have the added potential co-benefit of reducing emissions of toxic air contaminants and criteria air pollutants, which will improve health and social and economic resiliency to climate-related impacts. Verification of local mitigation can also be more straightforward than verification of mitigation that is outside of the jurisdictional boundaries of the lead agency.

4.1 GHG Mitigation Hierarchy

CEQA requires lead agencies to impose all feasible mitigation measures necessary to avoid or reduce GHG emissions to a less-than-significant level prior to certifying an Environmental Impact Report (EIR) or mitigated negative declaration. CEQA does not require mitigation measures that are infeasible for specific legal, economic, technological, or other reasons. If there are not sufficient mitigation measures that the lead agency determines are feasible for avoiding GHGs or reducing GHGs to a less-than-significant level, before approving a project, the lead agency must adopt all measures that are feasible and adopt a statement of overriding considerations (or significance "override") that explains why additional mitigation is infeasible.[79] The statement of overriding considerations must be supported by substantial evidence in the record.

A wide array of CEQA GHG mitigation that can help avoid the need to adopt statements of overriding considerations is discussed in Section 4.1.2 below. The hierarchy outlined below may provide a helpful reference for lead agencies and project sponsors on how to approach mitigation in a way that maximizes benefits to communities surrounding projects, with a particular emphasis on benefitting historically underserved and disadvantaged communities.

[79] Cal. Code Regs., tit. 14, § 15093(b).

The State recommends prioritizing CEQA GHG mitigation according to a geographic hierarchy as follows:

1. On-site design measures;
2. Off-site GHG mitigation:
    a. Funding or implementing local, off-site GHG reduction projects (within the communities or neighborhoods in the vicinity of the project);
    b. Funding or implementing non-local, off-site GHG reduction projects;
3. Purchasing and retiring carbon offset credits:
    a. That originate in the same air basin as the project;
    b. That originate elsewhere in California;
    c. That originate outside of California.

This geographical hierarchy is consistent with SB 7, in which the Legislature mandated a similar hierarchy for land use development projects seeking to be designated as "environmental leadership development projects" and granted certain streamlining provisions. Under this hierarchy, the community in which the project is located is prioritized to receive the environmental and economic co-benefits of the mitigation, especially the reductions in emissions of criteria air pollutants and toxic air contaminants that accompany many GHG reduction measures. Similar prioritization was included in the Oakland Waterfront Ballpark District Project, which required that a minimum of 50 percent of the GHG emission reductions from non-residential land uses result from local, direct measures, and stipulated that no more than 50 percent of reductions may result from offset credits.[80]

The following sections discuss each level of mitigation in the suggested hierarchy of mitigation.

4.1.1 On-site GHG Mitigation

Lead agencies should prioritize on-site design features within the project site that minimize GHG emissions. On-site GHG mitigation includes the implementation of project features, project design, or other measures, including but not limited to energy efficiency measures, installation of renewable energy electricity generation, all-electric building design, EV charging connections, and features that reduce VMT, such as a transportation demand management plan or the provision of shared mobility options (such as facilitating carpooling, providing active transportation and transit vouchers, and implementing telecommuting and alternate work schedules). Chapter 3 of CAPCOA's 2021 *Handbook for Analyzing Greenhouse Gas Emission Reductions, Assessing Climate Vulnerabilities, and Advancing Health and Equity*,[81] includes

[80] Bonta, Chapter 959, Statutes of 2018. California Environmental Quality Act: Oakland Sports and Mixed-Use Project. Available at: *https://leginfo.legislature.ca.gov/faces/billPdf.xhtml?bill_id=201720180AB734&version=20170AB73492CHP*.

[81] CAPCOA. 2021. Handbook for Analyzing Greenhouse Gas Emissions Reductions, Assessing Climate Vulnerabilities, and Advancing Health and Equity: Designed for Local Governments, Communities, and Project Developers. Available at: *https://caleemod.com/handbook/index.html*.

many on-site GHG reduction measures for a variety of project and plan types for lead agencies to consider. Many on-site GHG mitigation measures also result in a reduction in emissions of criteria air pollutants and toxic air contaminants in the air basin in which the project is located, as well as emissions of toxic air contaminants on or near the project site, consistent with legislative direction from SB 32 to "achieve the state's more stringent greenhouse gas emission reductions in a manner that benefits the state's most disadvantaged communities."

4.1.2 Off-site GHG Mitigation

If implementation of all feasible on-site GHG reduction measures is insufficient to reduce a project's impact to a less-than-significant level, the State recommends that the lead agency next explore options to fund or implement ***local***, off-site direct GHG reduction strategies.

Funding or implementing GHG mitigation measures in the project's vicinity may allow the project proponent and the lead agency to work directly with the impacted community to identify and prioritize the mitigation measures that meet its needs while minimizing multiple environmental and societal impacts. Direct, local investments help build relationships for future mutually beneficial development and mitigation opportunities in that community and may also provide a multitude of other co-benefits to the neighborhood's residents. To help remove barriers to employing these types of mitigation, lead agencies may wish to consider developing a local mitigation bank[82] that enables project applicants to fund such projects in exchange for being credited with the resulting GHG reductions in their CEQA analyses. The lead agency should also provide substantial evidence to show that the mitigation would actually serve to mitigate the proposed project's GHG emissions (i.e., a project cannot take credit for unrelated off-site measures that would occur independently of the proposed project). Examples of local investments and their co-benefits include:

- **Local urban forestry** programs that increase the number of trees and other plants in urban areas can sequester carbon, reduce air pollution and ambient temperatures, help manage stormwater and improve water quality, provide shade to reduce energy demand for cooling buildings (and the associated cost and GHG emissions of that energy), improve aesthetics, foster mental health, and encourage physical activity of residents and employees, among many other benefits.
- **Local building retrofit programs** targeting existing residential and commercial buildings in the project's vicinity can fund installation of cool roofs, solar panels, solar or heat pump water heaters, smart meters, and energy efficient lighting and appliances; replacement of fossil fuel-powered appliances with electric models; installation of energy efficient windows, insulation, and other building envelope measures; and

[82] As discussed in Section 5, below, the Regional GHG Collaborative Group along the Central Coast are working to educate and provide avenues for offset projects to help meet current and future local GHG reduction targets and CEQA GHG reduction needs.

implementation of water conservation measures. These investments can improve comfort, reduce utility bills, and help manage the demand for electricity while reducing GHG emissions.

- **Off-site EV chargers** can increase access to EV charging throughout a community. Some examples could include EV chargers in multi-unit dwellings in disadvantaged or low-income areas, public locations (schools, libraries, city centers), workplaces, key destinations (e.g., parks, recreation areas, sports arenas).
- **Public transit subsidies** can increase access to transit and to daily activities served by transit and can encourage less reliance on driving and increased reliance on other modes of transportation (e.g., transit and active transportation), which provides air quality and cost savings co-benefits to residents.

Like many on-site GHG mitigation measures, implementation of most local, off-site GHG reduction strategies also results in reductions of toxic air contaminants and criteria air pollutants and their precursors in the same air basin in which the project is located. The State recommends that lead agencies prioritize GHG mitigation that also increases a community's social and economic resilience to adverse impacts exacerbated by climate change. Applying a local lens to GHG mitigation and allowing for community-led decision-making helps prioritize the mitigation measures that address community-identified needs and can also fill gaps in the existing local approach to climate action.

If a project needs further GHG reductions after adoption of all feasible local, off-site mitigation options, applicants should next consider non-local, off-site mitigation. There has been concern that GHG emission reductions from off-site GHG mitigation measures (including carbon offset credits) may double count GHG emission reductions from California's Cap-and-Trade program. However, off-site mitigation measures, such as EV charging or building efficiency retrofits, are viable options for mitigation under CEQA and would not be double counted, provided they are not otherwise required by law or regulation and would not have happened but for the mitigation requirements of the project. If the mitigation would have been implemented or required through another statute, regulation, existing local program, or requirement other than the project it is mitigating, then the project being mitigated may not also claim credit for the reductions.

4.1.3 Conditions Applicable to Carbon Offset Credits

If implementation of all feasible on-site GHG reduction measures and all feasible off-site GHG reduction measures are insufficient to reduce a project's impact to a less-than-significant level, then the lead agency or project applicant should consider purchasing and retiring carbon offset credits. The State recommends that carbon offset credits retired as CEQA mitigation be registered with a recognized and reputable carbon registry on the voluntary market. For example, while CARB does not review or authorize voluntary-market offset registries or protocols for use as CEQA mitigation, CARB notes that the registries

approved by CARB for the Cap-and-Trade Program also serve as voluntary market credit registries, with voluntary market offsets available for CEQA mitigation purposes.[83]

In addition, starting in 2023, the California Carbon Sequestration and Climate Resiliency Project Registry[84] will be maintained by the California Natural Resources Agency for the purposes of identifying and listing projects in the state that drive climate action on the state's natural and working lands. The Registry is seeking funding from State agencies and private entities and may provide additional carbon offset credits. Note that compliance offsets for the Cap-and-Trade Program (a state market-based carbon program unaffiliated with CEQA) cannot be used for any purpose other than Cap-and-Trade compliance by covered entities and therefore cannot be purchased for use as CEQA mitigation.[85] As with other types of off-site mitigation, the State recommends pursuing carbon offset credits that are as close to the project site as possible in the following order of priority: (1) carbon offset credits that originate in the same air basin as the project, (2) carbon offset credits that originate elsewhere in California, (3) carbon offset credits that originate outside of California.

4.2 Clarifying CEQA's Requirements for GHG Mitigation

Over the years, agencies and courts have provided direction and guidance regarding GHG mitigation. Given the variety of potential projects and mitigation scenarios, some uncertainty and misconceptions persist. For example, when lead agencies consider off-site GHG mitigation (including carbon offset credits), they may sometimes conflate the requirements for compliance-grade offsets in California's Cap-and-Trade regulation with the requirements for GHG mitigation measures under CEQA. The Cap-and-Trade regulation requires that compliance offsets used in the Cap-and-Trade Program meet certain regulatory criteria, including that they be real, additional, quantifiable, permanent, verifiable, and enforceable. In general, the State's Cap-and-Trade Program restricts compliance offsets from being used for any purpose other than Cap-and-Trade compliance, including being used as mitigation under CEQA.

When designing GHG mitigation measures (whether local, off-site mitigation or carbon offset credits), the State recommends that lead agencies focus on applying the requirements specified in the CEQA statute, Guidelines, and case law – e.g., not otherwise required (see CEQA Guidelines section 15126.4(c)(3)); enforceable (see CEQA Guidelines section 15126.4(a)(2)); supported by substantial evidence; etc. – rather than strictly importing all of the regulatory requirements used for compliance offsets within California's Cap-and-Trade

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[83] CARB. 2022. *Offset Project Registries.* Available at: *https://ww2.arb.ca.gov/our- work/programs/compliance-offset-program/offset-project-registries*.

[84] Skinner, Chapter 237, Statutes of 2021. Carbon sequestration: state goals: natural and working lands: registry of projects. Available at: *https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=202120220SB27*.

[85] Cal. Code Regs., tit. 14, Chapter 3, §§ 15000 et seq.

program. It may be appropriate for lead agencies to require CEQA mitigation that helps localities meet targets or commitments set in local planning documents, including CAPs, lacking sufficient funding and are not otherwise explicitly required by regulation. Lead agencies should use substantial evidence to document that a specific off-site mitigation measure is not otherwise required and would not have occurred at that time ***but for*** the requirement to mitigate a project's GHG impacts. Examples of off-site GHG mitigation that would not have occurred but for the requirement to mitigate a project's GHG impacts and could therefore be not otherwise required are included in Section 4.1.2, Off-site GHG Mitigation.

5. Importance of Regional Collaboration

While local jurisdictions have considerable authority to act individually, it is important to consider the many benefits of regional collaboration. Transportation, land use, housing, climate, and energy issues are often interconnected. Local governments can benefit from collaborating with neighboring jurisdictions and regional agencies as they seek to reduce GHG emissions from these sectors. For example, CAPs that consider regional travel patterns, job and housing availability, and regional opportunities to mitigate GHG emissions can be more effective. In collaboration with other regional entities, local jurisdictions can leverage investments, data, best practices, and opportunities for GHG emission reductions in an equitable manner.

Regional collaboration and partnership across levels of government can bring together community leaders, agencies, academia, industry, community-based organizations, and other stakeholders from multiple jurisdictions within a region to share expertise, information, lessons learned, and strategies to promote mutually defined goals. Regional collaboration may include leveraging existing collaboratives and partnerships or establishing new ones. There are many excellent examples of regional collaboration in California that support the intersection of transportation, housing, and land use in tackling climate change. Local jurisdictions can leverage the work of these collaboratives and build on existing efforts to support equitable implementation of priority strategies and GHG mitigation. Examples of existing regional collaboratives include Community Choice Aggregators (CCAs), Regional Energy Networks (RENs), Regional Climate Collaboratives, Regional Housing Collaboratives, and Plug-in Electric Vehicle Collaboratives. The Integrated Climate Adaptation and Resiliency Program (ICARP)[86] offers funding, case studies, and tools for forming regional climate coordination entities.

Regional collaboration has tremendous potential to address barriers and expand opportunities for successful local GHG mitigation. It can help increase local opportunities for feasible GHG mitigation under CEQA that also benefit the communities impacted by the development. It can

[86] Governor's Office of Planning and Research. 2022. *Integrated Climate Adaptation and Resiliency Program (ICARP)*. Available at: *https://opr.ca.gov/climate/icarp/*.

help overcome barriers, such as project and administrative costs. It can help increase awareness of local mitigation opportunities for project applicants and lead agencies, improve connections with existing programs that offer mitigation opportunities, and identify sites for off-site mitigation opportunities, all in an effort to support a local voluntary mitigation market. And it can help site owners aggregate smaller mitigation projects to potentially reduce costs, increase the efficiency of mitigation projects, and leverage expertise on mitigation strategies and quantification methodologies.

Regional collaboration can also lend support to lead agencies and air districts as they seek opportunities for local GHG mitigation. San Luis Obispo County Air Pollution Control District, County of Santa Barbara, County of Ventura, City of Santa Barbara, City of San Luis Obispo, and Community Environmental Council formed a tactical Regional GHG Collaborative Group to understand and identify opportunities for local carbon sequestration and GHG reduction projects.

Developing a local voluntary mitigation market will help a city or region capture mitigation dollars and provide local benefits that are not realized by the purchase of distant, out-of-state carbon offset credits, while providing greater transparency and enforceability. Keeping GHG mitigation dollars within communities or regions can also be a strategy to address community needs and inequities from historic and ongoing underinvestment in vulnerable and disadvantaged communities.

Creating, sustaining, and expanding regional collaboratives takes time, resources, and expertise that are not always available to local jurisdictions. There may be a role for the State to ensure that all regions have access to mitigation opportunities. One potential avenue to accomplish this would be through the creation of a statewide GHG mitigation bank designed for CEQA mitigation purposes.

6. Conclusion

Local governments are essential partners in California's efforts to reduce GHGs. Their unique expertise and respective authorities allow them to shape growth and development patterns within their jurisdiction, and as a result, local actions remain critical for reducing GHG emissions from the built environment and transportation. Indeed, the Scoping Plan proposes transformative reductions in GHG emissions from the building and transportation sectors. These critical emission reductions rely on significant electrification of the state's vehicle fleet and building stock, but also require a significant shift in the transportation choices for Californians favoring active mobility, shorter trips, and robust public transit rather than sprawl and automobile dependence. Local governments have a critical role to play in this transition through their land use policies, transportation investments, and partnerships with neighboring jurisdictions, community organizations, business and labor groups, and the State.

Local leadership and regional collaboration are paving the way for reducing emissions in these sectors, and this appendix seeks to inform jurisdictions about opportunities to promote transportation electrification, VMT reduction, and building decarbonization through:

- Developing local CAPs and strategies consistent with the framework described in Section 2: “The Role of Local Climate Action Planning in Supporting the State’s Climate Goals;”
- Localizing State-level GHG priorities when approving individual land use plans and projects as described in Section 3: “The Role of Land Use Development Projects in Supporting the State’s Climate Goals;”
- Implementing mitigation to reduce GHG emissions associated with CEQA projects, consistent with Section 4: “Mitigating Greenhouse Gas Emissions Pursuant to CEQA;” and
- Leveraging regional collaboration to enhance the effectiveness of local climate action and overcome barriers to CEQA GHG mitigation as highlighted in section 5: “Importance of Regional Collaboration.”

California must accommodate population and economic growth in a far more sustainable and equitable manner than in the past. California’s climate trajectory relies on local efforts that align with and help implement the State’s priorities. The recommendations provided in this appendix are non-binding and should not be interpreted as a directive to local governments, but rather as evidence-based analytical tools to assist local governments with their role as essential partners in achieving California’s climate goals.

Attachment N

Fresno Local Agency Formation Commission

2020 Map update: Disadvantaged Unincorporated Communities Database

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Adopted:
February 12, 2020

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On February 18, 2015, the Fresno Local Agency Formation Commission ("LAFCo") adopted Disadvantaged Unincorporated Communities database management and implementation guidelines ("DUC database") to fulfill its responsibility to periodically identify DUCs pursuant to Senate Bill 244 (Wolk). The DUC database established a system to identify, record, and track DUC locations within Fresno County using Geographic Information Systems (GIS).

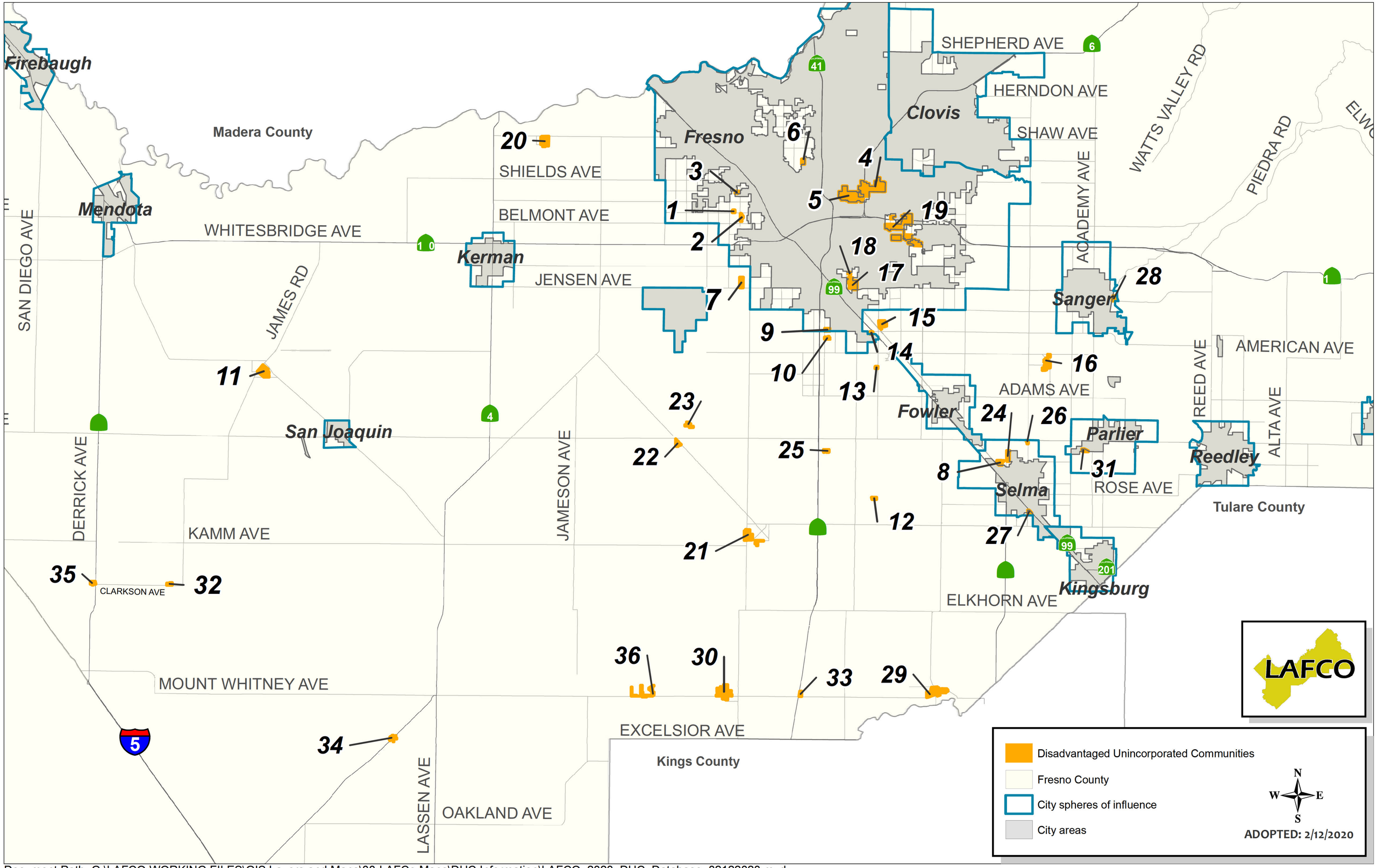
This narrative document complements Figure 1 - DUC Map that is also available on LAFCo's website at: http://www.fresnolafco.org/DUC.asp

LAFCo is a State-mandated, independent agency with countywide jurisdiction over changes in organization and boundaries of cities and special districts (collectively referred to as "local agencies").

The Cortese-Knox-Hertzberg Local Reorganization Act of 2000 establishes procedures and responsibilities for the 58 LAFCos in California. As a regional planning agency, LAFCo guides the future boundaries and areas served through the adoption of spheres of influence ("SOI") for each local agency under its purview. When a local agency proposes to update its SOI, LAFCo examines the agency's service plans, its financial capacity to provide services, and its overall governance by performing a Municipal Service Review ("MSR"). The MSR is also used to update information regarding DUCs within the jurisdiction of the LAFCo.

Please call Fresno LAFCo at (559) 600-0604 or email guc@fresnocountyca.gov if you wish to obtain or share additional information concerning DUCs.

Figure 1 - Disadvantaged Unincorporated Communities Database



Document Path: G:\LAFCO WORKING FILES\GIS Layers and Maps\00-LAFCo Maps\DUC Information\LAFCO_2020_DUC_Database_02122020.mxd

TABLE OF CONTENTS

1. Legislative and Policy Background 5
2. DUC Database 6
3. DUC Census Data: a moving target 7
4. Methodology 8
5. DUC Database Update 10
Appendix A – 2015 DUC Database Development Guidelines 25

1. Legislative and Policy Background

According to the legislative findings in Senate Bill 244, Wolk ("SB 244") hundreds of disadvantaged unincorporated communities ("DUCs") exist in California, and more than 200 of these communities exist within the San Joaquin Valley. Additionally, the Legislature found that DUCs lack access to basic infrastructure, including, but not limited to streets, sidewalks, storm drainage, clean drinking water, and adequate sewer service.

Under SB 244, the Legislature found that cities, counties, special districts, and LAFCos need to invest in these communities and begin to address the complex legal, financial, and political barriers that contribute to regional inequity and infrastructure deficits within DUCs. Water Code section 79505.5(a) defines a "disadvantaged community" as a community with an annual median household income ("MHI") that is less than 80 percent of the statewide annual median household income.

In addition, Government Code section 56033.5 defines a "*DUC*" as an inhabited territory (meaning territory within which there reside 12 or more registered voters), or as determined by LAFCo policy, that constitutes all or a portion of a "disadvantaged community" as defined by section 79505.5 of the Water Code.

Under SB 244, effective January 1, 2012, LAFCos are required to identify DUCs as part of the following procedures:

- Municipal Service Review determinations;
- Sphere of Influence determinations; and
- Proposed annexations (greater than 10 acres) to cities.

On January 9, 2013, the Commission exercised its authority under Government Code section 56375(g) to refine the definition of a DUC by adding the following characteristics:

- Have at least 15 dwelling units; and
- A density not less than one unit per acre.

The reader is advised that LAFCo's DUC database relies on U.S. Census data to approximate the statewide and DUC median household income. LAFCo consulted with County of Fresno Clerk/Registrar of Voters Department to determine whether each potential DUC location consists more than 12 register voters.[1] It is Commission policy that SB 244 is intended to ensure that cities, special districts, and LAFCos do not *purposefully* proscribe a DUC from future annexations and that DUCs are included in the scope of municipal service review and sphere of influence updates.

The 2020 Disadvantaged Unincorporated Communities Database updates and supersedes any and all previous DUC analyses performed by Fresno LAFCo.

[1] Number of register voters within DUC locations, as of December 14, 2019.

2. DUC Database

LAFCo's DUC policy determined that there may be a deficiency in Census data to accurately assess median household income levels in unincorporated communities. As a result, this database considers various sources of information in order to identify potential DUCs during the MSR update process, SOI update process, or when annexations greater than 10 acres are proposed to a city.

The foundation for the DUC database is the U.S. Census Bureau's American Community Survey ("ACS") five-year reports which provide Census Tract, Block Group, and/or Census Designated Place ("CDP") information to obtain population estimates, economic composition, and demographic data. The Census Tract and Block Group are geographical units used by the U.S. Census Bureau to sample data from a fraction of all households within the designated geographic unit.

From 2012 to current date, LAFCo staff has employed two different ACS datasets to identify potential DUC locations during the preparation of routine MSR and SOI updates.[2] In an effort to provide a centralized index that characterizes each potential DUC, LAFCo has obtained the most recent ACS five-year estimates for years 2012 through 2016 in order to update the DUCs' median household income estimates.

In addition, other data resources consulted include:

- California Department of Water Resources ("DWR") Disadvantaged Communities mapping tool,[3]
- County of Fresno parcel information,
- Fresno LAFCo's Municipal Service Reviews (2012 – present),
- Site investigations; and,
- Information sources including materials supplied by government agencies and other interested parties.

[2] ACS five-year estimates for years 2006 to 2010 and ACS five-year estimates for years 2011 to 2014.
[3] Disadvantaged Communities as defined per Public Resource Code §75005(g).

3. DUC Census Data: a moving target

The basis for a community's "disadvantage" is a comparison of its MHI with the Statewide MHI. A change of any of these MHI datasets over time could alter a given community's disadvantaged status. For example, the following bullet points summarize the change of disadvantaged MHI threshold levels compared to the Statewide MHI levels for the given 10-year period between 2006 through 2016:

- **U.S. Census Bureau, 2012-2016 American Community Survey**
  - California's statewide MHI was $63,783.
  - The threshold for a DUC is an MHI less than $51,026.

- **U.S. Census Bureau, 2010-2014 American Community Survey**
  - California's statewide MHI was $61,489.
  - The threshold for a DUC is an MHI less than $49,191.

- **U.S. Census Bureau, 2006-2010 American Community Survey**
  - California's statewide MHI was $60,883.
  - The threshold for a DUC is an MHI less than $48,706.

Given the fluidity of the datasets, the DUC database "casts a broad net" and uses the 2012 to 2016 ACS datasets to inventory potential DUC locations in Fresno County. The DUC database should therefore be considered as a point of beginning for subsequent actions by LAFCo and other public agencies, rather than a conclusive determination. LAFCo staff will continue to monitor the DUC database and recommend updates to the Commission on an as-needed basis.

4. Methodology

The data analysis methodology for this DUC database update follows the 2015 DUC mapping methodology is described in Appendix A.

The DUC mapping data consists of information gathered and automated in a GIS-compatible format, which provided flexibility in spatial and data analysis, data management, maintenance activities, and facilitated sharing information with local agencies and the public. The process below is involved in the characterization and mapping of the DUCs. These steps are summarized as follows:

1. LAFCo staff examines U.S. Census American Community Survey (ACS) five-year reports for the State to determine the statewide average MHI.

2. Based on the statewide average MHI, LAFCo examines Census Block Group data for locations in Fresno County that are unincorporated (those that are not within a city's limits) that meet the DUC MHI threshold as defined by Water Code section 79505.5(a). Pursuant to LAFCo policy this MHI data may be augmented by other information sources.

3. The Census units that may present a DUC MHI threshold are then evaluated in light of the following DUC Policy indicators:
    a. The number of dwelling are estimated by aerial photographs and/or site visits of at least 15 dwelling units;
    b. Dwelling units per acre are estimated to select in favor of areas presenting a density not less than one unit per acre; and
    c. Registered voter data from the County Elections Department to select in favor of inhabited areas.

4. Based on aerial photography and parcel patterns that meet steps 2 and 3(a)(b), LAFCo staff used GIS to create polygons that delineate potential DUC locations. An acreage estimate is calculated for the entire delineated DUC polygon. The total acreage and the estimated a number of dwelling units are used to calculate the DUC density. The potential DUC boundaries generally follow parcel lines; however, in certain conditions a DUC's boundaries are drawn to follow the visible concentration of dwelling units which may differ from parcel lines.

5. LAFCo staff assesses community conditions and summarizes each potential DUC location. DUCs are characterized by the nearest street intersection, community name, estimated number of residential parcels, estimated dwelling units, and their location relative to a known Census Tract or Block Group number. Most important, the service providers for water, sewer, and fire protection are listed for each DUC. The listed Census units (Tract and Block Group numbers) assist to monitor and obtain additional data for future proposals or research.

6. To determine the DUC's inhabited status, LAFCo staff consulted with the Fresno County Elections Department to request a register voter count for each of the potential DUC locations. LAFCo staff note that the number of register voters may fluctuate throughout any given period and the inhabited status for a potential DUC can be more accurately assessed and determined at the time an application or proposal is submitted to LAFCo.

Mapping DUC locations is a complex process because the delineation of the DUC boundaries may differ from the conventional local agency boundaries, statewide to local MHI ratios may change over a given timeframe that can result in a change to a community's disadvantaged status, and/or the number of register voters can fluctuate during election years.

Nevertheless, the objective of the DUC Mapping Program is to develop a uniform hierarchical catalog of all the locations that satisfied or may have the potential to meet Fresno LAFCo's DUC definition. This DUC database is envisioned to centralize, capture, maintain, and generate more information through LAFCo's MSR Program beneficial to the various local agencies and the public.

5. DUC Database Update

DUCs identified in the DUC database update are the results of staff efforts to identify these communities pursuant to LAFCo Policy.[4] It is staff's observation that additional DUCs may be identified as part of the Commission's ongoing SOI updates and MSR Program, and as new Census MHI datasets for California become available to the public.

Each identified DUC is described with the following characteristics:

- DUC database identification number
- Community name (based on nearest street intersection, historic cartographic place names, or subdivision tract name when available)
- U.S. Census geographic unit (tract and block group number)
- Estimated MHI level per ACS five-year reports for years 2012 through 2016
- Geographic location and
- Number of Register Voters
- Service providers (i.e. water, sewer, fire protection, or storm drainage)

As of December 2019, Fresno LAFCo estimates that there are 34 known DUC locations within the County of Fresno. Because DUCs are geographically smaller than the average size of a Census Designated Place ("CDP"), Census Tract, and block group boundaries, LAFCo notes that limited information is available to accurately identify a population figure within any given DUC location.

The American Community Survey five-year estimate reports indicate that California's statewide MHI was $63,783 between 2012 and 2016.[5] Therefore, the threshold for a potential DUC location is an MHI threshold less than $51,026. Any future application near or contiguous to a listed DUC will warrant additional analysis in compliance with State law and Fresno LAFCo's DUC Policy.

1. **Northwest Olive and Marty Avenues (Skaal Knolls Homes):** The DUC consists of approximately 29 parcels located within US Census Tract 38.07-Block Group 2. The ACS five-year estimate reports indicate that Census Tract 38.07-Block Group 2 had an MHI of $26,667 between 2012 and 2016. LAFCo estimates that there are 28 dwelling units, and the DUC area encompasses approximately 14 acres. Based on number of dwelling units per acreage, LAFCo estimates that there are two dwelling units per acre.
   - The DUC is located within the Fresno SOI at the northwest corner of Olive Avenue and Marty Avenue.
   - Register Voters: 48
   - <u>Service Providers:</u>
     Water and sewer: City of Fresno
     Fire protection: North Central Fire Protection District

[4] Fresno LAFCo, Commission Policies, Standards, and Procedures Manual, Section 106 - LAFCo Disadvantaged Communities Policy.
[5] American Community Survey five-year reports, 2012-2016.

Storm drainage: Fresno Metropolitan Flood Control District (system planned but not constructed)

2. **Southeast Olive and Valentine Avenues:** The DUC consists of approximately 34 parcels located within US Census Tract 38.07-Block Group 3. The US Census ACS five-year estimate reports indicate that Census Tract 38.07-Block Group 3 had an MHI of $35,179 between 2012 and 2016. This location was identified as a DUC in the 2015 City of Fresno MSR. LAFCo estimates that there are 37 dwelling units, and the DUC boundary encompasses approximately 27 acres. Based on number of dwelling units per acreage, LAFCo estimates the density to exceed one dwelling unit per acre.
   - The DUC is located within the Fresno SOI at the southeast corner of Olive Avenue and Valentine Avenue.
   - Register Voters: 64
   - <u>Service Providers</u>
     Water and sewer: City of Fresno
     Fire protection: North Central Fire Protection District
     Storm drainage: Fresno Metropolitan Flood Control District (system planned but not constructed)

3. **Southeast Clinton and Marty Avenues (Thomasville Estates):** The DUC consists of 28 parcels located within Census Tract 38.07-Block Group 1. The ACS five-year estimate reports indicate that Census Tract 38.07-Block Group 1 had an MHI of $25,849 between from 2012 to 2016. This location was identified as a DUC in the 2015 City of Fresno MSR. LAFCo estimates that there are 51 dwelling units, and the DUC area encompasses approximately 16 acres. Based on number of dwelling units per acreage, LAFCo estimates that there are three dwelling units per acre.
   - The DUC is located within the Fresno SOI at the southeast corner of Clinton Avenue and Marty Avenue. The consists of single-family residential units and a mobile home park.
   - Register Voters: 62
   - <u>Service Providers</u>
     Water and sewer: City of Fresno
     Fire protection: North Central Fire Protection District
     Storm drainage: Fresno Metropolitan Flood Control District

4. **Shields Avenue and Cedar Avenue:** This DUC encompasses the eastside of the "Mayfair" community. The DUC consists of approximately 1,030 parcels located within a DUC area that encompasses 533 acres. Portions of the DUC are located within Census Tract 32.01-Block Group 1, Tract 32.01-Block 2, Tract 32.02-Block Group 2, and Tract 52.02-Block Group 1. The ACS five-year estimate reports indicate that Census Tract 32.01-Block Group 1 had an MHI of $41,618; Tract 32.01-Block 2 had an MHI of $33,713; Tract 32.02-Block Group 1 had an MHI of $24,155; and Tract 52.02-Block Group 1 had an MHI of $29,545 between 2012 and 2016. LAFCo estimates that there are approximate 965 dwelling units in an area that encompasses

approximately 498 acres. LAFCo estimates that the density is approximately two dwelling units per acre within this DUC.

- The DUC is enclosed by Shields Avenue to the north, Winery Avenue to the east, Clinton Avenue to the south, and extends across SR 168 over to Cedar Avenue in the west. The DUC also includes an area south of Cambridge Avenue, west of Maple Avenue, north of University Avenue, and east of SR 168.
- Register Voters: 1,881
- Service Providers
  Water and sewer: City of Fresno
  Fire protection: Fresno County Fire Protection District
  Storm drainage: Fresno Metropolitan Flood Control District

5. **East McKinley and North First Avenue:** This DUC encompasses the westside of the "Mayfair" community. The DUC area encompasses 490 acres and it consists of approximately 1,235 unincorporated parcels. Portions of the DUC are located within Census Tract 32.02-Block Group 1, Census Tract 33.01-Block Group 1, Tract 33.02–Block Groups 1, 2, 3 and 4. The ACS five-year estimate reports indicate that Census Tract 32.02-Block Group 1 had and MHI of $24,155; Census Tract 33.01-Block Group 1 had an MHI of $29,531; Tract 33.02-Block 1 had an MHI of $21,034; Tract 33.02-Block Group 2 had an MHI of $45,231; Tract 33.02-Block Group 3 had an MHI of $32,969; and Tract 33.02-Block Group 4 had an MHI of $48,161 between 2012 and 2016. LAFCo estimates there are approximately 1,200 dwelling units within an area that encompasses 490 acres. LAFCo estimates that the density is approximately three dwelling units per acre within this DUC.
   - The DUC is enclosed by the Fresno city limits. The DUC is bounded by Princeton Avenue to the north, Cedar Avenue to the east, McKinley Avenue to the south, and First Avenue to the west.
   - Register Voters: 2,130
   - Service Providers
     Water and sewer: City of Fresno
     Fire protection: Fresno County Fire Protection District
     Storm drainage: Fresno Metropolitan Flood Control District

6. **Ashlan and Maroa Avenue:** According the County assessor parcel page, this tract map is known as the "Forkner Giffen, Fig Garden Subdivision." The DUC consists of approximately 60 residential properties within a DUC area that encompasses 34 acres. The DUC is located within Census Tract 49.01-Block Group 1. The ACS five-year estimate reports indicate that Census Tract 49.01-Block Group 1 had an MHI of $28,816 between 2012 and 2016. LAFCo estimates that the density is approximately two dwelling units per acre within this DUC.
   - The DUC is located at the southwest corner of Ashlan Avenue and Maroa Avenue.
   - Register Voters: 106
   - Service Providers
     Water and sewer: City of Fresno
     Fire protection: North Central Fire Protection District

Storm drainage: Fresno Metropolitan Flood Control District

7. **Northeast Jensen and Valentine (Berans No. 2):** The DUC is also known as "West Park" and it consists of approximately 110 properties located within Census Tract 19.00-Block Group 2. The ACS five-year estimate reports indicate that Census Tract 19.00-Block Group 2 had an MHI of $41,923 between 2012 and 2016. LAFCo estimates that there are 129 dwelling units located in an area that encompasses approximately 80 acres. There are at least two dwelling units per acre within this DUC.
   - The DUC is located outside the Fresno SOI at the northeast corner of Jensen Avenue and Valentine Avenue.
   - Register Voters: 163
   - Service Providers
     Water: County Service Area No.39 B
     Sewer: Private septic tanks
     Fire protection: North Central Fire Protection District
     Storm drainage: in the Fresno Metropolitan Flood Control District but no planned facilities

8. **East Dinuba and Leonard Avenues (Khan Tract):** This DUC consists of approximately 120 parcels, also identified within Census Tract 70.03-Block Group 1. The ACS five-year estimate reports indicate that Census Tract 70.03-Block Group 1 had an MHI of $43,583 between 2012 and 2016. The DUC encompasses approximately 56 acres, and LAFCo estimates that there are approximately 131 dwelling units within this DUC. LAFCo estimates that the density is approximately two dwelling units per acre within this DUC.
   - The DUC is located within Selma's SOI south of East Dinuba Avenue and east of Leonard Avenue.
   - Register Voters: 178
   - Service Providers
     Water: Private well
     Sewer: Selma-Kingsburg-Fowler County Sanitation District (via "out-of-District boundary customers")
     Fire protection: Fresno County Fire Protection District
     Storm drainage: No service provider

9. **Northeast Cherry and Central (Atkins Tract):** This DUC is also known as "Daleville" and it consists of 42 properties located within Census Tract 18.00-Block Group 1. The ACS five-year estimate reports indicated that Census Tract 18.00-Block Group 1 had an MHI of $38,973 between 2012 and 2016. The DUC is located within the Fresno SOI at the northeast corner of Cherry Avenue and Central Avenue. LAFCo estimates that there are 42 dwelling units located in an area that encompasses approximately 26 acres. There are at least two dwelling units per acre within this DUC.
   - Register Voters: 68
   - Service Providers
     Water: City of Fresno

Sewer: Private septic tanks
Fire protection: Fresno County Fire Protection District
Storm drainage: Fresno Metropolitan Flood Control District

10. **Southeast Britten and Cherry (Central CA Colony):** This DUC is also known as "Britten" and it consists of approximately 22 properties located within Census Tract 18.00-Block Group 1. The ACS five-year estimate reports indicated that Census Tract 18.00-Block Group 1 had an MHI of $38,973 between 2012 and 2016. LAFCo estimates that there are 25 dwelling units located in an area that encompasses approximately 21 acres. There are at least two dwelling units per acre within this DUC.
    - The DUC is located outside the Fresno SOI at the southeast corner of Britten Avenue and Cherry Avenue.
    - Register Voters: 48
    - <u>Service Provider</u>
      Water and sewer: Private
      Fire protection: Fresno County Fire Protection District
      Storm drainage: in the Fresno Metropolitan Flood Control District but no planned facilities

11. **Tranquillity:** the unincorporated community of Tranquillity is a CDP located within Census Tract 82.00-Block Group 2. The five-year ACS estimates indicate that Census Tract 82.00-Block Group 2 had a MHI of $31,250 between years 2012 through 2016. For that same period, Census Tract 82.00-block group 2 showed an estimated population of 736 residents and 216 households. The DUC boundary encompasses approximately 181 acres. Based on dwelling unit estimates, there is at least one dwelling unit per acre within this DUC.
    - Tranquillity is located 10 miles southeast of the City of Mendota near the junction of South James Road and Colorado Road.
    - Register Voters: 229
    - <u>Service Providers</u>
      Tranquillity Public Utility District provides street lighting, storm drainage, sewer collection and treatment, and parks services.
      Water: Tranquillity Irrigation District
      Fire protection: Fresno County Fire Protection District

12. **Monmouth:** The community of Monmouth contains agricultural land uses, agriculture warehousing, and approximately 36 rural residential parcels. This DUC is located with Census Tract 73.00-Block Group 1. According to the ACS five-year estimates, Census Tract 73.00-Block Group 1 had a MHI of $34,313 between years 2012 through 2016. The DUC boundary encompasses approximately 21 acres. Based on dwelling unit estimates, this DUC presents at least two dwelling units per acre.
    - Monmouth is located at the northwest corner of South Chestnut and East Nebraska Avenue.
    - Register Voters: 38
    - <u>Service Providers</u>

Water and sewer: Private
Fire protection: Fresno County Fire Protection District
Storm drainage: No service provider

13. **Southwest Jefferson and Chestnut Avenues (Washington Irrigated Colony):** This DUC is also known as "Shady Lakes Mobile Home Park" and it is located on one parcel. This DUC consists of a 62 mobile homes and five detached single family homes located within Census Tract 17.00-Block Group 1. The ACS five-year estimate reports indicate that Census Tract 17.00-Block Group 1 had an MHI of $37,257 between 2012 and 2016. The DUC boundary encompasses approximately 12 acres, of a 27-acre sized county parcel.

    According to California Rural Legal Assistance (CRLA), the mobile home park consists of multiple parcels that are served by a private wastewater system. The wastewater system in Shady Lakes Mobile Home Park is privately-owned active sludge treatment system that discharges effluent into two disposal ponds and a pastureland south of the park. Within the Park, stormwater management consists of a drainage gutter system that diverts stormwater into a basin west of the park that is managed by Fresno Irrigation District.

    Based on dwelling unit estimates, there is at least four dwelling unit per acre within this DUC.

    - The DUC is located outside but within a mile of the Fresno SOI. The DUC is located along Chestnut Avenue, between Jefferson Avenue and Lincoln Avenue.
    - Register Voters: 43
    - <u>Service Providers</u>
      Water: Shady Lakes Mobile Home Park Water System
      Sewer: Private Wastewater System
      Fire protection: Fresno County Fire Protection District
      Storm drainage: Private drainage gutter system

14. **Southeast Central and Maple Avenues:** This DUC is also known as "Flamingo Mobile Home Lodge." The DUC consists of one large property which hosts 75-lot mobile home park located within Census Tract 15.00-Block Group 1. The ACS five-year estimate reports indicate that Census Tract 15.00-Block Group 1 had an MHI of $29,167 between 2012 and 2016. The DUC boundary encompasses approximately 35 acres. Based on dwelling unit estimates, there is at least two dwelling units per acre within this DUC.

    - The DUC is located outside the Fresno SOI at the southeast corner of Central Avenue and Maple Avenue.
    - Register Voters: 69
    - <u>Service Providers</u>
      Water and sewer: Malaga County Water District
      Fire protection: Fresno County Fire Protection District
      Storm drainage: in the Fresno Metropolitan Flood Control District

15. **Malaga:** The community of Malaga is a CDP located within Census Tract 15.00-Block Group 2. The DUC consists of approximately 220 properties. The ACS five-year estimate indicated that Census Tract 15.00-Block Group 2 had an MHI of $41,656 between 2012 and 2016. The DUC boundary encompasses approximately 95 acres, and LAFCo estimates there are approximately 241 dwelling units within this DUC. Based on dwelling unit estimates, there is at least two dwelling units per acre within this DUC.
    - The community of Malaga is located at the southeast corner of the Muscat Avenue and Chestnut Avenue.
    - Register Voters: 495
    - <u>Service Providers</u>
      Potable water, sewer, and solid waste: Malaga County Water District
      Public street lights and landscaping services: County Service Area No. 33
      Fire protection: Fresno County Fire Protection District
      Storm drainage: Fresno Metropolitan Flood Control District

16. **Del Rey:** the community of Del Rey is a CDP located within Census Tract 69.00-Block Group 1. The community of Del Rey has a population of 1,457 people, and a housing stock of 379 units. The ACS five-year estimate reports indicate that Census Tract 69.00-Block Group 1 reported an average MHI of $25,809 for years 2012 through 2016.
    - Del Rey is located near the South Del Rey Avenue at East Jefferson Avenue intersection.
    - Register Voters: 384
    - <u>Service Providers</u>
      Del Rey Community Service District provides potable water, sewer, storm drainage, and solid waste services.
      Fire protection: Fresno County Fire Protection District

17. **Calwa:** The community of Calwa is a CDP that consists of approximately 385 properties located within Census Tract 12.01- Block Group 1, Tract 12.01-Block Group 2, and Tract 12.01-Block Group 4. The ACS five-year estimate reports show Census Tract 12.01-Block Group 1 had an MHI of $26,406; Tract 12.01-Block Group 2 had an MHI of $21,324; and Tract 12.01-Block Group 4 had and MHI of $48,162 between 2012 and 2016. LAFCo estimates that there are approximate 385 dwelling units in an area that encompasses approximately 179 acres. LAFCo estimates that the density is approximately two dwelling units per acre within this DUC.
    - The community of Calwa is located within the Fresno SOI near the southeast corner of Church Avenue and Orange Avenue.
    - Register Voters: 520
    - <u>Service Providers</u>
      Water and sewer: City of Fresno
      Fire protection: Fresno County Fire Protection District
      Storm drainage: Fresno Metropolitan Flood Control District

18. **North Church and East Orange (Villa View Tract):** The DUC is located north of Calwa and it consists of 22 properties located within Census Tract 12.01- Block Group 1. The ACS five-year estimate reports indicated that Census Tract 12.01-Block Group 1 had an MHI of $26,406 between 2012 and 2016. LAFCo estimates that there are approximate 23 dwelling units in an area that encompasses approximately 10 acres. LAFCo estimates that the density is approximately two dwelling units per acre within this DUC.
    - The DUC is located within the Fresno SOI, east of Orange Avenue and north of Belgravia Avenue. The nearest major intersection to the DUC is Church Avenue at Orange Avenue.
    - Register Voters: 23
    - Service Providers
      Water and sewer: City of Fresno
      Fire protection: Fresno County Fire Protection District
      Storm drainage: Fresno Metropolitan Flood Control District

19. **East Kings Canyon and South Minnewawa (Sunnyside part 1):** The DUC is also known as the "Sunnyside" community that consists of several neighborhood. This narrative provides a two-part summary for an area that consists of approximately 900 parcels that encompass approximately 660-acres. LAFCo identified this DUC in its 2015 City of Fresno Municipal Service Review. Currently, LAFCo estimates that this DUC area has a density of at least one dwelling unit per acre.

    The southeast section of the DUC consists of approximately 260 parcels that lie within Census Tract 30.03-Block Group 1 and Tract 30.03-Block Group 2. The ACS five-year estimate reports show Census Tract 30.03-Block Group 1 (west of Minnewawa and north of Kings Canyon) had an MHI of $19,478, while Tract 30.03-Block Group 2 (east of Minnewawa and north of Kings Canyon) had an MHI of $27,540 between 2012 and 2016.
    - This DUC is located north of Kings Canyon Avenue and along both sides of Minnewawa Avenue.
    - Register Voters: 1,714
    - Service Providers:
      Water and sewer: City of Fresno
      Fire protection: Fresno County Fire Protection District
      Storm drainage: Fresno Metropolitan Flood Control District

    South of Olive Avenue and east of Peach Avenue (Sunnyside part 2): This DUC section of the Sunnyside community consists of approximately 639 properties located within four Census Tracts. Portions of the DUC are located within Census Tract 29.03-Block Group 2, Census Tract 29.04-Block Group 1, Tract 29.04-Block 2, Tract 29.05-Block Group 2, and Tract 30.01-Block Group 2.

    The ACS five-year estimate reports indicate that Census Tract 29.03-Block Group 2 had an MHI of $20,737; Census Tract 29.04-Block Group 1 had an MHI of $34,000; Tract 29.04-Block

2 had an MHI of $46,618; Tract 29.05-Block Group 2 had an MHI of $27,396; and Tract 30.01-Block Group 2 had an MHI of $36,094 between 2012 and 2016.

- The DUC is bounded by Olive Avenue to the north, Minnewawa Avenue to the east, Belmont Avenue to the south, and Peach Avenue to the west. The area also includes areas south of Belmont Avenue, west of Bush Avenue, north of McKenzie Avenue, and east of Winery Avenue. A minor portion of the DUC is located north of SR 180, west of Helm Avenue, south of Tyler Avenue, and east of Willow Avenue.
- Service Providers
  Water and sewer: City of Fresno
  Fire protection: Fresno County Fire Protection District
  Storm drainage: Fresno Metropolitan Flood Control District

20. Biola: The community of Biola is a Census Designated Place ("CDP") located at the southeast intersection of Shaw Avenue and Howard Avenue. Biola is located within Census Tract 41.00-Block Group 2. The ACS five-year estimate reports indicate that Census Tract 41.00-block group 2 had an MHI of $33,393 between from 2012 to 2016. LAFCo estimates that there are 324 parcels within Biola and approximately 324 dwelling units. The DUC boundary encompasses approximately 157 acres. Based on number of dwelling units per acreage, LAFCo estimates that there are 2 dwelling units per acre.

- Biola is located near the Southeast corner of Shaw and Howard Avenues. The area is enclosed by West Shaw Avenue to the north, Seventh Avenue to the east, Ashlan Avenue to the South and Howard Avenue to the west.
- Register Voters: 415
- Service Providers
  Biola Community Service District provides the community potable water, sewer, storm drainage, solid waste, and street lighting services. County Service Area No. 35, only maintains a subdivision section within Biola.
  Fire protection: North Central Fire Protection District

21. Caruthers: The community of Caruthers is a CDP located in Census Tract 75.00-Block Group 5. According to the ACS five-year estimates, Caruthers has a population of 3,128 people and a housing stock of 812 units. During the ACS five-year estimates 2012 through 2016, Census Tract-75.00-Block Group 5 reported an MHI of $51,023.

- Caruthers is located southeast of the intersection of West Mountain View Avenue in Fresno County.
- Register Voters: 502
- Service Providers
  Caruthers Community Service District provides potable water, sewer, street lights, and storm drainage services.
  Fire protection: Fresno County Fire Protection District

22. Raisin City: Raisin City is a CDP located within Census Tract-76.00 Block Group 3. The ACS five-year estimates indicate that Census Tract-76.00 block group 3 had a MHI of $32,556

between years 2012 through 2016. The community of Raisin City has an estimated population of 234 people and a housing stock of 80 units.

- Raisin City located south of West Manning Avenue and along South Henderson Road in Fresno County.
- Register Voters: 76
- Service Providers
  County Service Area 43 provides potable water and street lighting services
  Fire protection: Fresno County Fire Protection District
  Storm drainage: no service provider

23. **Perrin Colony:** This DUC consists of approximately 50 parcels each containing either a mobile home or single-family unit, or a combination single-family unit and a mobile home. Perrin Colony is situated within Census Tract-76.00-Block Group 1. The ACS five-year estimates indicate that Census Tract-76.00-Block Group 1 had a MHI of $42,278 between years 2012 through 2016. Perrin Colony is located outside the jurisdictional boundaries of County Service Area 43.
    - Perrin Colony is situated north of Raisin City near the intersection of South Hayes Avenue and West Parlier Avenue
    - Register Voters: 32
    - Service Providers
      Water and sewer: Private
      Fire protection: Fresno County Fire Protection District
      Storm drainage: no service provider

24. **East Dinuba and South Shaft:** The DUC consists of approximately 65 dwelling units located within an area that encompasses approximately 49 acres. This DUC is identified within US Census Tract 70.03-Block Group 1. The ACS five-year estimate reports indicate that Census Tract 70.03-Block Group 1 had a MHI of $43,583 between years 2012 through 2016. LAFCo estimates that the density is approximately one dwelling unit per acre within this DUC.
    - The DUC is located within the Selma SOI north of East Dinuba Avenue at the intersection with South Shaft Avenue.
    - Register Voters: 82
    - Service Providers
      Water: Private well
      Sewer: Selma-Kingsburg-Fowler County Sanitation District (via "out-of-District boundary customers")
      Fire protection: Fresno County Fire Protection District
      Storm drainage:

25. **Carrillo Tract:** The DUC consists of approximately 26 properties amounting to a total area of 28 acres. This DUC is located within Census Tract-76.00-Block Group 4. The ACS five-year estimate indicate that Census Tract-76.00-Block Group 4 had a MHI of $31,324 between years 2012 through 2016.

- The Carrillo Tract is situated east of State Route 41 and south of Manning Avenue at the southeast corner of East Springfield Avenue and South Cherry Avenue.
- Register Voters: 30
- Service Providers
  Water: Private well
  Sewer: Private septic tanks
  Fire protection: Fresno County Fire Protection District
  Storm drainage:

26. **East Manning and McCall Avenues (Tract No. 1199):** The DUC consists of approximately 16 parcels located within Census Tract 70.03-Block Group 1. The ACS five-year estimate reports indicate that Census Tract 70.03-Block Group 1 had a MHI of $43,583 between years 2012 through 2016. LAFCo estimates that there are 17 dwelling units located within an area that encompasses approximately eight acres. LAFCo estimates that the density is approximately two dwelling units per acre within this DUC.
    - The DUC is located within the Selma SOI, south of East Manning Avenue and west of McCall Avenue.
    - Register Voters: 23
    - Service Providers
      Water: Private well
      Sewer: Private septic tanks
      Fire protection: Fresno County Fire Protection District
      Storm drainage:

27. **McCall and Blaine Avenues (Dukes Villa Addition):** The DUC consists of approximately 20 parcels located within the Census Tract 71.00-Block Group 3. The ACS five-year estimate reports indicate that Census Tract 71.00-Block Group 3 had an MHI of $43,583 between years 2012 through 2016. LAFCo estimates that there are 24 dwelling units located within an area that encompasses approximately 15 acres. LAFCo estimates that the density is approximately two dwelling units per acre within this DUC.
    - The DUC is located within the Selma SOI near the city limits, at the intersection of McCall Avenue and Blaine Avenue.
    - Register Voters: 23
    - Service Providers
      Water: Private well
      Sewer: Selma-Kingsburg-Fowler County Sanitation District (via "out-of-District boundary customers")
      Fire protection: Fresno County Fire Protection District
      Storm drainage:

28. **Newmark and East Annadale Avenues:** The DUC consists of approximately 44 residential unincorporated parcels within an area the encompasses 30 acres. This DUC is situated within Census Tract 62.02-Block Group 1. Census Tract 62.02-Block Group 1 reported an MHI of

$48,125 during 2012 through 2016. LAFCo estimate that this DUC has a density of one unit per acre.

- The DUC is located within the Sanger's SOI, east of the Sanger city limits. The DUC is located east of Newmark Avenue and north of East Annadale Avenue. Roads within the DUC area includes East Buck Avenue, South Lewis Lane, and South Madsen Avenue.
- Register Voters: 75
- Service Providers
  Water: Private well
  Sewer: Private septic tanks
  Fire protection: Fresno County Fire Protection District
  Storm drainage:

29. Laton: The community of Laton is a CDP located within Census Tract 74.00-Block Group 3. The DUC consists of approximately 520 unincorporated parcels, located within an area that encompasses 196 acres. There are approximately 522 dwelling units within Laton. The ACS five-year estimate reports indicate that Census Tract 74.00-Block Group 3 had an MHI of $25,809 between years 2012 through 2016. LAFCo estimates that the density is approximately two dwelling units per acre within this DUC.

- Laton is located near the intersection of South Fowler Avenue and Murphy Avenue.
- Register Voters: 435
- Service Providers
  Laton Community Service District provides water, sewer, storm drainage, solid waste, fire protection, and street lighting.

30. Riverdale: The community of Riverdale is a CDP located within Census Tract 77.00-Block Group 1 and 3. However, the ACS five-year estimate reports indicate that only Census Tract 77.00-Block Group 1 (western side of Riverdale) reported an average MHI level that meets the DUC threshold. The ACS five-year estimate reports indicate that Tract 77.00-Block Group 1 had an MHI of $47,405 between years 2012 through 2016. LAFCo estimates that the density is approximately two dwelling units per acre within this DUC.

- Riverdale is located near the intersection of South Marks Avenue and Mount Whitney Avenue.
- Register Voters: 562
- Service Providers
  Water, sewer, storm drainage, solid waste, fire protection, and street lighting: Riverdale Public Utility District

31. South Academy and East Manning: The DUC consists of 16 unincorporated rural parcels consisting of approximately 21 to 24 dwelling units within an area that encompasses approximately of 20 acres. The DUC area is located within Census Tract 85.01-Block Group 1. Between 2012 through 2016, this area of concern reported an MHI of $22,431. The census block group is geographically larger than the specific DUC area; however, available data

shows that census tract 85.01-block group 1 reported an approximate population of 1,258 people which is much greater than the DUC area.

- The DUC is located west of South Academy Avenue and south East Manning Avenue, immediately south of Parlier's city limits and east of Parlier's Wastewater Treatment Plant.
- Register Voters: 13
- Service Providers
  Water: Private well
  Sewer: Private septic tanks
  Fire protection: Fresno County Fire Protection District
  Storm drainage:

32. **Cantua Creek:** Cantua Creek is a CDP located within Census Tract 82.00-Block Group 6. The five-year ACS estimates indicate that Census Tract 82.00-Block Group 6 had an MHI of $33,813 between years 2012 through 2016. LAFCO estimates that there are 73 parcels within this DUC, and the DUC encompasses approximately 25 acres. The density is approximately two dwelling units per acre within this DUC.
    - Cantua Creek is located at Clarkson Avenue west of San Mateo Avenue in Fresno County.
    - Register Voters: 67
    - Service Providers
      County Service Area No. 32 provides water via contract with Westlands Water District, street lighting, solid waste, and wastewater services.
      Fire protection: Fresno County Fire Protection District
      Storm drainage:

33. **Camden:** The community of Camden consist of one parcel that houses a 28-lot mobile home park. The DUC encompasses approximately 25 acres. This DUC is located within Census Tract 77.00-Block Group 1. The ACS five-year estimate reports indicate that Census Tract 77.00-block group 1 had an MHI of $47,405 between years 2012 through 2016. Within Camden, there is a mobile home park (28 units), a convenience store, and a gas station. LAFCo estimates that there is a minimum of one dwelling unit per acre within Camden.
    - Camden is located near the intersection of East Mount Whitney Avenue and State Route 41.
    - Register Voters: 18
    - Service Providers
      Water: Private well
      Sewer: Private septic tanks
      Fire protection: Fresno County Fire Protection District
      Storm drainage:

34. **O'Neill Farms:** O'Neill Farms consists of seven unincorporated parcels that house several multiple family complexes. For the purpose of mapping this community, LAFCo's DUC boundary encompasses 37 acres and it only includes the residential clusters. LAFCo estimates

that there are approximately 42 dwelling units within this DUC area. O'Neill Farms lies within Fresno County's Census Tract 78.02 Block Group 1. The ACS five-year estimate reports indicate that Census Tract 78.02-Block Group 1 had an MHI of $34,700 between years 2012 through 2016. The Westside Elementary School is located with this DUC. Based on dwelling units and DUC acreage, there is at least one dwelling unit per acre within this DUC.

- This DUC is located at the intersection of W. Excelsior Avenue and S. Lake Avenue.
- Register Voters: 12
- Service Providers
  Water: County Service Area No. 49
  Wastewater: Private septic tanks
  Fire protection: Fresno County Fire Protection District
  Storm drainage:

35. **El Porvenir:** This community is also known as "Three Rocks" and it consists of 55 unincorporated rural residential parcels. For the purpose of mapping this community, LAFCo focused on the dwelling units, and omitted four undeveloped parcels and the CSA's neighborhood park and wastewater treatment ponding areas. LAFCo estimates that this DUC encompasses 27 acres. El Porvenir lies within Fresno County's Census Tract 83.02 Block Group 3. The ACS five-year estimate reports indicate that Census Tract 83.02-Block Group 3 had an MHI of $31,538 between years 2012 through 2016. Based on dwelling units and DUC acreage, there is at least one dwelling unit per acre within this DUC.
    - This DUC is located at the intersection of South Derrick Avenue (SR33) and West Clarkson Avenue.
    - Register Voters: 50
    - Service Providers
      County Service Area No. 30 provides water via contract with Westlands Water District, street lighting, solid waste, wastewater services, and park & recreational services.
      Fire protection: Fresno County Fire Protection District
      Storm drainage:

36. **Lanare:** The community of Lanare is located in Census Tract 77.00-Block Group 4. According to the ACS five-year estimates, Lanare has a population of 297 people and a housing stock of 72 units. During the ACS five-year estimates 2012 through 2016, the community of Lanare reported an MHI of $54,404.

    In 2018, Leadership Counsel for Justice and Accountability (LCJA), a Fresno based local organization that works with DUCs, finalized an income level survey conducted within Lanare. The survey consisted of mail in and door-to-door surveys conducted in accordance with the California State Water Resources Control Board's 2014 Multiagency Guidelines for MHI Surveys. According to LCJA, there are 154 dwelling units in Lanare and between December 2017 through March 2018 the survey information showed that Lanare had an MHI of $30,000 during 2017.

LAFCO estimates that there are 113 parcels within this DUC, and the DUC encompasses approximately 123 acres. The density is approximately one dwelling unit per acre within this DUC.

- Lanare is located near the intersection of South Grantland Avenue and Mount Whitney Avenue.
- Register Voters: 124
- Service Providers
  Water: Lanare Community Service District
  Wastewater: Private septic tanks
  Fire Protection: Fresno County Fire Protection District
  Storm drainage:

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Appendix A – 2015 DUC Database Development Guidelines

Fresno LAFCo
DUC Database Development Guidelines

Introduction

These guidelines will be used to develop and maintain the database necessary to implement Fresno LAFCo policy 106-01, to conduct reasonable demographic surveys and studies. The database will be augmented by site investigation, and other materials supplied by government agencies and other interested parties (collectively, the "Information Sources").

1. DUCs in Fresno County are initially identified by reviewing US Census information including census tract, block group, or block data to obtain population estimates, economic composition, and demographic information. Census tracts occasionally include both incorporated and unincorporated territories which do not necessarily coincide with city or municipal local agency boundaries. Though a census tract may encompass a large geographic area, the sample data reported therein provides a reasonable assessment of the economic composition among residents within the tract. The smallest geographic units which the US Census collects and tabulates decennial census data are the census block groups and blocks. Census block groups are statistical divisions of a census tract. Census block groups are generally defined between 600-3,000 people. A block group consists of clusters of blocks within the same census tract that have the same first digit of their census block number. Data collected from census block groups and blocks are generally more detailed for areas within a census tract, if available. Most block groups identified by US Census data were delineated by local participants in the Census Bureau's Participant Statistical Areas Program.

2. The definition of a “disadvantaged community” (DAC) per GC §56033.5, WC §79505.5, and PRC §75005(g), is “a community with an annual Median Household Income (MHI) that is less than 80 percent of the statewide annual MHI.” For example, the 2010 statewide MHI in California reported by the US Census American Community Survey (ACS) 5-year report is $60,883; thus, a community with a household income less than 80% of the MHI ($48,706) would be a “disadvantaged community”.

3. The Department of Water Resources (DWR) provides DAC mapping software and downloadable shape file maps are available through the DWR website. DWR’s DAC mapping data is created using the ACS five-year period reports between years 2006-2010. The DWR maps identify DACs for different areas using census tracts or block group information. The shape file maps include pre calculated fields for census tracts and block groups that are identified as DAC (per PRC §75005 (g)) with a “Yes or No.”

4. Fresno LAFCo Policy 106 definition is more specific and includes two additional DUC indicators aside from the MHI margin:
    a. the DUC will be inhabited territory (12 or more registered voters); and
    b. consist of at least 15 dwelling units at a density not less than one unit per acre.

    In addition, LAFCo policy 106-05 established that a DUC up to 300 feet distant from a proposed annexation boundary “is sufficient to start the annexation proceedings for a DUC.” This policy also identified “Legacy Communities” which are DUCs within one mile of an existing or proposed sphere of influence.

5. The DAC mapping information available in geographic information systems (GIS) shape files will be employed to develop a "first cut" of maps to identify areas in the County that report a MHI less than 80 percent of the statewide annual MHI. The DAC GIS shape files will be layered with maps available on the County of Fresno's GIS database. Fresno County's shape file named "CY_FRESNO.CENSUS_BLKGRP" will be utilized to identify all census block groups in the County that meet the DAC threshold. The "CY_FRESNO_CITY_NAMES" shape file will be used to map incorporated and unincorporated community boundaries. The "CY_FRESNO.PARCEL_VW" GIS shape file will be employed to identify parcelization patterns that could be compared to aerial photography in identification process of a DUC, per Commission Policy 106.

6. The DAC maps present an initial assessment of the areas based on MHI data at the census tract and block group levels. Further review of land parcelization patterns and identification of DUCs will be focused near city limits and within Municipal Local Agencies with SOI boundaries.[1] The data is selected to only identify DUCs near cities and Municipal Local Agencies that provide services related to sewer, municipal or industrial water, or fire protection. As such, each eligible Municipal Local Agency boundary was surveyed to identify and determine DUC locations that meet the 15 dwelling units at a density not less than one unit per acre.

[1] Fresno LAFCo policy 107-04, "Municipal Local Agencies" include cities and special districts that provide municipal services.

From:	Ruby Marquez
To:	Clerk
Subject:	Central Trucking Project
Date:	Wednesday, August 13, 2025 8:13:17 AM
Attachments:	Comment Letter Hirschfield OC.docx.pdf

External Email: Use caution with links and attachments

Good morning,
Please see the attached letter from Superintendent Terry Hirschfield. Thank you.

--

Ruby Marquez
Administrative Assistant
Orange Center School District
3530 S. Cherry Avenue
Fresno, CA 93706
P: 559-237-0437
E: [redacted]

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Orange Center School District

3530 S. Cherry Ave • Fresno, California 93706 • (559)237-0437 • Fax (559)237-9380

Terry Hirschfield, Superintendent

August 11th, 2025

Fresno City Council
City Hall Council Chamber, 2nd Floor,
2600 Fresno Street, Fresno, CA 93721

Sent via email clerk@fresno.gov

Dear Fresno City Council,

My name is Terry Hirschfield, and I am the Superintendent/ Principal at Orange Center School District. I am writing to you to urge you to deny Annexation Application No.P21-05778, Pre-zone Application No. P21-05870, and Development Permit Application No. P23-00149 to protect the health, safety, and well-being of the students, teachers, and staff who attend and work at Orange Center Elementary, and of the residents who live on Cherry Ave, Daleville, and surrounding disadvantaged unincorporated communities. I oppose this project because I am concerned about the impacts to our air quality from the emissions of heavy-duty truck traffic, traffic safety concerns, especially for the families commuting to Orange Center School, and the longer-term implications of industrial development less than a mile away from an elementary school.

The proposed annexation, rezoning to heavy industrial, and development permit for Central Transport in South Central Fresno will exacerbate already poor environmental and health conditions in the community. Conditions in South Central Fresno are so critical that the community of South Central Fresno was selected as one of the first communities for the AB 617 Community Air Protection Program to develop a Community Emissions Reduction Program and the Community Air Monitoring Program. The community of South Central Fresno worked for at least a year to develop strategies to reduce emissions, including rerouting truck traffic from Cherry Ave. The community has also heavily engaged and pushed for the development and adoption of a South Central Specific Plan to provide safeguards to protect residents from further industrial development. At this point, the City should be working to address existing issues instead of considering more projects that will create a larger impact to residents.

In 2024, the City of Fresno conducted a Health Impact Assessment (HIA), which found that South Fresno residents were more likely to live closer to a major street, truck route, or freeway,

Orange Center School District

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Terry Hirschfield, Superintendent

and as a result, residents were more exposed to PM 2.5, ozone, and diesel particulate matter. The HIA found that South Central Fresno residents had a significantly higher risk of experiencing a pre-term birth and infant mortality. Emergency room visits or hospitalization due to asthma or cardiovascular issues were found to be more prevalent in South Central Fresno than in other areas of the City, specifically for residents living within 1000 feet of a highway or truck route. Residents in South and Southwest Fresno have a 20-year shorter life expectancy than residents in other areas of Fresno.

My experience working near industrial operations has impacted me directly, as I can hear trucks rumbling by my office daily and at times even feel vibrations from trucks as they drive on Cherry Avenue.

Again, I urge you to please deny Annexation Application No.P21-05778, Pre-zone Application No. P21-05870, and Development Permit Application No. P23-00149 to protect the community of South Central Fresno from continued industrial growth in our backyards.

Respectfully,

[redacted]

Terry Hirschfield
Orange Center School District
Superintendent/ Principal

From:	Emma De La Rosa
To:	Clerk; Jerry Dyer
Cc:	Moore, Brian@ARB; Olp, Kevin@ARB; Fletcher, Chanell@ARB; Reyes, Deldi@ARB; Robert Swanson; Ryan Hayashi; Seth Alston; Stephanie Ng
Subject:	Written Comments for ID 25-1026
Date:	Wednesday, August 13, 2025 8:28:58 AM
Attachments:	Central Transport CL 8.13.pdf

External Email: Use caution with links and attachments

Good morning Mayor Dyer and Fresno City Clerk,

Please accept the attachment as formal comment for ID 25-1026 of tomorrow's agenda. Please distribute copies to the Council. Thank you.

--

Respectfully,

Emma De La Rosa, MPP
Pronouns: She, Her, Hers, Ella
Land Use and Transportation Policy Manager
Leadership Counsel for Justice & Accountability
[redacted]
Bakersfield, CA 93301
Cell: [redacted]

Click here to register!

August 13, 2025

Sent Via Email To clerk@fresno.gov

Fresno City Council
City Hall Council Chamber, 2nd Floor,
2600 Fresno Street, Fresno, CA 93721

Dear Mayor Dyer and City Council Members:

Leadership Counsel for Justice and Accountability ("LCJA") submits this letter in opposition to the annexation application No. P21-005778, prezone application P21-05870, and development permit No. P23-00149 (collectively the "Project"). LCJA works alongside residents from South Central Fresno, the South Fresno Community Alliance, other disadvantaged unincorporated communities south of the City's borders, and disadvantaged communities within the City bearing the brunt of the City's land use decisions of siting industrial development near residential communities. The Project will result in detrimental air, traffic, and noise impacts to residents in the community who have seen their neighborhoods slowly be consumed in the City's industrial development as it extends south into the County.

As an initial matter, we join the thorough comments submitted by Shute, Mihaly & Weinberger on August 13, 2025 (the "SMW Letter"). We agree that the mitigated negative declaration for the Project is wholly inadequate and inconsistent with the minimum standards set forth by the California Environmental Quality Act. This comment letter also builds on our comment submitted on June 18th, 2023 in response to the City's Planning Commission hearing included below as Attachment A.

Additionally, we write separately to highlight non-compliance with California fair housing and anti-discrimination law, elevate policy and infrastructure recommendations from the South Central Fresno AB 617 Community Truck Reroute Study (Truck Reroute Study), and elevate resident concerns.

A. <u>Approval Would Reinforce and Perpetuate Patterns of Discrimination In Violation Of The Duty To Affirmatively Further Fair Housing.</u>

Cities in California have a mandatory duty to affirmatively further fair housing ("AFFH"). (Gov. Code, § 8899.50.) This duty requires cities to "do more than simply refrain

from housing discrimination." (*Martinez v. City of Clovis* (2023) 90 Cal.App.5th 193 at 220.) Rather, AFFH includes "a mandate to take the type of actions that undo historic patterns of segregation and other types of discrimination and afford access to opportunity that has long been denied." (*Id*. at 288 quoting 80 Fed. Reg. 42274 (July 16, 2015).) As established by Government Code Section 8899.50, AFFH includes a requirement to take "meaningful actions" that "overcome patterns of segregation." (Gov. Code §8899.50(a)(1).)

The Project, as proposed, would perpetuate systemic racism and the disenfranchisement of low-income communities of color, where residents are already suffering the consequences of decades of environmental injustice and inequitable development practices. As described in prior comments regarding the Project, the project vicinity is an area where air pollution and associated health impacts are among the worst in the state. (*See* SMW letter (August 13, 2025); LCJA Letter (June 17, 2025) (Attachment A).) The proximity of the proposed project to vulnerable populations further exacerbates the seriousness of these concerns. Sensitive receptors in the area residences, as well as students and staff at Orange Center Elementary School would bear the greatest burden of the project's negative impacts. As proposed, the project would not only intensify truck traffic that would worsen the environmental conditions in the area, but would plan for wider development of heavy industrial uses, locking in the City's planning on a path that would only continue these discriminatory harms indefinitely. For these reasons, without incorporating mitigation measures to reduce the severity of these impacts, the Project would violate the City's Fair Housing obligation by perpetuating harmful patterns of segregation.

B. <u>Approval Would Constitute An Unlawful Land Use Practice, Violating The Fair Employment And Housing Act ("FEHA").</u>

FEHA prohibits discrimination in housing and land use practices. (Gov. Code § 12900, *et seq.*) FEHA extends to all "public or private land use practices" including "actions authorized under the Planning and Zoning Law." (Gov. Code § 12955(l).) The actual scope of FEHA is detailed expansively in its implementing regulations. As implemented, FEHA prohibits "any public or private land use practice that:... (2) has a discriminatory effect on members of a protected class." (CCR tit. 2 § 12161(a).) Further, a practice is unlawful if it:

> "[r]esults in the location of toxic, polluting, and/or hazardous land uses in a manner that…adversely impacts, or renders infeasible the enjoyment of residence, land ownership, tenancy, or any other land use benefit related to residential use, or in connection with housing opportunities of existing or proposed dwellings." (CCR tit. 2, § 12161 subs. (b)(10).)

The City, as a public agency with land use authority over the project area, is subject to FEHA in its land use practices. A decision by the City to approve the proposed annexation, development, and zoning change would constitute a practice that would have an effect on existing residences in the project vicinity. First, the Project environmental review acknowledges the existence of residents in and around the project area and, as discussed in the SMW letter and our prior letter, there is additional housing in the area that was not acknowledged in the MND. Next, if approved, the Project would result in the siting of a development which, during its operation and construction, would cause the emission of diesel particulate matter and other harmful air pollutants. Further, the proposed pre-zoning demonstrates that similarly polluting or even more acutely toxic heavy industrial land uses would be permitted in the area in the future. Each of these polluting impacts would interfere with the quiet use and enjoyment of housing near the project.

Thus, approval of the Project would result in the location of polluting and otherwise hazardous land uses in a manner that would adversely impact the use and enjoyment of the area's residents. This would directly violate FEHA.

C. Approval Would Violate State Law Prohibiting the Re-zoning of Residential Land to Less Intensive Uses.

The Housing Crisis Act, (SB 330 (2019), "the HCA"), was intended by the legislature to address the statewide shortage of affordable housing. The Act applies to "affected cities," which comprise almost all cities in the state located within urban areas, including the city of Fresno and Fresno County.[1]

Under the HCA, affected cities and counties are prohibited from enacting a "development policy, standard, or condition" that would have the effect of "[c]hanging the general plan land use designation…or zoning of a parcel or parcels of property to a less intensive use or reducing the intensity of land use" within the existing general plan designation or zoning of land where housing is an allowable use. (Gov. Code § 66300, subd.(b)(1).) A "[d]evelopment policy, standard, or condition" is defined to include a "provision of, or amendment to, a general plan" or a "provision of, or amendment to, a zoning ordinance." (Gov. Code § 66300, subd.(a)(5)(A)-(C).) "Reducing the intensity of use" is defined as including "reductions to…density" as well as "any other action that would individually or cumulatively reduce the site's residential development capacity." (Gov. Code § 66300, subd.(b)(1).)

[1] Department of Housing and Community Development *Affected Cities - 2023 Update* p.2, https://www.hcd.ca.gov/sites/default/files/docs/planning-and-community/affected-cities.pdf (Under this classification the County is also "affected" for the purposes of the HCA.); Department of Housing and Community Development *Affected Counties - 2023 Update p. 1,* https://www.hcd.ca.gov/sites/default/files/docs/planning-and-community/affected-counties.pdf.

Here, the proposed Project would involve the annexation of 80 acres into the city limits. Also proposed is a pre-zoning for 50 acres of the 80 acre area, which would change the land's designated uses from the existing County "Limited Agricultural" zoning to "Heavy Industrial." If carried out, these actions would constitute either provisions of, or alternatively, amendments to the City's General Plan and Land Use Code. Currently, the Limited Agricultural land use applied by the County permits single-family dwellings. (Fresno County Zoning Ordinance § 817.1) Under the proposed Heavy Industrial land use, residential uses would not be permitted. (City of Fresno Municipal Code Table 15-1302: Land Use Regulations – Employment Districts.) Thus, the effect of the pre-zoning and annexation of the 50 acres would be to change the zoning of the encompassed parcels such that the intensity of residential uses would be reduced to zero. Thus, the Project would individually and cumulatively reduce the residential development capacity of the parcels in violation of the HCA.

D. Approval Would Constitute Disparate Impact Discrimination Under State and Federal Civil Rights Law

Under state law, no person may be "unlawfully denied full and equal access to the benefits of…any program or activity that is…funded directly by the state, or receives any financial assistance from the state" on the basis of any protected characteristic. (Gov. Code, § 11135(a).) The characteristics protected by law include "race," "color," and "national origin." (Gov. Code. § 11135(c).) A violation occurs when an entity which receives any state financial support carries out any activity that is discriminatory, regardless of whether the discriminatory activity is directly funded. (*Comm. for Immigrant Rights v. County of Sonoma* (2009) 644 F. Supp. 2d 1177,1207.) Further, as under Federal antidiscrimination law, even facially neutral acts can amount to prohibited discrimination under Section 11135 when they result in a disparate impact on a protected class. (*Darensburg v. Metro. Transp. Comm'n* (2009) 611 F. Supp. 2d 994, 1042, ["As under Title VI, a prima facie case of disparate impact discrimination under section 11135 requires a plaintiff to show: (1) the occurrence of certain outwardly neutral practices; and (2) a significantly adverse or disproportionate impact on minorities produced by the defendant's facially neutral acts or practices."].)

For the reasons stated above, the City's failure to plan in a manner consistent with the duty to AFFH, and its failure to comply with the requirements of FEHA, is also a violation of the prohibition against discrimination established by Section 11135 and Title VI of the Civil Rights Act. The enumerated shortcomings of the Project environmental review demonstrate that the City's activities related to planning for community development deny residents access to the full range of benefits contemplated by CEQA. For instance, shortcomings in outreach and public engagement, and failures to accurately and sufficiently describe the project setting, the project itself, and the environmental impacts of both the proposed facility and the industrial land uses

fail to achieve both the public process and informed decisionmaking functions of CEQA. Further, if approved the project would also demonstrate a decision by the City to plan for trucking, manufacturing, and other heavy industrial uses in close proximity to homes in schools in South Fresno. These failures would foreseeably result in harms disproportionately borne by residents of the Project vicinity, who are more predominantly Hispanic or Latino/a/e when compared to the City, County, and state on average.[2]

E. The City Must Consider Project Impacts to the Community And The Serious Concerns Of Nearby Residents.

As mentioned, the proposed Project site is located in a polluted and environmentally burdened disadvantaged unincorporated community. The site is directly next to residential properties to the north of the site and to the eastern side of Cherry Ave. Daleville, a disadvantaged unincorporated community, is also less than a mile south of the Project site. Families have had generations of students attend Orange Center Elementary and are long-time residents of South Central Fresno. Residents report a deterioration of their community where little by little, the City of Fresno has continued to permit industrial development abutting residential properties. Close proximity to industrial operations has quickly pushed residents out of the area, leading to scattered and solitary residential dwellings on Cherry Ave. Industrial development permitted by the City has impacted the community's ability to breathe, ability to travel safely throughout their neighborhood roads, and their ability to learn, work, and play.

Residents are seriously concerned about the traffic impacts that will result from the Project, including impacts on Cherry Ave. North Ave., and Central Ave. Reports from the community indicate heavy-duty truck congestion as trucks travel off State Route 41 and State Route 99, creating major traffic hazards. One resident reported driving next to heavy duty trucks on three sides, inhibiting their ability to see incoming traffic. Residents are also concerned about the safety of their families, as trucks and other vehicles speed through Cherry Ave. Project proponents claim traffic impacts will be addressed by only allowing truck egress and ingress points on the north side of Cherry to prevent truck traffic from passing by the school. However, there is no physical or operational requirement that would ensure this is the case, and Project proponents and City staff fail to consider the families living in the residential dwellings on the northern end of Cherry Ave.

The community is concerned mitigation will not realistically address the dangerous reality of truck traffic near a school and residences, due to the narrowness and the direction of

[2] For example, the populations of Project vicinity census tracts 6019001800 and 6019001500 are over 66 percent and over 75 percent Hispanic, respectively, compared to a census tract population average of approximately 49 percent citywide, 53 percent countywide, and 38 percent statewide. Data from: https://oehha.ca.gov/calenviroscreen/maps-data.

traffic as one-way on Cherry Ave. For example, if trucks are idling, or trucks are waiting to enter the facility, trucks exiting the facility may not have enough space to turn left towards North Ave. Widening Cherry Ave. also causes angst to residents as that would lead to trucks traveling much closer to residences and idling much closer to their front doors and windows. Idling is a regular issue for residents as they report truck idling causing traffic blind spots for drivers and pedestrians as they travel on the road and as they pull out from their driveways. Residents report idling occurring right in front of their homes increasing their exposure to emissions. Despite calling the authorities, residents report low to no enforcement on truck idling in their neighborhoods. Photos depicting examples of truck idling are shown under Attachment B.

Residents are also concerned about the impacts on their health. Residents report suffering from asthma and other respiratory illnesses and having at least one or more family members also suffering from respiratory issues.The lack of sidewalks on Cherry Ave. exacerbates the dusty conditions created by truck traffic as they veer off on Cherry Ave. picking up dust and other particulate matter breathed by residents. The City must consider how poor air quality caused by existing operations and exacerbated by the Project will impact residents living in substandard housing conditions along Cherry Ave. and Daleville. Residents, particularly those with swamp coolers or no air conditioning, will be forced to breathe contaminated air even in the comfort of their own home.

Students' education is also impacted as a result of poor air quality. An educator from Orange Center Elementary shared frustration with having to limit students' physical education to instruction indoors on days with a high air quality index. Noise from the existing truck traffic also contributes to students learning as the traffic causes a distraction from instruction. Teachers and staff have also reported having to pause their conversations or instruction until truck noise is reduced.

F. <u>The City Must Engage the Community of South Central Fresno and Adopt the Southcentral Fresno Specific Plan Before Continuing with Project Consideration.</u>

Even though City staff and developers have been planning for the Project for the last four to five years, engagement with residents has been minimal, vague, unclear, and not transparent. The proponents of the Project suggest their engagement has sufficed, however, residents disagree the few meetings and information provided is enough to ensure all affected residents will have the chance to learn about the project, share concerns, and express their position. Project meetings were mostly held virtually creating accessibility issues for residents who were unable to join online, or for residents who were unfamiliar with the zoom call option. Meetings were also poorly attended with no more than six residents attending the meetings held in February of 2021 and July 2021 in total. Moreover, noticing for the required meeting held in February of 2021 was only extended to property owners within 1000 ft from the project site. As a result, few residents

within the 1000 ft buffer actually received notice, while none of the families and staff from Orange Center Elementary were informed about the neighborhood meeting.

Project proponents met with the District 3 Project Review Committee (PRC) which was held in April 2021. During the PRC, committee members recommended denial of the project, raising concerns about the environmental impacts to the community and Orange Center Elementary, and directed further analysis of impacts be completed. Notably, the PRC also recommended the proponents to conduct more community engagement by noticing within 3,000 ft from the project instead of 1,000 ft. City staff and the Project proponents disregarded the PRC's noticing recommendation.

Precision Engineering hosted a meeting on August 7th, 2025 at Orange Center Elementary, one week before the scheduled City Council public hearing for the Project. At least 30 residents, staff, parents, and families from Orange Center Elementary attended the meeting to express their opposition to the Project. Regrettably, Precision Engineering provided vague and unclear answers to residents' questions and concerns. For instance, they were unable to share how many truck trips the Project would produce. They failed to provide Spanish translation for the community meeting and failed to send a map of the Project site with the notice. The information was inaccessible and technical, and the facilitators discouraged group discussions and questions throughout the meeting. Residents were very vocal about their concerns related to air quality, truck traffic, and safety for their children, however, Precision Engineering did not take note of any of the resident comments.

Community engagement and participation for the Project and the future of South Central Fresno process is vital to ensure impacts associated with harmful land uses are considered, mitigated and enforced. Residents from South Fresno continue to advocate for the development and adoption of the South Central Specific Plan (SCSP) to prioritize the health and safety of residents living near existing industrial operations, and prevent harm from the City's industrial and heavy industrial development in the future. The City has yet to continue the development of the SCSP since it was last discussed in November of 2024. The City must ensure the SCSP is developed alongside the community and adopted prior to the consideration and approval of any project, including Central Transport.

We urge the City Council to consider scheduling public hearings and any other meetings related to the project in the evening to facilitate community participation. This Council has historically requested hearings to be conducted in the evening for other City matters for the purpose of allowing community participation. We ask the City to do the same for the community of South Central.

G. The City Should Implement Measures from the Community Emissions Reduction Program.

We remind the City about its commitment to improve air quality and health outcomes in South Central via the implementation of the AB 617 Community Emission Reduction Program (CERP), which included a commitment to reduce emissions and pollution exposure from sensitive receptors such as Orange Center Elementary by implementing measure HD. 11: Heavy Duty Truck Rerouting. The City also commissioned the UC Merced Community and Labor Center to conduct a Health Impact Assessment (HIA) to inform strategies in the South Central Fresno AB 617 Community Truck Reroute Study (Truck Reroute Study). The HIA found compelling evidence regarding poor health outcomes including increased risk of pretermed births, infant mortality, and increased visits to the emergency department for asthma and cardiovascular issues.[3]

The Truck Reroute Study identified multiple "treatment" strategies for Cherry Avenue including: new crosswalks on North Ave.and Cherry Ave., and Central Ave. and Cherry Ave.; one mile in length of sidewalks on Cherry Ave. between North Ave. and Central Ave.; and traffic calming measures on Cherry Ave. between North and Central Ave. Traffic calming measures recommended to reduce truck speeds or divert trucks altogether includes roadway narrowing, speed bumps and roundabouts. Notably, the proposed truck reroute map removes Cherry Ave as a designated truck route.[4] Removing Cherry Ave. as a designated truck route is supported by the HIA which recommends allowing truck routes outside of a 1,000 foot buffer from areas where people live, work, and play.

Policy recommendations in the Truck Reroute Study and the HIA includes: transitioning to zero emission trucks, time-of-day restrictions, and enforcement. Requiring zero emission trucks for future industrial operations is vital to reducing health impacts caused by emissions. Time-of-day restrictions are recommended to limit pollution exposure and traffic impacts near sensitive receptors, such as Orange Center Elementary. Specifically, the Truck Reroute Study recommends amending the truck ordinance of the City's Municipal Code, Section 14-1303 to allow truck access only during non-school hours and ensure enforcement is achieved through patrolling and issuing of tickets for violations. Enforcement is particularly important to address truck egress and truck idling. Currently, residents report frequent truck idling on Cherry, North, and Central Ave exposing residents to emissions and the odor of oil and gas fumes from diesel trucks, and causing blind spots and blocking driveways. Lastly, truck focused signage on SR 41,

[3]Fresno Community Environmental Health Impact Assessment April 2024, University of California Merced. Pg.8.
[4]South Central Fresno AB 617 Community Truck Reroute Study | Truck Routing and Implementation Strategies Report April 2024. Figure 4: Proposed Truck Routes & Truck Regulated Areas.

SR 180, and SR 99 is recommended to inform truck drivers about existing truck routes, time-of-day restrictions, speed, and enforcement.

The HIA and the Truck Reroute Study were conducted to identify methods of reducing exposure to emissions for sensitive receptors and community residents in efforts to reduce the health impacts associated with exposure to significant air contaminants and pollution. Currently, the project's mitigated negative declaration does not include any of the recommendations identified in the HIA and the Truck Reroute Study. The City must ensure that strategies are implemented.

* * * * *

For the reasons stated above, approval of the Project as proposed would harm nearby communities and violate California law.

Sincerely,

Seth Alston
Staff Attorney
Leadership Counsel for Justice and Accountability

/s/
Panfilo Cerillo
South Central Resident

/s/
Patricia Garcia
South Central Resident

/s/
Sandra Arreola
South Central Resident

/s/
Jorge Arreola
South Central Resident

/s/
Rosa Maria Hernandez de Arreola
South Central Resident

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Attachment A

June 17th, 2025

Fresno City Planning Commission
City Hall Council Chamber, 2nd Floor,
2600 Fresno Street, Fresno, CA 93721

Sent via email PublicCommentsPlanning@fresno.gov

Dear Planning Commission,

Leadership Counsel for Justice and Accountability ("LCJA") submits this letter in opposition to the annexation application No. P21-005778, prezone application P21-05870, and development permit No. P23-00149, all three hereby referred to as "Project". LCJA works alongside residents from South Central Fresno and other disadvantaged communities throughout the City bearing the brunt of the City's land use decisions of siting industrial development near residential communities. Alongside residents of Southcentral, we have engaged extensively for more than five years in efforts to improve air quality, traffic concerns, and infrastructure development through the City's land use planning processes including the development of the Southcentral Fresno Specific Plan. Residents of Southcentral Fresno are also part of the AB 617 Community Steering Committee working to address heavy truck traffic in their neighborhoods by identifying truck routes away from sensitive receptors such as Orange Central Elementary and places of worship. We strongly oppose this Project as approval of the Project will lead to an exacerbation of air quality impacts, traffic congestion and emissions from heavy truck traffic, and further strain on public infrastructure. Furthermore, we are concerned the Project description and Impact Analysis violates CEQA due to inconsistencies in the mitigated negative declaration. We urge the Commission to deny or delay the Project until the Project has undergone a full environmental review.

1. **The Project Description and Impact Analysis Violate CEQA**

The MND fails to meet the requirements of CEQA because it includes inconsistencies that make the project description unstable and render its conclusions of impact significance indefensible.

<u>The project description is unstable and inaccurate</u>

The MND for the proposed project includes contradictory descriptions of the expected heavy truck trips rate, rendering the project description unstable and inaccurate. An initial study is required to include a project description. An "accurate, stable and finite" project description is the "sine qua non" of an environmental review document. (*County of Inyo v. City of Los Angeles*

(1977) 71 Cal.App.3d 185 at 192.) A project description that meets these standards is necessary for evaluation of potential environmental impacts.

Here, inconsistencies within the environmental document mean that the included project description fails to meet the informational standard required under CEQA. The project description included in the environmental checklist form for the project states "[t]he Project includes a total of approximately 84 truck trips per day (42 entering and 42 exiting) and 120 passenger vehicle trips per day (60 entering and 60 exiting)." (MND Appendix G, p.3.) This data appears to be consistent with the analysis included in the discussion of hazards and hazardous materials impacts. (Appendix G, Checklist Item IX.) However, in the discussion of transportation impacts, the truck trips are projected to be "approximately 126 per day" and the passenger vehicle trips as "approximately 180 per day." (Appendix G, Checklist Item XVI(a).) These figures are in line with the technical data included to support the environmental review. (Emily Bowen, Air Quality, Health Risk, Greenhouse Gas, and Energy Technical Memorandum, November 13, 2024, p.2.) Thus, the vehicle trip estimates included in the project description vary substantially from figures included elsewhere in the document.

The project description includes unsupported estimates of vehicle trips that are inconsistent with the included technical analysis, such that the document provides two possible estimates of vehicle trips, with the upper estimate 1.5 times the lower estimate. Because of the ambiguity that results from these inconsistencies, the project description is unstable and inaccurate. Without a stable, accurate project description of the vehicle trips associated with the buildout of the trucking facility, the IS/MND fails as an informational document and is in violation of CEQA requirements. Where, as in this case, an environmental document "precludes informed decisionmaking and public participation, the goals of CEQA are thwarted and a prejudicial abuse of discretion has occurred." (*Save Our Peninsula Committee v. Monterey County Bd. of Supervisors* (2001) 87 Cal.App.4th 99 at 128.)

<u>Significance determinations are unsupported by the impact analysis</u>

As described above, the environmental document includes multiple estimates of projected project vehicle traffic. In addition to rendering the Project Description unstable and inaccurate, these inconsistencies undermine the conclusion of the environmental document that project impacts will be less than significant with mitigation implemented. A Mitigated Negative Declaration allows a lead agency to avoid the need to complete a full environmental impact report when the Initial Study prepared for the project "identifies potentially significant effects on the environment" but also identifies revisions to the project to "mitigate the effects to a point where clearly no significant effect on the environment would occur" and "there is no substantial evidence…that the project, as revised, may have a significant effect on the environment." (Pub. Res. Code § 21080(c)(2).)

Here, the environmental document provides multiple estimates for the trip traffic that will result from the proposed project. The number of trips varies between sections of the Initial Study. In addition, the discussion of potential air quality impacts does not specify what daily rate of trips is employed in the analysis of health impacts to support its conclusions. This is despite the fact that the Initial Study concludes that there would be a significant impact under Checklist Item III(c), due to exposure of sensitive receptors to substantial pollutant concentrations. (Appendix G, Checklist Item III.) The Initial Study states that implementation of MM AIR-1 would reduce this impact to less than significant level, but MM AIR-1 only pertains to construction emissions, not operational emissions. Because of the ambiguity surrounding the vehicle trips per day, it is possible that the operational emissions of the project are greater than what is reflected in the discussion of Item III(c). As a result, it is not certain that MM AIR-1 would actually mitigate the significant impact under Checklist Item III(c) to a less than significant impact. Therefore, the MND cannot be shown to meet the requirements of section 21080(c)(2).

Further, the Transportation section of the Initial Study references an Institute of Transportation Engineers (ITE) trip generation manual for the estimated daily truck trip rate. The ITE code used is 30, for an "intermodal truck terminal." (Appendix G, Table 20.) The analysis does not specify why this code was selected as opposed to other possibly relevant ITE codes, like those for warehouses or parcel fulfillment centers. The discussion also fails to support the inclusion of the rate selected for ITE code 30 (1.97) as opposed to other possible rates included in ITE data sources. (See *ITE Trip Generation Data Plots - Modal, 000s - Port and Terminal - Modal Data Plots 1*, showing average rate 2.14 for ITE code 30, available at: https://www.ite.org/tripgenappendices/.) This section also references that trip estimates were based on "information provided by the Project applicant," without further specificity. (Appendix G, Checklist Item XVII(a).) Despite the ambiguities included in this section of the checklist as to the assumptions of truck traffic, the Initial Study finds that there would be no significant impact with mitigation incorporated. Because the assumptions underlying the analysis are ambiguous, it is not clear that the mitigation would be sufficient to reduce the effect of the project on the environment.

Other inconsistencies

In addition to the above inconsistencies, which result in substantial ambiguity about the assumptions that underlie the impact analysis and thus make it unclear whether the identified mitigation measures will actually achieve a reduction in the project's effect on the environment, the environmental document also includes contradictory statements under Checklist Item X - Hydrology and Water Quality. For Checklist Item X(b), it describes the impact as less than significant with mitigation incorporated. However, the discussion of that item states the impact would just be less than significant, and does not describe any mitigation. For Checklist Item

X(c), there is no impact indicated in the table at the start of the section. Lastly, the analysis should include an analysis of impacts on sensitive receptors including Orange Central Elementary, places of worship, and adjacent disadvantaged unincorporated community as directed to by the District 3 Project Review Committee in 2023.

2. Findings For Annexation Approval is Inaccurate

According to the Fresno Municipal Code, annexations shall not be approved unless all criteria as listed in Section 15-6104 are met. Staff finds that "No Disadvantaged Unincorporated Communities are identified adjacent or within the vicinity of the proposed annexation boundary" for Section 15-6104 Annexation Criteria D[1]. The finding is inaccurate as the proposed annexation site is within the City of Fresno's sphere of influence and is adjacent and contiguous to the disadvantaged unincorporated community ("DUC") on Cherry Ave and E. Central Ave. The DUC begins with a small cluster of homes directly adjacent to the Project site and in front of the Orange Central Elementary which are in close proximity to homes on E. Daleville Ave and E. Central Ave[2]. See exhibit A. The DUC will be heavily impacted as Cherry Ave is used by truck traffic to enter the facilities. Before moving forward with the Project, staff should comply with Section 15-6104 of the City's municipal code and partner with the community to determine support for annexation and coordinate terms for a potential annexation process.

Exhibit A

[1] Fresno City Municipal Code Section 15-6104 https://library.municode.com/ca/fresno/codes/code_of_ordinances?nodeId=MUCOFR_CH15CIDECOINRE_PTVADPE_ART61COPLPNIAN_S15-6104ANCR .

[2] Addresses for small cluster of residential parcels include: 3081 S. Chery Ave, 3085 S. Cherry Ave., 3097 S. Cherry Ave. 3103 . Cherry Ave., 3121 S. Cherry Ave., and 3133 S. Cherry Ave.

3. **The City Must Engage the Community of Southcentral Fresno and Adopt the Southcentral Fresno Specific Plan Before Continuing with Project consideration.**

The City of Fresno must ensure to communicate and collaborate with the community of Southcentral Fresno for the Project. The community of Southcentral Fresno was not informed about the consideration of the Project despite its introduction in 2021 and despite direction from the District 3 Project Review Committee to have better stakeholder engagement notice with a 3,000-foot radius buffer[3]. According to Exhibit J the last time the Project was discussed with the community was February 18th 2021, four years from now. The Staff report does not indicate if Staff followed through with the 3,000-foot radius buffer. We urge the Commission to delay consideration of the Project until notification with a 3,000-foot radius buffer for the Project has been completed and the community has had an opportunity to raise concerns and guide mitigation.

Since the introduction of the project the community of Southcentral Fresno and the AB 617 Community Steering Committee has worked on the development of the Southcentral Specific Plan (SCSP) and the Southcentral Truck Reroute Study. The City should delay the Project until the adoption of the SCSP to ensure future development reduces impacts on the environment and improves the quality of life for residents. Moreover, the Project should be delayed until the SCSP "Good Neighbor" policies and buffering requirements are established to ensure neighboring uses collaborate with residents and impacts are mitigated through buffering.

4. **Adoption of the Project is inconsistent with the City's duty to Affirmatively Further fair Fair Housing and the Fair Employment and Housing Act.**

The impacts of industrialization and polluting land uses in Southcentral are extensively documented and known by the City of Fresno. It is very clear that the City's land use decisions have detrimentally impacted the community leading to high cumulative pollution burden. In approving this Project, the City may violate their duty to affirmatively further fair housing which includes avoiding land use patterns which continue to negatively impact disadvantaged communities and communities of color. Given the Project's location and likely significant adverse impacts in disproportionately pollution burden community of color, it is essential not only from a CEQA perspective that the City analyze and fully mitigate the Project's impacts on housing, but it is also necessary in order for the City to comply with its duty to affirmatively furthering fair housing and not take any action that is materially inconsistent with that duty. Gov. Code § 8899.50.

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[3] Fresno District 3 Project Review Committee Minutes, March 28th, 2023.

Moreover, the Fair Employment and Housing Act ("FEHA") prohibits any public or private land use practices, which include any single act or omission, that intentionally discriminate or that has a discriminatory effect without a legally sufficient justification. 2 C.C.R.§ 12161. A legally sufficient justification exists for a discriminatory effect resulting from a public agency's land use practice only when there is no feasible alternative practice that would equally or better accomplish a substantial, legitimate non-discriminatory purpose, and other factors are met. 2 C.C.R. § 12062(b). Land use practices that may result in unlawful discriminatory effect under FEHA may include the siting of toxic, polluting or hazardous land uses in a manner that adversely impacts housing opportunities. 2 C.C.R. § 12161. In approving the Project, the City is at risk of violating the Fair Employment and Housing Act as its land use decisions continue to create disparate and discriminatory effects on protected classes.

We strongly urge the Commission to oppose or deny the Project until the Project has undergone a full environmental analysis and until the Southcentral Specific Plan has been adopted.

Respectfully,

Seth Alston
Staff Attorney
Leadership Counsel for Justice and Accountability

Attachment B

TRY-US
TRANSPORTATION INC.
466

From:	Ruby Marquez
To:	Clerk
Subject:	Central Trucking Project
Date:	Wednesday, August 13, 2025 8:52:57 AM
Attachments:	Comment Letter Template.docx.pdf

External Email: Use caution with links and attachments

Good morning,
Please see the attached letter. Thank you.

--
Ruby Marquez
Administrative Assistant
Orange Center School District
3530 S. Cherry Avenue
Fresno, CA 93706
P: 559-237-0437
E: [redacted]

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August 11th, 2025

Fresno City Council
City Hall Council Chamber, 2nd Floor,
2600 Fresno Street, Fresno, CA 93721

Sent via email clerk@fresno.gov

Dear Fresno City Council,

My name is Ruby Marquez, and I proudly serve as an employee at Orange Center Elementary. I'm writing to strongly urge you to reject Annexation Application No. P21-05778, Pre-zone Application No. P21-05870, and Development Permit Application No. P23-00149. These proposed actions pose serious risks to the health, safety, and overall wellbeing of our students, educators, staff, and the residents of Cherry Avenue, Daleville, and surrounding underserved, unincorporated neighborhoods.

I am deeply concerned about the environmental and public health consequences this industrial development would bring—particularly the increased air pollution from heavy-duty truck emissions, the potential rise in traffic hazards, and the broader implications of placing an industrial site so close—less than a mile—to an elementary school.

Approving this project would only worsen already severe conditions in South Central Fresno. The area has long been recognized for its critical environmental burdens. In fact, South Central Fresno was designated under the AB 617 Community Air Protection Program due to its high pollution levels and resulting health disparities. Through this program, community members spent over a year developing a Community Emissions Reduction Program and advocating for initiatives like rerouting truck traffic away from Cherry Avenue. The community also pushed for the creation and adoption of a South Central Specific Plan to safeguard residents from further industrial encroachment. Instead of moving forward with more harmful projects, the City should be prioritizing these community-led efforts and focusing on addressing existing challenges.

The City's own 2024 Health Impact Assessment (HIA) confirmed that South Fresno residents disproportionately live near high-traffic corridors such as truck routes, freeways, and major streets. This proximity results in higher exposure to pollutants like PM 2.5, ozone, and diesel particulate matter. The HIA also revealed significantly higher rates of preterm births, infant mortality, and emergency visits for asthma and cardiovascular problems in South Central Fresno—particularly among residents living within 1,000 feet of truck routes. Perhaps most alarming is the 20-year life expectancy gap between South/Southwest Fresno residents and those in other parts of the city.

As someone who lives near industrial activity, I can personally attest to the toll it takes on everyday life. These are not abstract concerns—they are lived realities for families like mine.

For these reasons, I respectfully urge you to deny Annexation Application No. P21-05778, Pre-zone Application No. P21-05870, and Development Permit Application No. P23-00149. Protecting the people of South Central Fresno from additional industrial burden is not only a matter of environmental justice—it's a moral obligation.

Sincerely,

[redacted]

Ruby Marquez

From:	Maryann Espinoza
To:	Clerk
Subject:	Central Trucking Project
Date:	Wednesday, August 13, 2025 9:01:40 AM
Attachments:	August 11, 2025.pdf

External Email: Use caution with links and attachments

Please see the attached letter for the Central Trucking Project.

Mary Ann Espinoza
Administrative Registrar/Clerk
Orange Center Elementary School
3530 S. Cherry Ave.
Fresno, CA 93706
(559) 237-0437
[redacted]

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August 11, 2025
Fresno City Council
City Hall Council Chamber, 2nd Floor
2600 Fresno Street
Fresno, CA 93721
Sent via email: clerk@fresno.gov

Dear Members of the Fresno City Council,

My name is Mary Ann Espinoza, and I am a staff member at Orange Center School Elementary. I am writing to express my strong opposition to Annexation Application No. P21-05778, Pre-zone Application No. P21-05870, and Development Permit Application No. P23-00149. I respectfully urge the Council to reject these applications to protect the health, safety, and well-being of Orange Center Elementary School's students, staff, and surrounding communities—including families living along Cherry Avenue, Daleville, and neighboring disadvantaged unincorporated areas.

My opposition stems from serious concerns about increased air pollution from heavy-duty truck traffic, traffic safety—especially for those commuting to and from Orange Center Elementary—and the broader consequences of allowing industrial development less than a mile from an elementary school.

This proposed annexation and rezoning to heavy industrial use for Central Transport in South Central Fresno would worsen the already challenging environmental and public health conditions in the area. In fact, South Central Fresno's urgent need for environmental safeguards led to its selection as one of the first communities under California's AB 617 Community Air Protection Program. This program resulted in the development of a Community Emissions Reduction Plan and Community Air Monitoring efforts. Residents spent more than a year working on solutions, including strategies to reroute truck traffic off Cherry Avenue.

In addition, community members have actively supported and participated in the planning process for the South Central Specific Plan—designed to create long-term protections against harmful industrial encroachment. At this point, the City should be prioritizing efforts to alleviate existing burdens—not approve new projects that would only intensify them.

In 2024, the City's own Health Impact Assessment (HIA) highlighted troubling disparities. South Fresno residents are disproportionately exposed to harmful pollutants like PM 2.5, ozone, and diesel particulate matter because they live closer to freeways and major truck routes. The HIA also revealed significantly higher risks of preterm births, infant mortality, asthma, and cardiovascular disease among residents—especially those living within 1,000 feet of truck routes or highways. Perhaps most alarmingly, people living in South and Southwest Fresno have, on average, a 20-year shorter life expectancy compared to residents in other parts of the city.

From my personal experience living near industrial activity, I have witnessed firsthand [insert your personal story or concerns here].

For all these reasons, I respectfully urge the Fresno City Council to reject Annexation Application No. P21-05778, Pre-zone Application No. P21-05870, and Development Permit Application No. P23-00149. It is vital that the City take meaningful steps to protect the South Central Fresno community from further harmful industrial expansion.

Sincerely,
Mary Ann Espinoza

From:	Ivanka Saunders
To:	Clerk
Subject:	Public Comment to Oppose Applications: No.P21-05778, No. P21-05870, and No. P23-00149.
Date:	Wednesday, August 13, 2025 9:45:32 AM
Attachments:	Katie Taylor"s Comment Letter re Central Transport.pdf

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External Email: Use caution with links and attachments

Dear Councilmembers,

Please accept the attached Public Comments written by resident Katie Taylor who is in Opposition of Applications: No.P21-05778, No. P21-05870, and No. P23-00149.

Thank you
--
Ivanka Saunders
Community Advocacy Manager
Leadership Counsel for Justice and Accountability
[redacted]

August 11th, 2025

Fresno City Council
City Hall Council Chamber, 2nd Floor,
2600 Fresno Street, Fresno, CA 93721

Sent via email clerk@fresno.gov

Dear Fresno City Council,

My name is Katie Taylor and I have been a resident of South Central Fresno for several decades where I have raised my family. I am writing to you to urge you to deny Annexation Application No.P21-05778, Pre-zone Application No. P21-05870, and Development Permit Application No. P23-00149.

I am asking that you prioritize the wellbeing of the community of citizens that live in South Fresno and help protect their physical and mental health and their safety. This community is made up of Fresno residents who live on or near the Avenues of Cherry, Daleville, Central, Orange, Britten and Cedar. I oppose this project because I am concerned about the impacts to our air quality from the emissions of heavy duty truck traffic, traffic safety concerns, and especially for the families commuting to Orange Center Elementary, and the longer term implications of industrial development less than a mile away from an elementary school. It is unsafe for our kids and they are too frightened to walk home and these heavy duty trucks make it extremely dangerous to drive your family car within our community without the risk of an accident and being forced off the road.

We are being overburdened in this area from all unhealthy impacts caused by heavy duty trucks and the operations of heavy industrial facilities. Where I live, there is a 4 way intersection where these heavy duty trucks run 24 hours a day, 7 days a week. I don't deserve more trucks running less than 20 feet from the front door of my home! This causes not only respiratory issues from the diesel fumes, it also causes impacts to my mental and physical health. There is an increase in my blood pressure and heart rate due to the constant noise, the loudness of the banging when big rigs constantly hit potholes, and the vibration of your home shaking. It all wears on your nerves and peace of mind. The city and county of Fresno continue to work together to promote and allow investors and developers to buy the land and rezone it in South Fresno to heavy industrial uses without any concern nor remorse of the negative impacts on the residents. And yet, it is a fact that this same City council will listen to the residents of north Fresno and their concerns of the truck traffic impacts caused by just one development of a Cosco warehouse on Herndon Ave. This Council is willing to discuss their concerns of impacts and try to find solutions and create real mitigations to prevent harmful impacts on north Fresno residents, and yet the City refuses to

complete a South Central Specific Plan and a Truck Reroute Study to protect south Fresno residents from harm in an already overburdened area of too many industrial facilities. I ask myself, why would my City's leaders allow for this detrimental planning and unfortunately, the answer is the definition of structural and environmental racism. Residents of South Fresno continue to have to fight these patterned actions of detrimental land use decisions just for the basic rights to have a healthy community.

Again, I urge you to please deny Annexation Application No.P21-05778, Pre-zone Application No. P21-05870, and Development Permit Application No. P23-00149 to protect the community of South Central Fresno from continued industrial growth in our backyards.

Sincerely,

Katie Taylor