

**ECONOMIC AND FISCAL IMPACT STATEMENT
(REGULATIONS AND ORDERS)**

STD. 399 (Rev. 10/2019)

ECONOMIC IMPACT STATEMENT

DEPARTMENT NAME California Air Resources Board	CONTACT PERSON Jennifer Lee	EMAIL ADDRESS jennifer.lee@arb.ca.gov	TELEPHONE NUMBER 916-282-6279
DESCRIPTIVE TITLE FROM NOTICE REGISTER OR FORM 400 Amendments to the In-Use Off-Road Diesel-Fueled Fleets Regulation			NOTICE FILE NUMBER Z 2022-0906-13

A. ESTIMATED PRIVATE SECTOR COST IMPACTS *Include calculations and assumptions in the rulemaking record.*

1. Check the appropriate box(es) below to indicate whether this regulation:

- | | |
|--|---|
| <input checked="" type="checkbox"/> a. Impacts business and/or employees | <input checked="" type="checkbox"/> e. Imposes reporting requirements |
| <input checked="" type="checkbox"/> b. Impacts small businesses | <input type="checkbox"/> f. Imposes prescriptive instead of performance |
| <input checked="" type="checkbox"/> c. Impacts jobs or occupations | <input checked="" type="checkbox"/> g. Impacts individuals |
| <input type="checkbox"/> d. Impacts California competitiveness | <input type="checkbox"/> h. None of the above (Explain below): |

*If any box in Items 1 a through g is checked, complete this Economic Impact Statement.
If box in Item 1.h. is checked, complete the Fiscal Impact Statement as appropriate.*

California Air Resources Board2. The _____ estimates that the economic impact of this regulation (which includes the fiscal impact) is:
(Agency/Department)

- ☐ Below \$10 million
- ☐ Between \$10 and \$25 million
- ☐ Between \$25 and \$50 million
- ☒ Over \$50 million *[If the economic impact is over \$50 million, agencies are required to submit a [Standardized Regulatory Impact Assessment](#) as specified in Government Code Section 11346.3(c)]*

3. Enter the total number of businesses impacted: 12,040Describe the types of businesses (Include nonprofits): Businesses operating applicable equipment (See attachment, SA)Enter the number or percentage of total businesses impacted that are small businesses: 6,4144. Enter the number of businesses that will be created: 0 eliminated: 0Explain: The Proposed Amendments will not directly lead to the creation or elimination of businesses. (SA)5. Indicate the geographic extent of impacts: ☒ Statewide
☐ Local or regional (List areas): _____6. Enter the number of jobs created: 3,490 and eliminated: 18Describe the types of jobs or occupations impacted: Mining, construction, and commercial and industrial machinery and equipment rental and leasing are estimated to see the greatest impacts to employment. (SA)7. Will the regulation affect the ability of California businesses to compete with other states by making it more costly to produce goods or services here? ☐ YES ☒ NO

If YES, explain briefly: Proposed Amendments impose requirements equally on all fleets that operate these vehicles in these industries in California. Work performed by off-road diesel vehicles is bound to job sites within California; unlikely that businesses would move out of State.

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ECONOMIC IMPACT STATEMENT (CONTINUED)**B. ESTIMATED COSTS** *Include calculations and assumptions in the rulemaking record.*

1. What are the total statewide dollar costs that businesses and individuals may incur to comply with this regulation over its lifetime? \$ 3.14 billion
- a. Initial costs for a small business: \$ 225 (SA) Annual ongoing costs: \$ 3,965(SA) Years: 9 (SA)
- b. Initial costs for a typical business: \$ 449 (SA) Annual ongoing costs: \$ 81,573 (SA) Years: 13 (SA)
- c. Initial costs for an individual: \$ 0 (SA) Annual ongoing costs: \$ 0 (SA) Years: 0
- d. Describe other economic costs that may occur: n/a
2. If multiple industries are impacted, enter the share of total costs for each industry: Construction (NAICS 23) 53%, Commercial and industrial machinery and equipment rental (NAICS 5324) 15%, other industries 27 % (SA)
3. If the regulation imposes reporting requirements, enter the annual costs a typical business may incur to comply with these requirements. Include the dollar costs to do programming, record keeping, reporting, and other paperwork, whether or not the paperwork must be submitted. \$ 449 (SA)
4. Will this regulation directly impact housing costs? ☐ YES ☒ NO
If YES, enter the annual dollar cost per housing unit: \$ (SA)
Number of units: (SA)
5. Are there comparable Federal regulations? ☐ YES ☒ NO
Explain the need for State regulation given the existence or absence of Federal regulations: The Proposed Amendments are necessary to meet California's air quality mandates and goals.
- Enter any additional costs to businesses and/or individuals that may be due to State - Federal differences: \$ 3.14 billion

C. ESTIMATED BENEFITS *Estimation of the dollar value of benefits is not specifically required by rulemaking law, but encouraged.*

1. Briefly summarize the benefits of the regulation, which may include among others, the health and welfare of California residents, worker safety and the State's environment: PM2.5 and NOx, emission reductions; and resulting reductions in cancer risk and adverse health impacts, including 570 avoided premature mortalities, 180 fewer hospitalizations, and 277 fewer ER visits.
Cost savings of approx. \$1.28 billion which result from fleets replacing vehicles on a different schedule than under the baseline scenario. (SA)
2. Are the benefits the result of: ☒ specific statutory requirements, or ☒ goals developed by the agency based on broad statutory authority?
Explain: The Proposed Amendments are needed to achieve federal and State air quality and toxics mandates and goals. SA
3. What are the total statewide benefits from this regulation over its lifetime? \$ 7.08 Billion (SA)
4. Briefly describe any expansion of businesses currently doing business within the State of California that would result from this regulation: While the Proposed Amendments are not anticipated to have any significant expansion of business, there could be a small expansion of businesses that manufacture and supply ZE technology to the extent the optional compliance flexibility is used by fleets.

D. ALTERNATIVES TO THE REGULATION *Include calculations and assumptions in the rulemaking record. Estimation of the dollar value of benefits is not specifically required by rulemaking law, but encouraged.*

1. List alternatives considered and describe them below. If no alternatives were considered, explain why not: Alternative 1: less stringent alternative that delays or does not implement the phase-out of vehicles and does require the use of renewable diesel (R99 or R100). Alternative 2: more stringent alternative that moves up the phase-out of vehicles and adds a phase-out of Tier 3 vehicles. (SA)

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ECONOMIC IMPACT STATEMENT (CONTINUED)

2. Summarize the total statewide costs and benefits from this regulation and each alternative considered:

Regulation: Benefit: \$ 7.08Billion Cost: \$ 3.32 Billion

Alternative 1: Benefit: \$ 3.95 Billion Cost: \$ 2.68 Billion

Alternative 2: Benefit: \$ 8.40 Billion Cost: \$ 4.27 Billion

3. Briefly discuss any quantification issues that are relevant to a comparison of estimated costs and benefits for this regulation or alternatives: none4. Rulemaking law requires agencies to consider performance standards as an alternative, if a regulation mandates the use of specific technologies or equipment, or prescribes specific actions or procedures. Were performance standards considered to lower compliance costs? ☐ YES ☒ NO

Explain: The Proposed Amendments require the phase-out of specific engine Tiers and limit the engine Tiers fleets can add to their fleet, but do not prescribe the specific engine technology manufacturers use to comply with those engine standards. CARB also considered alternate performance standards as part of the evaluation. (SA)

E. MAJOR REGULATIONS *Include calculations and assumptions in the rulemaking record.*

California Environmental Protection Agency (Cal/EPA) boards, offices and departments are required to submit the following (per Health and Safety Code section 57005). Otherwise, skip to E4.

1. Will the estimated costs of this regulation to California business enterprises exceed \$10 million? ☒ YES ☐ NO

***If YES, complete E2. and E3
If NO, skip to E4***

2. Briefly describe each alternative, or combination of alternatives, for which a cost-effectiveness analysis was performed:

Alternative 1: Alternative 1: less stringent that delays or does not implement the phase-out of vehicles and does require RD.Alternative 2: Alternative 2: more stringent that moves up the phase-out of vehicles and adds a phase-out of Tier 3 vehicles*(Attach additional pages for other alternatives)*

3. For the regulation, and each alternative just described, enter the estimated total cost and overall cost-effectiveness ratio:

Regulation: Total Cost \$ 3.32 Billion Cost-effectiveness ratio: \$ 23,054

Alternative 1: Total Cost \$ 2.68 Billion Cost-effectiveness ratio: \$ 40,590

Alternative 2: Total Cost \$ 4.27 Billion Cost-effectiveness ratio: \$ 24,636

4. Will the regulation subject to OAL review have an estimated economic impact to business enterprises and individuals located in or doing business in California exceeding \$50 million in any 12-month period between the date the major regulation is estimated to be filed with the Secretary of State through 12 months after the major regulation is estimated to be fully implemented?

☒ YES ☐ NO

If YES, agencies are required to submit a Standardized Regulatory Impact Assessment (SRIA) as specified in Government Code Section 11346.3(c) and to include the SRIA in the Initial Statement of Reasons.

5. Briefly describe the following:

The increase or decrease of investment in the State: Private domestic investment is estimated to show a decrease of \$282 million in 2023, and a decrease as large as \$919 million in 2027, and is 0.17% or less in any given year. This decrease is followed by an increase of \$281 million by 2038. (SA)

The incentive for innovation in products, materials or processes: The Proposed Amendments provide opportunities for the development and deployment of zero-emission technologies, which could create a staging ground for fleets the expand ZE deployment. (SA)

The benefits of the regulations, including, but not limited to, benefits to the health, safety, and welfare of California residents, worker safety, and the state's environment and quality of life, among any other benefits identified by the agency: See Section C.1.

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FISCAL IMPACT STATEMENT**A. FISCAL EFFECT ON LOCAL GOVERNMENT** *Indicate appropriate boxes 1 through 6 and attach calculations and assumptions of fiscal impact for the current year and two subsequent Fiscal Years.*

- ☐ 1. Additional expenditures in the current State Fiscal Year which are reimbursable by the State. (Approximate)
(Pursuant to Section 6 of Article XIII B of the California Constitution and Sections 17500 et seq. of the Government Code).

\$ _____

- ☐ a. Funding provided in _____
Budget Act of _____ or Chapter _____, Statutes of _____

- ☐ b. Funding will be requested in the Governor's Budget Act of _____
Fiscal Year: _____

- ☐ 2. Additional expenditures in the current State Fiscal Year which are NOT reimbursable by the State. (Approximate)
(Pursuant to Section 6 of Article XIII B of the California Constitution and Sections 17500 et seq. of the Government Code).

\$ _____

Check reason(s) this regulation is not reimbursable and provide the appropriate information:

- ☐ a. Implements the Federal mandate contained in _____

- ☐ b. Implements the court mandate set forth by the _____ Court.

Case of: _____ vs. _____

- ☐ c. Implements a mandate of the people of this State expressed in their approval of Proposition No. _____

Date of Election: _____

- ☐ d. Issued only in response to a specific request from affected local entity(s).

Local entity(s) affected: _____

- ☐ e. Will be fully financed from the fees, revenue, etc. from: _____

Authorized by Section: _____ of the _____ Code;

- ☐ f. Provides for savings to each affected unit of local government which will, at a minimum, offset any additional costs to each;

- ☐ g. Creates, eliminates, or changes the penalty for a new crime or infraction contained in _____

- ☐ 3. Annual Savings. (approximate)

\$ _____

- ☐ 4. No additional costs or savings. This regulation makes only technical, non-substantive or clarifying changes to current law regulations.

- ☐ 5. No fiscal impact exists. This regulation does not affect any local entity or program.

- ☒ 6. Other. Explain No current fiscal year (22-23) impact. From 2023-2038, costs of \$111M, savings of \$40M, rev. increase of \$145M, and rev. decrease of \$93M. (SA)

**ECONOMIC AND FISCAL IMPACT STATEMENT
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FISCAL IMPACT STATEMENT (CONTINUED)**B. FISCAL EFFECT ON STATE GOVERNMENT** *Indicate appropriate boxes 1 through 4 and attach calculations and assumptions of fiscal impact for the current year and two subsequent Fiscal Years.*☐ 1. Additional expenditures in the current State Fiscal Year. (Approximate)

\$ _____

It is anticipated that State agencies will:☐ a. Absorb these additional costs within their existing budgets and resources.☐ b. Increase the currently authorized budget level for the _____ Fiscal Year☐ 2. Savings in the current State Fiscal Year. (Approximate)

\$ _____

☐ 3. No fiscal impact exists. This regulation does not affect any State agency or program.☒ 4. Other. Explain No current year (22-23) impact. From 2023-2038, costs of \$47M, savings of \$13M, rev. increase of \$119M, rev. decrease of \$77M. (SA)**C. FISCAL EFFECT ON FEDERAL FUNDING OF STATE PROGRAMS** *Indicate appropriate boxes 1 through 4 and attach calculations and assumptions of fiscal impact for the current year and two subsequent Fiscal Years.*☐ 1. Additional expenditures in the current State Fiscal Year. (Approximate)

\$ _____

☐ 2. Savings in the current State Fiscal Year. (Approximate)

\$ _____

☒ 3. No fiscal impact exists. This regulation does not affect any federally funded State agency or program.☐ 4. Other. Explain _____

FISCAL OFFICER SIGNATURE

DATE

May 16, 2023

The signature attests that the agency has completed the STD. 399 according to the instructions in SAM sections 6601-6616, and understands the impacts of the proposed rulemaking. State boards, offices, or departments not under an Agency Secretary must have the form signed by the highest ranking official in the organization.

AGENCY SECRETARY

DATE

05/31/2023

Finance approval and signature is required when SAM sections 6601-6616 require completion of Fiscal Impact Statement in the STD. 399.

DEPARTMENT OF FINANCE PROGRAM BUDGET MANAGER

DATE

California Air Resources Board

Form 399 Attachment

Proposed Amendments to the In-Use Off-Road Diesel-Fueled Fleets Regulation

The California Air Resources Board (CARB) staff is proposing amendments to the In-Use Off-Road Diesel-Fueled Fleets Regulation (Off-Road Regulation or Current Regulation), California Code of Regulations, title 13, Sections 2449, 2449.1, and 2449.2 to achieve additional reductions of oxides of nitrogen (NO_x) and diesel particulate matter (PM) from the off-road sector in California. Despite significant improvements in California's air quality over the past decades, major populated regions in California are still not in attainment with the federal particulate matter 2.5 (PM_{2.5})¹ and ozone standards. Off-road vehicles are one of the larger sources of PM and ozone-forming emissions today, as on-road vehicle emissions continue to be reduced by CARB regulations. Off-road vehicle emissions urgently warrant further control in light of pressing public health needs in communities and non-attainment of federal air quality standards across California. Achieving further PM and NO_x reductions from the off-road sector is critically important to providing much-needed public health protection for the millions of Californians who still breathe unhealthy air, reducing community exposure to air toxics, and helping to meet current health-based ambient air quality standards across California.

Background

CARB approved the Off-Road Regulation (Cal. Code Regs., tit. 13, §§ 2449 et seq.) for adoption in 2007, and it became effective in 2008. The Off-Road Regulation was amended twice in 2009, and again in 2010. The 2009 amendments introduced additional credits to incentivize early actions and added clarifying language. The 2010 amendments made significant changes to the Off-Road Regulation which delayed the initial compliance date for all fleets by four years, provided a path to compliance without any required retrofits, and simplified the Off-Road Regulation. The purpose of this Off-Road Regulation is to reduce diesel PM, NO_x, and other criteria air pollutants from in-use off-road heavy-duty vehicles in California.

¹ PM_{2.5} refers to fine particulate matter that are 2.5 microns or less in diameter.

The Off-Road Regulation applies to owners of applicable vehicles, such as dozers, loaders, forklifts, cranes, skid steers, and scrapers,² owned or operated in California. It requires fleets to reduce their emissions by retiring off-road equipment with older engines and replacing it with vehicles with newer, cleaner engines; repowering older engines; or installing verified diesel emission control strategies in older engines (VDECS); and restricts the adding of older vehicles to fleets. The Off-Road Regulation does not apply to off-road diesel vehicles owned and operated by an individual for personal, non-commercial, and non-governmental purposes.

The emission performance requirements of the Off-Road Regulation require fleets to meet declining fleet average targets that are phased in by fleet size. A fleet is defined as all off-road vehicles and engines owned by a person, business, or government agency that are operated within California and are subject to the Off-Road Regulation. There are two ways to be compliant with the emission performance requirements of the Off-Road Regulation:

1. A fleet can either meet its fleet average target, calculated based on the fleet's equipment composition; or
2. Comply with the Best Available Control Technology (BACT) requirements, which require a fleet to turn over a certain percentage of the fleet's total horsepower (generally ten percent) or use credits accrued by the fleet for actions taken in previous years. The phase in of the fleet average targets are described in Table 1.

If a fleet does not meet its final fleet target by the final date shown in Table 1, the fleet is required to turn over ten percent of its total fleet horsepower each year until it meets that target. The Off-Road Regulation also has annual fleet reporting requirements, vehicle labeling requirements, and special provisions for vehicles that operate fewer than 200 hours per year (low-use vehicles). The compliance dates and compliance requirements by fleet size are incorporated into CARB's baseline off-road emission inventory. For each year a fleet reports and submits a Responsible Official Affirmation of Reporting attesting to the fleet's compliance with the Off-Road Regulation, CARB issues the fleet a fleet Certificate of Reported Compliance.

² The regulation also applies to workover rigs operating in the oil and gas industry, two-engine water-well drilling rigs, and other two engine vehicles that are specially constructed, among others.

Table 1. Off-Road Regulation Fleet size, Phase-in Dates of Performance Requirements, and Number of Fleets and Vehicles

Fleet Size	Fleet Average Target or BACT Date (January 1)	Number of Fleets ³	Number of Vehicles ⁴ (% of total)
Large (>5,000 total horsepower)	2014-2023	1,029	100,775 (54%)
Medium (2,501 to 5,000 total horsepower)	2017-2023	713	16,520 (9%)
Small (≤2,500 total horsepower)	2019-2028	11,361	70,997 (38%)
Ultra-small (optional) (<500 total horsepower, subset of small fleets)	2019-2029	6,837 (subset of small)	18,059 (subset of small)
Total fleets and vehicles ⁵		13,103	188,292

Need for the Proposed Amendments

In the coming years, California needs to continue to build upon its successful efforts to meet critical health, environmental risk-reduction, and air quality mandates and goals. Achieving these goals will provide much-needed public health protection for the millions of Californians who still breathe unhealthy air, reduce community exposure to air toxics, and help to meet health-based ambient air quality standards across California.

California has made significant improvements in its air quality over the past decade. However, despite these improvements, more than half (21 million out of nearly 40 million) of Californians live in areas that exceed the health-based federal national ambient air quality standard for ozone. In order to meet the federal air quality standards and to improve public health across the State, further PM and NO_x emissions reductions are needed statewide. These emissions reductions are especially needed from the off-road sector, as seen in Figure 1 below and presented to the Board as part of the 2020 Mobile Source Strategy.⁶ The arrow in the figure shows the point where emissions from the combined off-road sectors exceeded the emissions from all on-road vehicles. The importance of achieving further emissions reductions from the off-road sector is only getting more critical as the share of

³ The numbers of fleets have been updated since the Initial Statement of Reasons (ISOR) to reflect data reported as of February 23, 2023. The number of fleets reported include local, State, and federal fleets.

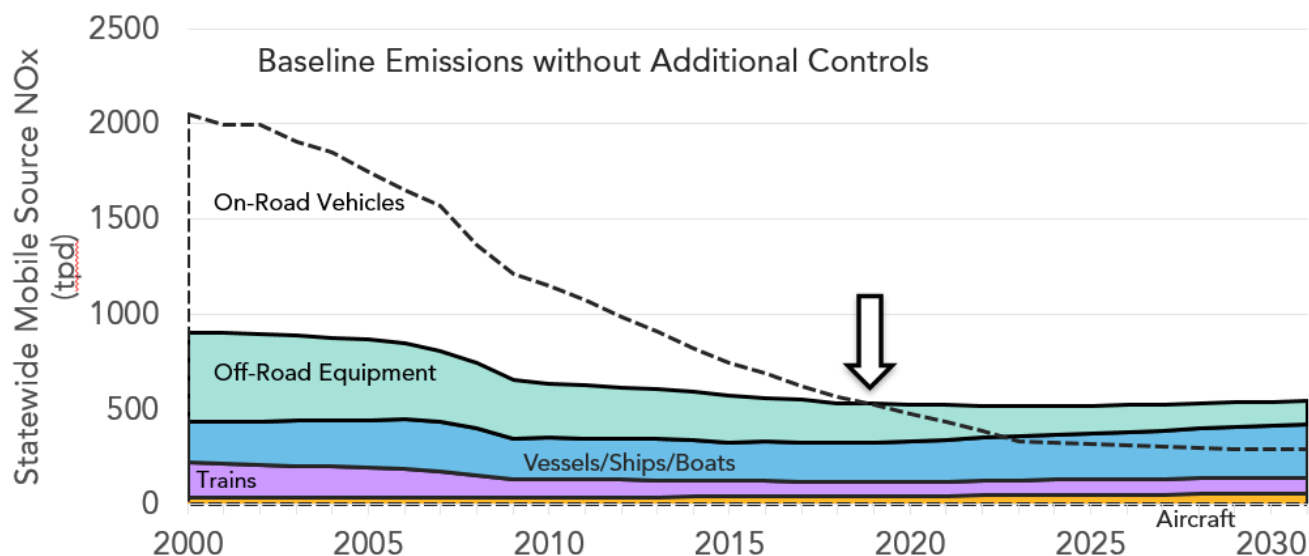
⁴ The numbers of vehicles have been updated since the ISOR to reflect data reported as of February 23, 2023.

⁵ Totals include counts of fleets and vehicles for large, medium, and small fleets. Ultra-small counts for fleets and vehicles are not included in the total because they are a subset of small fleets.

⁶ CARB. (2020). 2020 Mobile Source Strategy Presentation. Retrieved October 28, 2021, from [2020 Mobile Source Strategy - December 2020 Board Update \(ca.gov\)](#).

emissions from the on-road sector, as a portion of total emissions, continues to decline as a result of CARB's robust on-road regulatory and incentive policies.

Figure 1. Statewide Emissions of NO_x by Mobile Sector



The Proposed Amendments to the In-Use Off-Road Diesel-Fueled Fleets Regulation (Proposed Amendments) will achieve PM and NO_x emission reductions by restricting the addition of older off-road diesel-powered vehicles to fleets, accelerating the turnover of older, higher-emitting vehicles, and requiring the use of renewable diesel fuel. The Proposed Amendments will achieve needed NO_x and PM emission reductions statewide, helping ensure that communities are protected from toxic emissions from off-road equipment in construction and other sector sources. They will also enhance the enforceability of the Off-Road Regulation which will help ensure that compliant fleets are not subject to unfair competition from noncomplying fleets.

The Proposed Amendments are one of several statewide control measures CARB committed to bring to the Board for consideration and would achieve the NO_x reductions needed for attainment as part of the 2022 State Strategy for the State Implementation Plan (SIP).⁷ Additionally, the Proposed Amendments would support State policies and plans directing CARB to obtain additional diesel emission reductions, including the 2020 Mobile Source

⁷ CARB. (2022a). 2022 State Strategy for the State Implementation Plan. Retrieved February 15, 2023, from [2022 State Strategy for the State Implementation Plan September 22, 2022 \(ca.gov\)](#).

Strategy,⁸ Assembly Bill 617 (C. Garcia, Chapter 136, Statutes of 2017),⁹ Governor Newsom's Executive Order (EO) N-79-20,¹⁰ and CARB's Short-Lived Climate Pollutant Reduction Strategy.¹¹

Objectives of the Proposed Amendments

The Proposed Amendments are designed to be complementary to the existing compliance of fleets and achieve further NO_x and diesel PM reductions from fleets that have fully implemented the current Off-Road Regulation. These additional reductions are needed in order to meet the federal air quality standards and to improve public health throughout the State. The Proposed Amendments also aim to improve compliance with the Off-Road Regulation, with the intent of maintaining a level playing field for compliant vehicles conducting business in California and ensuring that the projected emission reductions are being achieved.

Proposed Amendments to the Off-Road Regulation

The Proposed Amendments have several main elements:

1. Phase out the oldest and highest-emitting off-road engines (Tiers 0, 1, and 2) from operation in California. This provision will be implemented by fleet size and engine Tier;
2. Restrict the addition of vehicles with Tier 3 and 4i engines, which is an expansion of provisions of the Current Regulation that restrict the vehicle-engine Tier that can be added to a fleet;
3. Require contracting entities to obtain and retain a fleet's valid Certificate of Reported Compliance prior to awarding a contract or hiring a fleet;
4. Mandate the use of RD 99/100 renewable diesel (RD)¹² for all fleets, with some limited exceptions;
5. Provide voluntary compliance flexibility options for fleets that adopt zero-emission technology; and

⁸ CARB. (2021). 2020 Mobile Source Strategy. Retrieved from https://ww2.arb.ca.gov/sites/default/files/2021-12/2020_Mobile_Source_Strategy.pdf.

⁹ California Legislative Information. (2017). AB-617 Nonvehicular air pollution: criteria air pollutants and toxic air contaminants. California Health and Safety Code §§ 39607.1, 40920.6, 40920.8, 42400, 42402, 42411, 42705.5, 44391.2. Retrieved July 6, 2022, from [Bill Text - AB-617 Nonvehicular air pollution: criteria air pollutants and toxic air contaminants](#).

¹⁰ Executive Department State of California (2020). Executive Order N-79-20. Office of Governor Gavin Newsom. Retrieved January 31, 2022, from [Executive Order N-79-20 \(ca.gov\)](#).

¹¹ CARB. (2017). Short-Lived Climate Pollutant Reduction Strategy. Retrieved April 5, 2022, from https://ww2.arb.ca.gov/sites/default/files/2020-07/final_SLCP_strategy.pdf.

¹² Fuel that is 99 or 100 percent renewable diesel.

6. Include additional requirements to increase enforceability, provide clarity, and provide additional flexibility for permanent low-use vehicles.

Tier Phase-out

The Proposed Amendments will require that fleets no longer operate vehicles with Tier 0, 1, or 2 off-road engines and specified model years (MY) of on-road engines in California after specified dates, based on fleet size, as summarized in Table 2, below.¹³ Some exemptions apply, such as for vehicles used for fewer than 200 hours per year (i.e., low-use).

Table 2. Tier and Model Year Phase-Out Dates by Fleet Size

Year (January 1)	Large Fleets	Medium Fleets	Small Fleets	Ultra-Small Fleets ¹⁴
2024	Tier 0/MY 1994 or older on-road			
2026	Tier 1/MY 1999 or older on-road	Tier 0/MY 1994 or older on-road		
2028	Tier 2/MY 2003 or older on-road	Tier 1/MY 1999 or older on-road	Tier 0/MY 1994 or older on-road	Tier 0/MY 1994 or older on-road
2030		Tier 2/MY 2003 or older on-road	Tier 1/MY 1999 or older on-road	Tier 1/MY 1999 or older on-road
2032			Tier 2/MY 2003 or older on-road	
2036				Tier 2/MY 2003 or older on-road

In addition, for all fleet sizes, the Proposed Amendments will discontinue the low-use vehicle exemption and the Jobs Corps exemption for Tier 0 or MY 1994 or older on-road engines, requiring the removal of those engines from all fleet's California operations by January 1, 2036. Tier 0 low-use vehicles contribute significant NOx and PM emissions compared to newer vehicles and, under the Current Regulation, can operate indefinitely. Given their low usage, staff is proposing significant time to phase these vehicles out, however, their ultimate phase-out is necessary to achieve additional emissions reductions.

The tier phase-out requirements and discontinuation of the low-use vehicle exemption for the oldest vehicles would greatly reduce operations of the oldest and highest-emitting vehicles in communities throughout California.

¹³ Where there is any conflict between this document and the text of the Proposed Amendments, the text of the Proposed Amendments governs.

¹⁴ Ultra-small fleets are allowed to comply with the Off-Road Regulation using an optional compliance schedule which requires that they only operate Tier 2 or cleaner engines by January 1, 2029.

Expansion of the Adding Vehicles Requirements

The Proposed Amendments will expand an existing provision that already restricts the addition of Tier 0, 1, and 2 vehicles to fleets to include a restriction on the addition of Tier 3 and Tier 4i vehicles, as well as MY 2006 or older on-road vehicles. The Proposed Amendments would disallow the addition of older-technology engines into fleets in California on a phased schedule, based on fleet size, as summarized in Table 3, below. This proposed requirement would ensure that new vehicles added to a fleet would meet the cleanest standards, reducing emissions to protect public health and meet air quality standards and goals.

Table 3. Compliance Dates for the Restrictions on Adding Vehicles

Year (January 1)	Large Fleets	Medium Fleets	Small Fleets	Ultra-Small Fleets
2024	Tier 3 Tier 4i/MY 2006 or older on-road	Tier 3 Tier 4i/MY 2006 or older on-road	Tier 3	Tier 3
2028			Tier 4i/MY 2006 or older on-road	
2035				Tier 4i/MY 2006 or older on-road

Contracting Requirements

The Proposed Amendments include new contracting requirements for prime contractors¹⁵ and public works awarding bodies¹⁶ beginning on January 1, 2024. These proposed requirements are intended to enhance the enforceability of the Off-Road Regulation and are based on years of experience implementing and enforcing the Current Regulation. These proposed new requirements would help ensure the expected emissions reductions of the Off-Road Regulation are achieved, by ensuring these entities only hire compliant fleets. Additionally, these proposed new requirements will reduce unfair competition. The proposed requirements are:

- To obtain and retain copies of the valid Certificates of Reported Compliance for the fleet selected for the contract and their listed subcontractors, if applicable; and

¹⁵ For the purpose of these Proposed Amendments, a prime contractor is defined as the entity that contracts directly with the project owner for any project involving the use of vehicles subject to the Off-Road Regulation, which are also proposed to be defined in the Proposed Amendments.

¹⁶ For the purpose of these Proposed Amendments, public works awarding bodies are defined as any public agencies that award or enter into contracts for public works projects, which are also proposed to be defined in the Proposed Amendments.

- Not enter into a contract with a fleet for which it does not have a valid Certificate of Reported Compliance for the fleet and their listed subcontractors, if applicable.

Prime Contractor Requirements

CARB has proposed additional requirements for prime contractors that will provide additional mechanisms for CARB to become aware of and investigate situations in which fleets do not have valid Certificates of Reported Compliance. The requirements will help CARB staff receive critical information related to responsible parties from the prime contractors when performing inspections at job sites. These requirements will help ensure the expected emissions reductions of the Off-Road Regulation are achieved, reduce unfair competition, and increase the enforceability of the Off-Road Regulation. The proposed additional requirements for prime contractors are:

- To collect new valid Certificates of Reported Compliance between March 1 and June 1 of each year for each fleet that has an ongoing contract with the prime contractor;
- To report to CARB any observed noncompliance with the Off-Road Regulation on their job sites, and report any fleets intending to operate at the jobsite that do not have a valid Certificate of Reported Compliance;
- To disclose to CARB, upon request, the responsible party for all vehicles subject to the Off-Road Regulation operating at their job sites; and
- To prominently display a sign at each of their job sites, where work on the job site lasts longer than seven days, that includes information regarding the applicability of the Off-Road Regulation, key requirements of the Off-Road Regulation that would help a person from the public identify noncompliant vehicles, and a method to notify CARB when noncompliance with the Off-Road Regulation is observed.

Renewable Diesel Requirements

The Proposed Amendments would require fleets to use RD 99/100 in their off-road vehicles, beginning January 1, 2024. This requirement will achieve significant near-term NO_x and PM reductions and will not increase or decrease the volume of fuel used by the off-road vehicles that are impacted by the requirement.

The proposed requirements pertaining to RD include the following:

- All fleets are required to use RD 99/100 fuel in all vehicles owned or operated in California that are subject to the Off-Road Regulation, with the exception of any fleet or fleet portion that is designated as solely operating in attainment areas (captive attainment area fleet), any vehicle while operating in one of the counties listed under the definition of a captive attainment area fleet, or any fleet that is comprised entirely of vehicles with Tier 4 Final engines or MY 2007 or newer on-road engines, or fleets, fleet portions, or vehicles operating in cold temperatures to prevent potential performance issues;

- In each year that annual reporting is required under the Off-Road Regulation, a fleet shall submit to CARB an affirmation that the fleet complied with the RD use requirement;
- Fleets must document and retain records related to the fleet's use of RD; and
- Exemptions are included if a fleet is unable to procure RD and, in that situation, the fleet must document and retain records related to its inability to procure RD. Additionally, exemptions are provided under certain weather conditions where cold temperatures could impact the performance of RD. The fleet must document and provide to CARB specific information related to temperature and the volume of low temperature-specific diesel fuel used instead of RD.

The RD supply and distribution network is generally available throughout California due to the Low Carbon Fuel Standard.¹⁷ However, RD 99/100 is used almost exclusively in the on-road sector. On-road vehicles are significantly cleaner than older off-road vehicles due to their use of selective catalytic reduction and diesel particulate filters. Using RD in the older, higher-emitting off-road vehicles will provide additional NOx and PM benefits. However, RD does not provide any additional NOx or PM benefits beyond its current use in on-road vehicles when used in the most advanced off-road vehicles (Tier 4 final). As such, CARB attributed benefits of RD use to its use in Tier 0 through Tier 4 interim engines, but not in Tier 4 final engines.

Optional Zero-Emission Compliance Flexibility

The Proposed Amendments include two zero-emission flexibility provisions, beginning on January 1, 2024. These provisions are needed in order to provide a regulatory incentive that encourages the cleanest off-road vehicles that achieve zero emissions. The proposed compliance flexibility provisions are the following:

- A fleet may delay the phase-out of one vehicle with a Tier 1 or Tier 2 engine for two years for each zero-emission vehicle it adds to the fleet if all required conditions are met. The zero-emission vehicle would be required to have a similar power output rating to the vehicle whose phase-out is being delayed. The use of this flexibility provision is voluntary, and the degree to which it will be employed will depend on individual fleets' decisions. This option gives vehicle operators the chance to use zero-emission vehicles in settings that are most important to them while obtaining some compliance flexibility in return; and
- A fleet may use an alternate compliance pathway and be exempted from the performance requirements of the Current Regulation and the tier phase-out requirements of the Proposed Amendments if the fleet submits a Zero-Emission

¹⁷ Many diesel fuel suppliers currently blend conventional CARB ultra-low sulfur diesel with renewables prior to distribution to fueling stations. These blends are usually at a rate of five percent or less of renewables.

Technology Application (ZETA) to CARB and commits to completing the ZETA project, CARB approves the ZETA as meeting the regulatory requirements, and the fleet implements the approved ZETA. The ZETA outlines the steps the fleet must take to substantially shift to ZEVs and/or zero-emission operations. The ZETA must be submitted to CARB prior to the compliance dates for which the fleet is seeking an exemption and it must describe the actions the fleet will take to replace, at a minimum, 50 percent of the fleet's total hp with zero-emission technology by January 1, 2035. The ZETA must be approved by the Executive Officer, and then the fleet must adhere to the approved ZETA and provide annual updates to CARB showing its progress in meeting the approved ZETA. If CARB determines that a fleet does not adhere to its approved ZETA based on metrics outlined in the Proposed Amendments, then the fleet must immediately come into compliance with the performance requirements of the Current Regulation and the Tier phase-out requirements of the Proposed Amendments. This option is also available for vehicles operating at a single facility.

Additional Requirements

Additionally, the Proposed Amendments include the following changes:

Beginning upon adoption of the Proposed Amendments:

- A fleet that observes that the emission control label is no longer visible or readable on any vehicle in its fleet must request a replacement emission control label from the vehicle manufacturer, and
- Small fleets may no longer keep vehicles with no VDECS available indefinitely.

Beginning January 1, 2024:

- Low-use provisions will be modified as follows:
 - Provide additional flexibility to fleets for vehicles designated as permanent low-use by allowing vehicles to qualify as low-use by averaging less than 600 hours of vehicle use over 3 consecutive years (3-year rolling average);
 - Remove the year-by-year low-use definition and compliance options;
 - Require fleets to retain photographic evidence of the engine hour meter that validates the engine hour meter reading reported to CARB and submit that evidence to CARB upon request; and
 - Require fleets to notify CARB if a vehicle's engine hour meter on a low-use vehicle has been replaced, changed, or altered in any way.

These provisions would not require fleets to significantly change their current reporting and compliance requirements.

- Fleets will be prohibited from adding a vehicle with a Tier 0 engine and designating it as a dedicated snow removal vehicle, a vehicle used for emergency operations, or a job corps vehicle. In the last three reporting years (2019-2022), about forty Tier 0 vehicles were added to fleets for these operations. Fleets would still be allowed to add used vehicles with Tier 1 or newer engines to their fleets for these operations, so there would be no technical or availability challenges with this provision.

Beginning January 1, 2024, for medium and large fleets and January 1, 2029, for small fleets:

- Extended annual reporting requirements. The Current Regulation requires fleets to report annually to CARB until they meet their final fleet average target. The Proposed Amendments extend this reporting through 2036.

Several of the provisions discussed above have not been included in the cost analysis, either because the provisions will not pose additional costs to fleets, or because the provisions are voluntary and we cannot predict their usage or expect their impact on costs and benefits to be minimal, so they have not been included in the compliance modeling. These provisions are:

- Renewable diesel—CARB staff believe there will not be additional costs associated with these requirements,¹⁸ with the exception of the additional reporting requirements for fleets using the low-temperature exemption, because RD prices in California have historically been found to be similar to conventional diesel prices,^{19, 20} generally due to credits generated through the Low Carbon Fuel Standard (LCFS);
- Optional zero-emission compliance flexibility—this is a voluntary provision and CARB cannot predict its use and has omitted its use in the compliance modeling;
- Request of a replacement emission control label—engine—manufacturers are already required to provide a replacement emission control label, and are currently doing so at no additional cost to the vehicle owner; and

¹⁸ There could be limited permitting of fuel storage tanks required as fleets convert from fossil diesel to RD. This would be limited to Eastern Kern Air Pollution Control District (Eastern Kern APCD) when RD exceeds the specific gravity exemption threshold. CARB did not assess the direct costs of these new permits since data is not available on how many of these permits would need to be issued. However, in the interest of full disclosure, the permit holder's cost for a fuel storage tank permit requires an initial permitting fee of \$400 with subsequent annual permitting fees retain ranging from \$151 to \$363. Eastern Kern APCD estimates that there could be up to 30 storage tanks that may need permitting (phone conversation on February 28, 2023). This could result in a one-time cost of \$12,000 in 2023 and an average ongoing cost of \$7,710. This represents less than 0.01 percent of the total net cost of the regulation.

¹⁹ U.S. Department of Energy. (2019- 2022). Clean Cities Alternative Fuel Final Report October 2019- April 2022. Retrieved from [Alternative Fuels Data Center: Publications \(energy.gov\)](https://www.energy.gov/alternative-fuels-data-center/publications).

²⁰ U.S. Department of Energy. (2022). Clean Cities Alternative Fuel Final Report January 2022 - October 2022. Alternative Fuels Data Center. Retrieved from [Alternative Fuels Data Center: Publications \(energy.gov\)](https://www.energy.gov/alternative-fuels-data-center/publications).

- Low-use changes—these provisions would not require fleets to significantly change their current reporting and compliance requirements, and, for this reason, are not expected to impact the benefit and cost analyses of the Proposed Amendments.

Changes Since the ISOR

Since the release of the Staff Report: Initial Statement of Reasons (ISOR)²¹ on September 20, 2022, staff updated our economic modeling to match the latest forecasts and data, and the Proposed Amendments have been updated.

The Regional Economic Models, Inc. (REMI) Policy Insight Plus Version 3.0.0 is used to estimate the macroeconomic impacts of the Proposed Amendments on the California economy. The REMI model's National and Regional Control was updated to conform to the most recent California Department of Finance economic forecasts which include U.S. Real Gross Domestic Product, income, and employment, as well as California civilian employment by industry, released with the 2023-2024 Governor's Budget on January 10, 2023, and Department of Finance demographic forecasts for California population forecasts, last updated in July 2021.^{22,23,24,25} After the Department of Finance's economic forecasts end in 2026, CARB staff made assumptions that post-2026 economic variables would continue to grow at the same rate as those projected in the REMI baseline forecasts.

On April 10, 2023, CARB staff released a Notice of Public Availability of Modified Text and Availability of Additional Documents and Information for proposed 15-day changes to the Proposed Amendments. As a result of the 15-day changes, the total net cost of the Proposed Amendments from 2023 to 2036 is estimated to be \$1.97 billion compared to \$1.94 billion in the ISOR. A summary of the 15-day changes is provided below. The changes are as follows:

²¹ CARB (2022). Amendments to the In-Use Off-Road Diesel-Fueled Fleets Regulation Staff Report: Initial Statement of Reasons. [Public Hearing to Consider Proposed Amendments to the In-Use Off-Road Diesel-Fueled Fleets Regulation Staff Report: Initial Statement of Reasons \(ca.gov\)](#).

²² California Department of Finance. (2022). National Economic Forecast – Annual & Quarterly. November 2022. California Department of Finance Economic Research Unit. Retrieved January 11, 2023, from <https://dof.ca.gov/wp-content/uploads/Forecasting/Economics/Documents/United-States-Economic-Forecast-GB-2023-24.xlsx>.

²³ California Department of Finance. (2022). California Economic Forecast – Annual & Quarterly. November 2022. California Department of Finance Economic Research Unit. Retrieved January 11, 2023, from <https://dof.ca.gov/wp-content/uploads/Forecasting/Economics/Documents/California-Economic-Forecast-GB-2023-24.xlsx>.

²⁴ California Department of Finance. (2022c). National Deflators: Calendar Year averages: from 1929, April 2021. November 2022. California Department of Finance Economic Research Unit. Retrieved January 11, 2023, from <https://dof.ca.gov/wp-content/uploads/Forecasting/Economics/Documents/Implicit-Price-Deflators-CY.xlsx>.

²⁵ California Department of Finance. (2021). Report P-3: Population Projections, California, 2010-2060 (Baseline 2019 Population Projections; Vintage 2020 Release). July 2021. California Department of Finance. Retrieved January 11, 2023, from https://dof.ca.gov/wp-content/uploads/Forecasting/Demographics/Documents/P3_Complete.zip.

- Updated the definition of emergency operations to clarify that public and private entities would be considered essential service utilities for activities that are considered emergency operations. Added broadband as an entity that would be considered essential service utilities for activities that are considered emergency operations. These changes have no impact on the total estimated cost of the Proposed Amendments.
- Removed the requirements that new vehicles beginning on January 1, 2028, would have to be California certified or certified to a California-equivalent standards. These changes have no impact on the total estimated cost of the Proposed Amendments.
- Added the ability to exempt fleets from the Tier 4 Interim vehicle adding requirements if Tier 4 Final technology is not available. This provides CARB the ability to grant compliance flexibility in situations where Tier 4 Final vehicles are not available by allowing fleets to add Tier 4 Interim vehicles in these situations. These changes have no impact on the total estimated cost of the Proposed Amendments.
- Extended the annual reporting requirements through 2036 for all fleets. The Current Regulation requires all fleets to complete an annual report until specified dates or until the fleet meets their final fleet average target, whichever is later. Additionally, the Current Regulation requires fleets with low-use vehicles to continue to complete annual reports while those vehicles remain in the fleet. The Proposed Amendments extend the annual reporting requirements through 2036. The costs of this additional reporting are described in Section B of the Economic Impact Statement and were added to Alternative 1 and Alternative 2.
- Added flexibility allowing a fleet that is unable to take photographic evidence of low-use hour meter readings due to military security reasons to keep a written log as an alternative recordkeeping method. These changes have no impact on the total estimated cost of the Proposed Amendments.
- Several changes were made to the RD requirements of the Proposed Amendments. These are as follows:
 - Added two exemptions to the RD requirements for fleets, fleet portions, or vehicles operating in cold temperatures. This change was necessary because comments were made during the 45-day comment period that demonstrated potential performance issues when using RD at cold temperatures. The exemptions are as follows:
 - The first exemption allows for fleets to procure and use low temperature-specific diesel fuel during the months of November, December, January, and February if a fleet, fleet portion, or vehicle is located or operated in a location where the 10th percentile minimum ambient air low temperature in January drops below 20 degrees Fahrenheit (20°F). This exemption allows for fleets to procure the appropriate fuel for low-temperature operations. Use of this exemption requires reporting to CARB on the location of the fleet or operations, the temperature, and volumes of fuel used during the exemption time period. This reporting is necessary to ensure the effectiveness of the RD requirements and that

CARB receives appropriate data regarding the actions of the fleets utilizing this exemption to verify compliance with the Off-Road Regulation. CARB updated the benefits and costs analysis to incorporate the use of this exemption in areas likely to meet the temperature threshold established in the exemption. The costs of this exemption are described in Section B of the Economic Impact Statement. The use of this exemption was also modeled and updated in Alternative 2. This was not modeled for Alternative 1 because this Alternative does not include the requirements to use and procure RD.

- The second exemption allows for fleets to procure and use low-temperature specific diesel fuel where the temperature drops below 20°F or is forecast to drop below 20°F for the period of days in which the low-temperature condition(s) occurs. This exemption is targeted for cold weather events that cannot be anticipated by normal weather patterns. This exemption is only to be used on rare occasions when cold weather conditions occur outside the defined months in locations eligible for the first exemption or when cold weather conditions occur in areas not eligible for the first exemption. Since this exemption is dependent on actual weather events that cannot be predicted, use of this exemption is uncertain and expected to be rare; therefore, CARB expects this exemption to have minimal impact and did not quantify the benefits impact or the costs associated with the reporting requirements of this exemption.
- Added language allowing vehicles that operate in captive attainment regions to be exempted from the RD requirements, in addition to fleets specifically designated as captive attainment area fleets. In the cost and benefits analysis completed for the ISOR, CARB did not assume any benefits or costs associated with using RD in captive attainment areas, therefore these changes have no impact on the total estimated cost of the Proposed Amendments.
- Added clarifying language that the RD requirements are to “procure” and “use this fuel” in all vehicles subject to the Off-Road Regulation. This aligns with updated recordkeeping requirements clarifying that fleets need to maintain records of fuel procurement for each vehicle in their fleets. These changes meet the intent of the original proposal and have no impact on the total estimated cost of the Proposed Amendments.
- Updated the name of the Zero-Emission Transition Application to Zero-Emission Technology Application (ZETA) to better represent the intent of the Alternate Compliance Pathway through Zero-Emission Technology. Made clarifying changes to remove any ambiguity regarding the process CARB will follow for approval or disapproval of a ZETA. Additionally, this compliance flexibility was updated with an option for vehicles operating at a single facility to participate. CARB did not analyze costs or benefits from this compliance flexibility because this is a voluntary provision and CARB expects cost and benefit impacts to be minimal.

- Minor changes: These include changes such as formatting changes, modifications to definitions for clarity, the incorporation of documents by reference, and additional clarity on the submittal of documents to CARB. These changes have no impact on the total estimated costs of the Proposed Amendments.

Economic Impact Statement

A.3. Businesses Impacted

The Off-Road Regulation applies to any person, business or government agency who owns or operates applicable vehicles within California. While some of these entities may be domiciled outside of California, the Off-Road Regulation and the Proposed Amendments apply to specified vehicles owned or operating within California. A fleet reported to CARB for the Off-Road Regulation means all off-road vehicles and engines owned by a person, business, or government agency that are operated within California and are subject to the Off-Road Regulation. For the purpose of the costs analysis reported on Form 399, CARB assumes that all non-governmental fleets are businesses and that, because the Off-Road Regulation does not apply to off-road diesel vehicles owned and operated by an individual for personal, non-commercial, and non-governmental purposes, individuals will not have direct costs. Table 1 displays the number of individual fleets that are reported to CARB and are subject to the Off-Road Regulation as of February 2023, inclusive of private business and State, federal, and local fleets. As of February 2023, there are currently 12,040 business²⁶ fleets with vehicles subject to the Off-Road Regulation reported to CARB, of which 6,414 have a total horsepower of less than 500 horsepower (ultra-small fleet).

For the purpose of the cost analysis reported on the Form 399, a small business is defined as an ultra-small, off-road diesel vehicle fleet. Fleets meeting the ultra-small fleet definition have the option of complying with the small fleet requirements or with the less stringent ultra-small fleet requirements of the Proposed Amendments. It is likely that some fleets not categorized as ultra-small fleets could be considered "small," especially fleets that fall into the small or medium fleet definition of the Off-Road Regulation; however, for the purpose of this cost analysis, only ultra-small fleets are included as "small businesses." Ultra-small fleets typically operate only a few small- or medium-horsepower vehicles and generally do not operate high-horsepower equipment. The businesses operating these vehicles predominantly employ fewer than 100 employees. Vehicles owned by these fleets tend to be older than those owned by large and medium fleets and are usually purchased as used vehicles.

The Proposed Amendments address emissions from a wide variety of off-road diesel vehicles owned by businesses operating in several different industries in California. The construction industry uses the highest number of off-road diesel vehicles in California, but these types of vehicles are also used by industries such as airlines, mining, equipment rental, oil and gas

²⁶ This total excludes state, federal, and local fleets reported to CARB which are included in Table 1.

drilling, and the industrial sector. The industrial sector using these vehicles includes facilities, including both wholesale and retail distribution points, throughout the State. Forklifts, cranes and other tractors are used at such facilities in manufacturing, and to distribute raw materials and finished products. The industrial sector includes a wide variety of business types, such as recycling facilities, landfills, refineries, power plants, retail and wholesale goods distribution, utility services, golf courses, ski resorts, sewage treatment plants, landscape materials, and factories. Government agencies also use these vehicles for road maintenance, lawn and tree care for recreational spaces, and other activities. Table 4 displays the industries and associated North American Industry Classification System (NAICS)²⁷ code impacted by the Proposed Amendments, as well as each industry's share of the percentage of the total vehicle population.²⁸ The Off-Road Regulation does not require fleets to report the industry in which they operate, so CARB staff assumes these industries are equally represented among the different fleet sizes, with the exception of State and federal fleets, which are required to comply with the large fleet requirements.

Table 4. Industries Impacted by the Proposed Amendments

Industry	NAICS Code	Percent of Vehicle Population
Mining, quarrying, and oil and gas extraction	21	10%
Construction	23	53%
Air transportation	481	3%
Commercial and industrial machinery and equipment rental and leasing	5324	15%
Waste management and remediation services	562	4%
Services to buildings and dwellings	5617	5%
Commercial and industrial machinery and equipment (except automotive and electronic) repair and maintenance	8113	5%
State Government	N/A	1%
Local Government	N/A	3%
Federal Civilian	N/A	1%
Total	N/A	100%

²⁷ U.S. Census Bureau. (2022). 2022 North American Industry Classification System (NAICS). Retrieved April 7, 2022, from [North American Industry Classification System \(NAICS\) U.S. Census Bureau](#).

²⁸ CARB. (2007). Technical Support Document: Proposed Regulation for In-Use Off-Road Diesel Vehicles. Retrieved from [TSD FINAL \(ca.gov\)](#).

A.4. Business Creation and Elimination

The Proposed Amendments are not expected to directly result in business creation or elimination. Ample consideration was given to the effects of these amendments and stakeholders were consulted to ensure compliance was possible without presenting undo harm to any one industry. As discussed later in this document, the cost impacts to a typical business are minimal when compared to typical industry revenue.

REMI Policy Insight Plus Version 3.0.0 is used to estimate the macroeconomic impacts of the Proposed Amendments on the California economy. Although the REMI model cannot directly estimate the creation or elimination of businesses, the model does predict changes in the number of jobs and output in the California economy. Such predictions can be used to understand some of the potential impacts to businesses, which are discussed in the next section. Initially, California will see job losses, but the overall impact will be a slight growth in employment, which suggests that the Proposed Amendments will have a minimal impact on business operations. However, as off-road fleets and regulated entities face compliance costs, the potential for some of these businesses to be eliminated cannot be ruled out.

Section A.6. Job Creation or Elimination of the Economic Impact Statement describes the statewide employment impacts of the Proposed Amendments. The overall jobs and output impacts are small relative to the total California economy. The largest employment and output decline in the State is estimated to be about 0.05 percent in 2027. Reductions in output could indicate the elimination of businesses. Within the primary industries impacted, mining, construction, and commercial and industrial machinery and equipment repair and maintenance are estimated to see the greatest negative impact in 2027, with an approximate 0.2 percent decrease in employment relative to baseline employment in 2027 (See Table 6). Conversely, increased output within an industry could signal the potential for additional business creation if existing businesses cannot accommodate all future demand. There is no threshold that identifies the creation or elimination of business. The overall net loss of 35,299 jobs over the lifetime of the Proposed Amendments results in a decrease of approximately 0.01 percent when compared to the employment levels of California overall which suggests very little impact on business operations.

A.6. Job Creation or Elimination

The Proposed Amendments are estimated to have a marginally negative impact on statewide employment from 2023 to 2031, and then a positive impact on statewide employment from 2032 to 2038, when compared to the baseline.

The results suggest that the estimated negative employment impact for the initial years is primarily from increased production costs due to increases in vehicle purchase costs, maintenance costs, and contracting costs as a result of the Proposed Amendments in the industries described in Table 4. This is caused by the Proposed Amendments' requirement to accelerate the replacement or retirement of vehicles with older engine Tiers between 2023

and 2031, which accelerates natural turnover that likely would have happened after 2031. The decrease in vehicle capital investment and production costs after 2031 results from the vehicle purchases and replacements that have happened in earlier years in the time period between 2023 to 2038. Overall, the change in total employment is anticipated to be small, relative to the baseline employment for the California economy. The year with the largest employment change is 2027, which represents a 0.05 percent decrease relative to baseline California employment.

Section A.6 of the Economic Impact Statement reports the increase and the decrease in jobs in 2038, the final year of the analysis timeframe. In 2038, the Proposed Amendments are estimated to add 3,490 jobs and eliminate 18 jobs. The number of jobs created and eliminated from 2023 to 2038 are presented in Table 5 by year, as well as the net change for each year when compared to the baseline employment in California.

Table 5. Jobs Created and Eliminated by Year

Year	Jobs Created	Jobs Eliminated	Net Change	% Change
2023	1,308	-4,035	-2,727	-0.01%
2024	59	-9,446	-9,387	-0.04%
2025	173	-10,519	-10,346	-0.04%
2026	44	-12,472	-12,428	-0.05%
2027	243	-13,298	-13,055	-0.05%
2028	51	-8,645	-8,594	-0.03%
2029	76	-6,482	-6,406	-0.02%
2030	77	-3,034	-2,958	-0.01%
2031	627	-2,005	-1,378	-0.01%
2032	3,852	-366	3,486	0.01%
2033	4,444	-117	4,328	0.02%
2034	5,835	-47	5,788	0.02%
2035	5,473	-26	5,447	0.02%
2036	5,157	-30	5,127	0.02%
2037	4,352	-23	4,330	0.02%
2038	3,490	-18	3,472	0.01%

The overall trend in employment changes by major sector is illustrated in Figure 2. Some major sectors will see gains in employment growth, while other major sectors may see decreases in employment growth. The construction and services sectors are estimated to make up the largest proportion of job increases and decline. Because the construction sector represents more than 50 percent of the total off-road diesel vehicle population under the Proposed Amendments, this sector experiences the lion's share of the employment change. The services sector, which also sees significant job impacts, includes the following industries

that are directly affected by the Proposed Amendment: services to buildings and dwellings, waste management and remediation services, commercial and industrial machinery and equipment repair and maintenance, and office administrative services and facilities support services.

Figure 2. Changes in Employment by Major Sector due to the Proposed Amendments

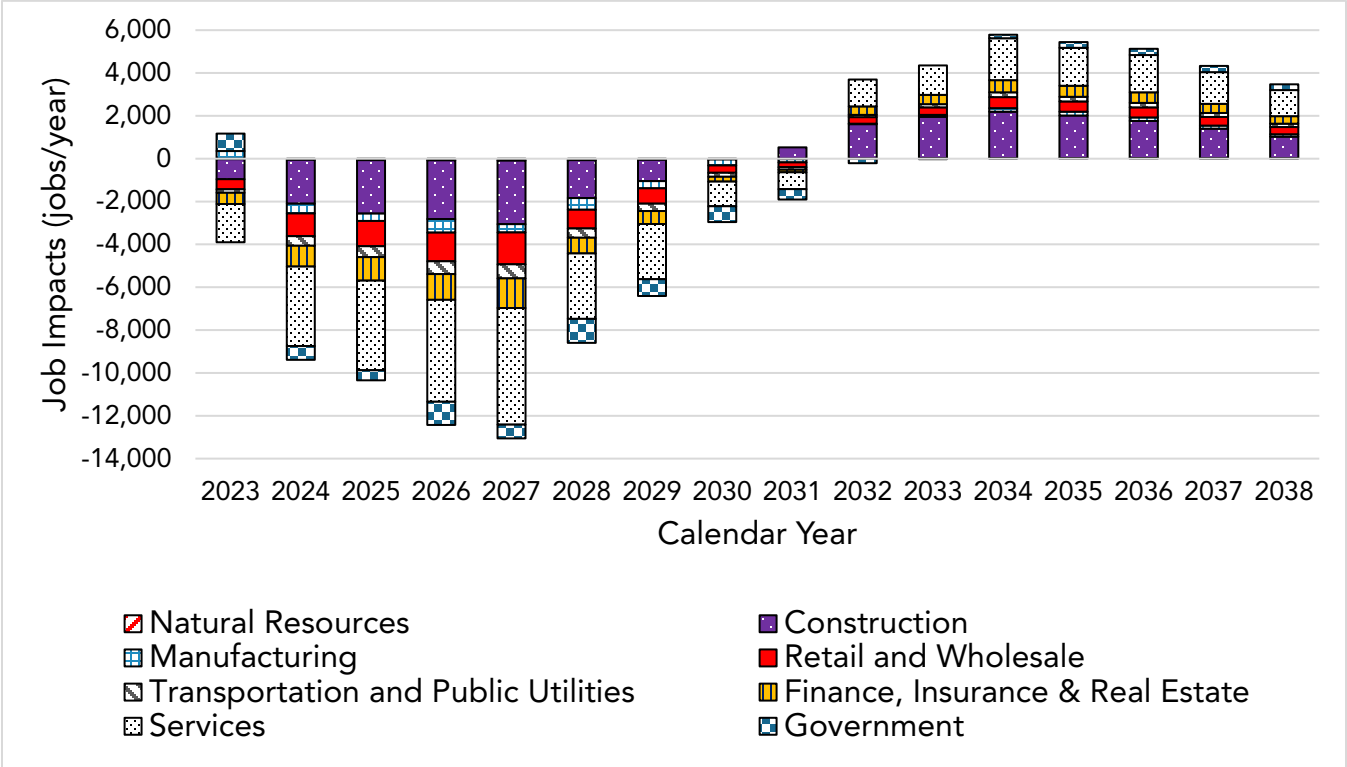


Table 6 shows the changes in employment by industries that are directly impacted by the Proposed Amendments. Of these directly-impacted industries, mining, construction, and commercial and industrial machinery and equipment repair and maintenance are estimated to see the greatest impacts on employment, with an approximately 0.2 percent decrease in baseline employment in 2027.

Table 6. Employment Impacts by Industry

	Mining (21)		Construction (23)		Air transportation (481)		Commercial and industrial machinery and equipment rental and leasing (5324)		Services to buildings and dwellings (5617)		Waste management and remediation services (562)		Commercial and industrial machinery and equipment (except automotive and electronic) repair and maintenance (8113)		State and Local Government	
Year	Change in Jobs	% Change	Change in Jobs	% Change	Change in Jobs	% Change	Change in Jobs	% Change	Change in Jobs	% Change	Change in Jobs	% Change	Change in Jobs	% Change	Change in Jobs	% Change
2023	-23	-0.07%	-928	-0.07%	-35	-0.05%	-10	-0.03%	-83	-0.02%	-7	-0.01%	-16	-0.05%	815	0.04%
2024	-44	-0.13%	-2,045	-0.16%	-49	-0.07%	-22	-0.07%	-194	-0.04%	-25	-0.04%	-35	-0.11%	-637	-0.03%
2025	-58	-0.17%	-2,493	-0.19%	-59	-0.08%	-28	-0.09%	-217	-0.05%	-29	-0.05%	-48	-0.15%	-472	-0.02%
2026	-66	-0.20%	-2,740	-0.20%	-61	-0.08%	-34	-0.10%	-248	-0.06%	-36	-0.06%	-59	-0.18%	-1,079	-0.05%
2027	-80	-0.24%	-2,970	-0.22%	-75	-0.10%	-40	-0.12%	-276	-0.06%	-39	-0.06%	-73	-0.23%	-643	-0.03%
2028	-62	-0.18%	-1,769	-0.13%	-37	-0.05%	-31	-0.09%	-168	-0.04%	-31	-0.05%	-63	-0.20%	-1,120	-0.05%
2029	-52	-0.15%	-994	-0.07%	-34	-0.05%	-26	-0.08%	-137	-0.03%	-25	-0.04%	-58	-0.18%	-781	-0.03%
2030	-35	-0.10%	-3	0.00%	-16	-0.02%	-18	-0.05%	-67	-0.02%	-17	-0.03%	-46	-0.14%	-736	-0.03%
2031	-25	-0.07%	529	0.04%	-13	-0.02%	-13	-0.04%	-43	-0.01%	-12	-0.02%	-38	-0.12%	-489	-0.02%
2032	-3	-0.01%	1,612	0.12%	12	0.02%	-1	0.00%	56	0.01%	1	0.00%	-19	-0.06%	-210	-0.01%
2033	8	0.02%	1,941	0.14%	13	0.02%	5	0.01%	69	0.02%	5	0.01%	-8	-0.03%	-24	0.00%
2034	18	0.05%	2,174	0.15%	20	0.03%	10	0.03%	99	0.02%	11	0.02%	4	0.01%	163	0.01%
2035	21	0.06%	1,991	0.14%	19	0.03%	12	0.03%	93	0.02%	12	0.02%	10	0.03%	269	0.01%
2036	23	0.07%	1,736	0.12%	19	0.03%	13	0.04%	91	0.02%	13	0.02%	15	0.05%	289	0.01%
2037	23	0.07%	1,379	0.10%	17	0.03%	13	0.03%	78	0.02%	12	0.02%	18	0.05%	292	0.01%
2038	21	0.06%	1,006	0.07%	15	0.02%	12	0.03%	65	0.01%	11	0.02%	19	0.06%	269	0.01%

B. Estimated Costs

The Proposed Amendments will result in direct cost impacts to fleets, as well as to contracting entities. The total cost of the Proposed Amendments on businesses is estimated to be \$3.14 billion from years 2023 through 2038. The net cost, which includes cost-savings, of the Proposed Amendments is estimated to be approximately \$1.86 billion from years 2023 through 2038. The direct costs include capital costs for new Tier 4 final off-road diesel vehicles and used Tier 4 final off-road diesel vehicles, annual costs for the maintenance of Tier 4 final vehicles, and contracting and signage costs for prime contractors.

The Proposed Amendments also have direct costs to federal, State, and local governments, which are quantified separately in the Fiscal Impacts Section. For the purpose of the analysis of costs to businesses, all costs attributed to contracting requirements for public works awarding bodies are assumed to apply to State and local governments and are not reported in Section B of the 399 Economic Impact Statement. CARB staff estimates that 5 percent of applicable vehicles are owned and operated by federal, State, and local governments (Table 4); vehicle and maintenance costs associated with these vehicles are not reported in Section B of the 399 Economic Impact Statement. CARB assumes that all costs to fleets and prime contractors are costs to businesses.

The assumptions underlying the direct costs are detailed in the sections below. All estimates for annual off-road diesel vehicle populations are from the 2022 Statewide In-Use Off-Road Emissions Inventory Model (off-road inventory), excluding vehicles designated as low-use. All estimated costs are in 2020 dollars (2020\$), unless otherwise specified.

Off-Road Diesel Vehicle Costs

The Proposed Amendments require fleets to remove their Tier 0, 1, and 2 vehicles from operation in California. This requirement is phased in based on fleet size. CARB staff analyzed the affected off-road diesel vehicle population for the three different fleet sizes (small, medium, and large) in the off-road inventory. CARB analyzed two sets of probabilities, one for large fleets, and one for medium and small fleets, for six compliance pathways, based on responses to CARB's Fleet Cost and Compliance Survey.²⁹ The six compliance pathways identified are:

1. Retiring off-road diesel vehicles and replacing them with new Tier 4 final vehicles,

²⁹ In October 2021, staff developed a survey to help CARB better understand how off-road vehicles are purchased and other costs that stakeholders may incur as a result of the potential amendments to the Off-Road Regulation. The survey was developed at the request of stakeholders. The survey consisted of two parts: a questionnaire worksheet that included questions regarding vehicle purchasing behavior, vehicle purchasing mechanisms, fuel use, selling of old vehicles, and other questions to better understand how the proposed concept would impact fleets, and a purchasing data worksheet that requested detailed cost information on recent vehicle acquisitions.

2. Retiring off-road diesel vehicles and replacing them with used Tier 4 final vehicles (5-year-old),
3. Retiring off-road diesel vehicles and not replacing them,
4. Designating off-road diesel vehicles as low-use and purchasing new Tier 4 final vehicles,
5. Designating off-road diesel vehicles as low-use and purchasing used Tier 4 final vehicles (5-year-old), and
6. Designating off-road diesel vehicles as low-use and not purchasing any other vehicles.

To determine the costs of the vehicles, CARB staff divided off-road vehicles into eight different horsepower groups. These groups were established based on the phase-in of the Tier standards by horsepower. The cost of new Tier 4 final off-road diesel vehicles was estimated based on stakeholder survey input, data gathered from grants for new Tier 4 final vehicles funded by the Carl Moyer Memorial Air Quality Standards Attainment Program between the years of 2015 through 2021, and cost data provided by the Construction Industry Air Quality Coalition (CIAQC) in 2018, as shown in Table 7, converted to 2020 dollars. The cost of used, five-year-old Tier 4 final off-road diesel vehicles was estimated based on vehicle auction³⁰ data from the years 2019, 2020, and 2021. Table 8 displays the estimated cost of vehicles used in the cost analysis, by horsepower group.

Table 7. New Vehicle Cost Data by Source

Engine hp Group Number	Minimum hp	Maximum hp	Average Survey Cost Data	Average Carl Moyer Cost Data	CIAQC Cost Data
1	25	49	\$61,172	\$49,179	\$57,584
2	50	74	\$75,496	\$80,829	\$104,699
3	75	99	\$105,618	\$120,427	\$130,874
4	100	174	\$175,380	\$183,853	\$167,518
5	175	299	\$288,315	\$358,619	\$314,097
6	300	599	\$659,153	\$771,161	\$785,242
7	600	749	\$912,670	\$1,738,621	\$1,046,989
8	750	9999	\$1,529,102	\$1,613,170	\$1,884,580

³⁰ CARB Staff collected data by recording sale prices at vehicle auctions that took place in Northern and Southern California.

Table 8. Engine Horsepower (hp) Groups and New and Used Tier 4 Final Vehicle Costs

Engine hp Group Number	Minimum hp	Maximum hp	Average New Tier 4 final cost	Used Tier 4 final cost
1	25	49	\$55,978	\$16,828
2	50	74	\$87,008	\$32,823
3	75	99	\$118,973	\$37,788
4	100	174	\$175,583	\$62,173
5	175	299	\$320,343	\$128,175
6	300	599	\$738,519	\$124,538
7	600	749	\$1,232,760	\$168,222
8	750	9999	\$1,675,618	\$869,249

As described above, CARB staff identified six likely compliance pathways used to analyze direct costs for fleets. Based on responses to the survey, each compliance pathway was assigned a fraction based on the likelihood of it being chosen by a fleet of a specific size. Table 9 displays the fraction allocated to each compliance pathway, by fleet size.

Table 9. Compliance Pathways with Probability Fractions by Fleet Size

Fleet Size	Retired /Replaced with new Tier 4 final	Retired /Replaced with used Tier 4 final	Retired /Not replaced	Low-use /Replaced with new Tier 4 final	Low-use /Replaced with used Tier 4 final	Low-use /Not replaced
Large	0.779	0.051	0.047	0.058	0.004	0.062
Medium and Small	0.537	0.102	0.120	0.101	0.019	0.120

For each year of the analysis, staff calculated the number of vehicles that would be removed from operation (vehicle turnover population) in California for both the baseline and the Proposed Amendments. The baseline turnover accounts for the vehicles that would be removed from the fleet due to the Off-Road Regulation, as well as natural attrition, i.e., what would happen in the absence of the Proposed Amendments. These vehicle turnover populations were calculated for each fleet size and engine hp group identified in Table 8. The analysis for costs begins in the calendar year 2023 since the first compliance date for the Proposed Amendments is January 1, 2024, so fleets would need to take action in 2023 to comply. The resulting vehicle population was then multiplied by the compliance path fraction in Table 9, and then by the new or used vehicle cost in Table 8. To accommodate the delayed phase-out of Tier 2 engines in ultra-small fleets until January 1, 2036, staff adjusted the vehicle turnover populations for the Proposed Amendments for each engine hp group to keep 35 percent of small-fleet Tier 2 vehicles that would have been phased out January 1, 2032, in the statewide fleet until January 1, 2036. The resulting vehicle population portions were then separately multiplied by the compliance path fractions, as discussed above. The baseline vehicle capital cost was then subtracted from the Proposed

Amendments' vehicle capital cost and then sales tax was applied to this difference to obtain the incremental vehicle capital cost. The incremental vehicle capital costs inclusive of sales tax are shown in Table 10. Sales tax is further discussed below.

The incremental vehicle capital cost is positive in years where the cost of the Proposed Amendments is larger compared to the baseline, and negative in years where the baseline has a larger capital cost. Incremental vehicle capital costs are amortized over five years at 5 percent interest. The unamortized costs show a pattern of positive and negative costs, which primarily reflect the implementation of the Tier phase-out. The baseline has larger capital costs in years where some portion of the baseline turnover population was turned over in a previous year due to implementation of the Proposed Amendments. For example, a Tier 0 in a large fleet may be turned over in 2024 under the baseline scenario, but the Proposed Amendments would require that vehicle be turned over in 2023.

Finally, while fleets would most likely be able to recoup some costs by selling the retired or replaced vehicle on the used market, and while CARB staff does have data on resale values from past auctions, CARB staff decided to omit these possible recouped costs from this analysis due to the amount of uncertainty arising from the numerous factors that would impact the amount that could be recouped, including the effect of the Tier phase-out, transportation costs, and condition of the vehicle, among other factors, that may deteriorate the value of the vehicle in the future. The costs in Table 10 are, therefore, a high-end estimate of vehicle capital costs, and account for the full replacement costs associated with the Proposed Amendments.

Table 10. Incremental Vehicle Capital Cost, Inclusive of Sales Tax³¹

Year	Vehicle Capital Cost (unamortized)	Vehicle Capital Cost (amortized)
2023	\$1,645,750,962	\$380,126,996
2024	(\$109,653,969)	\$354,799,693
2025	\$519,441,797	\$474,777,657
2026	(\$164,604,372)	\$436,758,196
2027	\$868,363,285	\$637,328,230
2028	(\$293,045,854)	\$189,515,027
2029	\$80,361,576	\$233,403,829
2030	(\$258,173,290)	\$53,794,341
2031	(\$103,856,776)	\$67,825,505
2032	(\$226,713,321)	(\$185,109,593)
2033	(\$200,178,727)	(\$163,659,627)
2034	(\$179,161,037)	(\$223,602,810)
2035	(\$107,195,704)	(\$188,730,793)
2036	(\$140,404,324)	(\$197,172,355)
2037	(\$119,614,515)	(\$172,435,230)

³¹ Note that totals may not sum due to rounding.

Year	Vehicle Capital Cost (unamortized)	Vehicle Capital Cost (amortized)
2038	(\$103,217,850)	(\$150,039,711)
Total Net Costs	\$1,108,097,883	\$1,547,579,355
Total costs	\$3,113,917,620	\$2,828,329,475
Total savings	(\$2,005,819,737)	(\$1,280,750,120)

Sales Tax

Sales tax is an additional cost levied on the purchase of an off-road diesel vehicle, so off-road diesel vehicles purchased in California incur a sales tax on top of the purchase price. Sales tax is based on the purchase price of an off-road diesel vehicle. Sales tax is higher for units that would be purchased to comply with the Proposed Amendments, due to their higher capital costs. The sales tax varies across the State, from a minimum of 7.25 percent up to 10.5 percent in some municipalities. For this analysis, staff used a value of 8.74 percent, which is a weighted average based on county-level output.^{32, 33} Staff applied the additional sales tax cost to the capital cost for off-road diesel vehicles based in California. This results in higher costs, equivalent to the sales tax, for California-based off-road diesel fleets and higher revenue for local and State governments (discussed in the Fiscal Impact Statement).

Maintenance Costs

Typical off-road vehicles require annual maintenance. While most engine Tiers have similar maintenance costs, Tier 4 final engines have additional emission controls that require ongoing maintenance on top of the maintenance already required for the other engine Tiers. To achieve the Tier 4 final emission standards, engine manufacturers introduced diesel particulate filters (DPF) on about 50 percent of the engines certified by CARB, as well as selective catalytic reduction, which requires the use of diesel exhaust fluid (DEF). The amount of DEF consumed is, on average, between 2 to 3 percent of the diesel fuel consumed. CARB staff assumed a 3 percent consumption rate, at an average price of \$4.00 per gallon, for DEF. The percentage and price were then multiplied by the average fuel used (in gallons) per vehicle, which was multiplied by the projected population of Tier 4 final vehicles in each hp group for each year. DPFs also require annual cleanings, at an average cost of \$475 per unit. To calculate the cost of DPF cleanings, 50 percent of the Tier 4 final population in each hp group per year was multiplied by the average cleaning cost. This analysis was completed for both the baseline and the Proposed Amendments. The baseline represents the Tier 4 final vehicles that would have been added to fleets in the absence of the Proposed Amendments. The difference of the baseline costs subtracted from the Proposed Amendments results in

³² County-level output derived from Regional Economic Models, Inc. (REMI) Policy Insight Plus. Output is defined as the amount of production, including all intermediate goods purchased as well as value added (compensation and profit). Can also be thought of as sales or supply. The components of Output are Self Supply and Exports (Multiregions, Rest of Nation, and Rest of World).

³³ California Department of Tax and Fee Administration. (2022). California City & County Sales & Use Tax Rates, April 1, 2022. Retrieved February 22, 2023, from [California City & County Sales & Use Tax Rates](#).

incremental costs, for both DEF purchases and DPF cleaning, which are displayed in Table 11.

Table 11. Incremental Off-Road Diesel Vehicle Tier 4 Maintenance Cost of Proposed Amendments over Baseline for Businesses

Year	Maintenance DPF Cost	Maintenance DEF Cost
2023	\$0	\$0
2024	\$775,473	\$1,045,233
2025	\$775,473	\$1,045,233
2026	\$1,271,397	\$1,486,592
2027	\$1,271,397	\$1,486,592
2028	\$2,383,728	\$2,231,245
2029	\$2,383,728	\$2,231,245
2030	\$2,869,273	\$2,480,430
2031	\$2,869,273	\$2,480,430
2032	\$3,139,572	\$2,586,695
2033	\$3,139,572	\$2,586,695
2034	\$3,139,572	\$2,586,695
2035	\$3,139,572	\$2,586,695
2036	\$3,283,972	\$2,643,355
2037	\$3,283,972	\$2,643,355
2038	\$3,283,972	\$2,643,355
Total³⁴	\$37,009,946	\$32,763,847

Costs for Prime Contractors

The Proposed Amendments include new requirements to ensure that prime contractors only hire compliant fleets, maintain appropriate records, report observed non-compliance, and prominently display information regarding the Off-Road Regulation. These new requirements are explained in further detail in the summary of the Proposed Amendments, under Contracting Requirements and Prime Contractor Requirements, and would cause prime contractors to incur an additional cost. CARB assumes that all prime contractors are businesses. CARB analyzed the cost for Prime Contractor cost in two parts: (1) contracting costs related to obtaining and retaining Certificates of Reported Compliance and hiring of compliant fleets, and (2) signage costs. CARB did not analyze costs associated with the reporting of observed non-compliance, since this should be non-substantive if the prime contractor is complying with the proposed new requirements to obtain a fleet's Certificate of Reported Compliance from the fleet prior to awarding the fleet a contract, and to only hire those fleets that have a valid Certificate of Reported Compliance.

³⁴ Note that total may not sum due to rounding.

Contracting Costs

To estimate these potential costs to prime contractors³⁵, CARB staff analyzed three key factors: (1) the number of projects in California that would include a prime contractor, (2) the number of hours needed by a prime contractor staff person to verify compliance and maintain records, and (3) the job classification and labor rate of the prime contractor staff person who would most likely be performing this work.

CARB staff could not find data showing the number of projects that would involve a prime contractor, so CARB staff used the best available data that could be used to estimate this number. To estimate the number of projects that would involve a prime contractor, CARB staff first used the California Department of Finance's Annual Data of Residential Units and Valuation,³⁶ and found that in 2019, California had 111,284 new residential units under construction. Approximately half of these units were part of multi-family housing projects (as seen in the Department of Finance data). CARB staff assumed that multi-family housing projects would include multiple units constructed under a single project and involve only a single prime contractor. CARB staff assumed that, on average, a project includes 5 units,³⁷ accordingly, the total number of projects from this analysis was 66,770 projects (55,642 single unit construction projects and 11,128 multi-unit construction projects, with an average of 5 units each, so that single-family and multi-family projects each account for half of the 111,284 new residential units).

In addition to residential projects, there are nonresidential construction projects and public works projects. Public works projects, which would also involve a prime contractor and be subject to the Proposed Amendments, are described and analyzed in Section E.3: Total Costs and Cost-Effectiveness, and determined to add approximately 100,000 projects³⁸ to this analysis. For nonresidential non-public works projects, CARB staff used the California Department of Finance's Annual Data of Residential Units and Valuation³⁹ and Annual Data of

³⁵ Since the contracting requirements are the same for all contracting entities, CARB uses the same methodology for calculating costs for prime contractors and public works awarding bodies. The costs for public works awarding bodies are described in section E.3.

³⁶ California Department of Finance. (2020). Annual Data of Residential Units and Valuation – June 2020, California Department of Finance. Retrieved from <https://dof.ca.gov/forecasting/economics/economic-indicators-2/construction-permits/>.

³⁷ Because some multi-unit projects would consist of a small number of units and other projects would consist of a large number of units, CARB staff used 5 units as a conservative estimate of the number of units per project.

³⁸ The number of public works projects is estimated in Section B. Estimated Costs, and was rounded due to the uncertainty in the development of that estimate.

³⁹ California Department of Finance. (2020). Annual Data of Residential Units and Valuation – June 2020, California Department of Finance. Retrieved from <https://dof.ca.gov/forecasting/economics/economic-indicators-2/construction-permits/>.

Nonresidential Valuation⁴⁰ and determined that the valuation of residential to nonresidential construction in California is approximately a 1:1 ratio. Because nonresidential projects are expected to be more expensive than residential projects, the number of nonresidential projects were expected to be lower than the number of residential units. For this reason, CARB staff assumed that the number of nonresidential projects would be approximately half that of the residential units determined above and added 33,386 nonresidential projects to the analysis.

Adding the 66,770 residential projects, 100,000 public works projects, and 33,386 nonresidential projects together, CARB staff estimates that there are 200,156 projects subject to the Proposed Amendments' new requirements to ensure that prime contractors only hire compliant fleets and maintain appropriate records. These results are based on the best available data and on broad assumptions.

Next CARB staff analyzed the amount of labor required for a prime contractor to comply with the proposed new requirements. The number of labor hours required to implement these provisions varies greatly, based on the size of the project. For a small project, a prime contractor may only need to verify the Certificate of Reported Compliance for 1 or 2 fleets, estimated to take somewhere between 15-30 minutes. For a large project, however, a prime contractor may need to verify the Certificate of Reported Compliance for many fleets, receive many documents from various entities, and then maintain those records throughout the project, tasks that could take several hours and could be spread over multiple years if a project extends over multiple years. Based on this understanding, CARB staff decided to use 1 hour as the average amount of time needed to comply with these requirements, recognizing that an individual prime contractor could require quite a bit more or less time to comply with the requirements.

Finally, CARB assumed a first line supervisor for construction trades and extraction workers would be the most likely staff person to implement these requirements for the prime contractor, and using the U.S. Bureau of Labor Statistics data,⁴¹ CARB determined the labor rate to be \$56.17 an hour, adjusted for total compensation rate.

Taking an estimate of 200,156 construction projects initiated in California each year, an average of one hour to comply with the requirements, and a labor rate of \$56.17 per hour, the total potential annual cost to all prime contractors across the State to comply with the Proposed Amendments is estimated to be \$11.2 million. Most of this cost is expected to be attributed specifically to the construction industry, the industry within which most Prime Contractors conduct business, with a small amount also attributed to the mining industry, to

⁴⁰ California Department of Finance. (2020). Annual Data of Nonresidential Valuation – June 2020. California Department of Finance. Retrieved from <https://dof.ca.gov/forecasting/economics/economic-indicators-2/construction-permits/>.

⁴¹ U.S. Bureau of Labor Statistics. (2020). State Occupational Employment and Wage Estimates – May 2020. Retrieved April 7, 2022, from [California - May 2020 OEWS State Occupational Employment and Wage Estimates \(bls.gov\)](https://www.bls.gov/news.release/archives/oea-ca-2020-05.pdf).

the extent that those in the mining industry conduct business as a Prime Contractor, so CARB assumed a cost split of 90 percent to the construction industry and 10 percent to the mining industry.

Table 14 shows the total direct incremental costs of the Proposed Amendments from 2023 through 2038 to businesses. Direct incremental costs include vehicle capital costs (amortized), off-road diesel vehicle Tier 4 final maintenance costs, and administrative costs for reporting and review of fleet certificates associated with the prime contractor provisions. As shown in Table 14, costs to businesses are higher in the earlier years of the Proposed Amendments and reduced in later years. Starting in 2032, amortized capital costs due to the Proposed Amendments decrease as a result of fleets having already purchased newer vehicles in prior years to comply with the accelerated turnover mandated by the Proposed Amendments. Therefore, for those years, fleets are no longer subject to the capital costs required as part of natural turnover in the baseline.

Signage Costs

The Proposed Amendments include a new requirement for prime contractors to prominently display, at each job site, information regarding the applicability of the Off-Road Regulation, and the telephone number and web address of CARB's off-road programs. To comply with this requirement, CARB assumes that most prime contractors will post a sign. The Proposed Amendments include the specific language that is required to be posted, and CARB will provide prime contractors with a sign, available electronically, that they can use to meet all the requirements of the Proposed Amendments. CARB does not anticipate prime contractors will have costs associated with the design of the sign. CARB also does not anticipate prime contractors will have costs associated with posting the sign in a prominent location since this cost will be negligible because the prime contractor is already at the job site and should be able to quickly display the required information. However, CARB staff did estimate costs associated with the printing of the sign.

To determine the costs associated with printing the sign, staff used the estimated number of annual projects identified for the Administrative Costs for Prime Contractors of 200,156. CARB staff gathered costs associated with a prime contractor printing the sign using one of two methods:

1. Prime contractor could use their own equipment (self-print); or
2. Prime contractor could print the sign through a retail outlet, FedEx or Staples, for example.

CARB staff assumed 50 percent of prime contractors would self-print and 50 percent would print through a retail outlet. CARB staff estimates the cost of one page of waterproof and tear-resistant paper to self-print is about \$0.80.⁴² As of June 2022, it costs \$1.79 to print a

⁴² Waterproof and tear resistant paper can be found at Amazon.com for \$79.79 per pack of 100, 8X11 inch sheets of paper, and can also readily be found at other local retail outlets.

black and white sign on waterproof and tear-resistant paper at FedEx, an example retail outlet.

Finally, CARB assumed a first line supervisor for construction trades and extraction workers would be the most likely staff person to implement these requirements for the prime contractor, and, using the U.S. Bureau of Labor Statistics data,⁴³ CARB determined the labor rate to be \$56.17 an hour, adjusted for total compensation rate. To self-print, staff estimates it will take 5 minutes, resulting in a labor cost of \$4.49, and 30 minutes to print at a retail outlet, resulting in a labor cost of \$28.09.

Total costs per project could range from \$5.29 to self-print to \$29.88 to print at a retail outlet. Using the estimate that half of prime contractors would self-print and half would print through a retail outlet, CARB staff estimates the annual cost of this requirement would be \$3.52 million beginning in 2024. Table 14 and subsequent tables combine the administrative and signage costs for prime contractors into a single cost for the prime contractor's column. A prime contractor is conducting business in California and is therefore considered a business for the purpose of Form 399.

Costs for Renewable Diesel Exemption Reporting

The Proposed Amendments include two exemptions from the RD requirements for fleets that operate in places with extremely cold temperatures, which could be unsuitable for the use of RD due to the chemical properties of the fuel. Specifically, the Proposed Amendments specify that fleets that operate in places where the 10th percentile minimum ambient air low temperature in January drops below 20°F would qualify for a four-month exemption from November through February. A second short-term exemption extends to fleets that are expected to work in rare conditions where the weather has been forecasted to drop below 20°F in an area that does not qualify for the four-month exemption or on the occasion that a rare cold weather event occurs outside of the four-month exemption period. To utilize these exemptions, affected fleets are required to provide additional documentation. This documentation includes the location of the work where the low-temperature conditions exist, the volumes and compositions of the low-temperature-specific diesel fuel, and the 10th percentile minimum January temperature for the four-month exemption or the daily high and low temperatures for the short-term exemption. The reporting required to utilize the exemption is expected to cause affected fleets to incur a cost. CARB staff performed the following analysis to determine the number of affected entities that will be able to utilize the four-month exemption. CARB staff did not include the fleets that will be utilizing the short-term exemption as weather patterns can vary. Although CARB is not able to predict with certainty the frequency of the weather conditions that would allow use of this exemption,

⁴³ U.S. Bureau of Labor Statistics. (2020). State Occupational Employment and Wage Estimates – May 2020. Retrieved April 7, 2022, from [California - May 2020 OEWS State Occupational Employment and Wage Estimates \(bls.gov\)](https://www.bls.gov/publications/may2020/California-May-2020-OEWS-State-Occupational-Employment-and-Wage-Estimates).

staff expects the short-term exemption to be used only rarely and so impacts are expected to be minimal.

Estimate of the Number of Businesses Impacted

CARB staff analyzed publicly available daily temperature data from the National Weather Service of weather stations located across California to determine the regions of the state that would meet the 10th percentile minimum January ambient temperature of under 20°F. As captive attainment counties separately receive an exemption from the RD requirements of these Amendments, weather stations in those counties were excluded from this analysis. From this analysis, a total of thirteen weather stations meeting these conditions were identified, spread among five air basins covering the Lake Tahoe area, the Sierra Nevada, and the San Gabriel Mountains.

CARB staff then queried the DOORS reporting database to obtain the addresses and vehicle counts of each fleet reported as part of compliance with the Off-Road Regulation. Where possible, physical addresses of the fleets were used, otherwise a mailing address was included. While these addresses are not reported as the actual locations of the vehicles themselves, which are not required to be reported as part of the Off-Road Regulation, the fleet addresses allow CARB staff to perform an estimate on the number of impacted fleets and vehicles. As part of this analysis, the address and vehicle count data were overlaid onto the map with the thirteen weather stations using Geographic Information Systems (GIS) so that CARB staff could determine the number of fleets within the affected regions. Because there were vast distances between weather stations, CARB staff considered topography when interpolating to determine the number of fleets most likely to experience conditions associated with the nearby weather station. Worth noting is that there were many fleets with addresses outside of California extending across the United States, which CARB staff assumes to be mostly performing work in the major metropolitan areas not affected by these cold temperature areas. However, of these out-of-state fleets, there were also a number based around the Reno, Nevada and Carson City, Nevada areas. Since reporting in DOORS is only required for fleets operating in California and subject to the Off-Road Regulation, it is safe to assume that the fleets and vehicles reported in these areas operate in California, specifically in the Lake Tahoe region, which is the nearest population center. CARB staff made the decision to include these fleets and vehicles in this analysis, with the Carson City, Nevada area fleets assumed to be primarily operating in the Lake Tahoe air basin, while the Reno, Nevada area fleets were assumed to be split between operating in the Lake Tahoe Air Basin and the neighboring Mountain Counties Air Basin. Based on this GIS analysis, CARB staff determined that a total of 250 businesses subject to the Off-Road Regulation operate in regions where winter conditions meet these exemptions' cold temperature criteria.

Estimate of Costs Associated with Reporting

CARB staff estimated that it would take businesses on average one hour a year to complete the required reporting. CARB staff assumed a first line supervisor for construction trades and extraction workers would be the most likely staff person to implement these requirements for

the prime contractor, and, using the U.S. Bureau of Labor Statistics data,⁴⁴ CARB determined the labor rate to be \$56.17 an hour, adjusted for total compensation rate. Table 12 displays the annual reporting costs for businesses using the RD exemption.

Table 12. Costs for Businesses Associated with RD Exemption Reporting

Number of businesses impacted	Time to complete annual reporting (hours)	Labor rate (per hour)	Total annual cost
250	1	\$56.17	\$14,043

Costs for Extended Annual Reporting

The Current Regulation requires all fleets to complete annual reporting each year to verify and attest to their compliance with the Off-Road Regulation. The Current Regulation requires large fleets to report annually each year from 2012 to 2023; medium fleets to report annually each year 2016 to 2023; and small fleets to report annually each year from 2018 to 2028. Any fleet that fails to meet the fleet average target rate for the final target date must continue to report annually each year until it does so. Any fleet that operates permanent or year-by-year low-use vehicles must continue to report annually for each permanent or year-by-year low-use vehicle for as long as the fleet owns or operates the vehicle. To remove any ambiguity regarding the timeframe for which fleets need to report, and to ensure that fleets continue to verify and attest to their compliance with the regulation, the Proposed Amendments extend this annual reporting through 2036.

To analyze the costs associated with the extended reporting, CARB staff used data reported to CARB through DOORS to establish the count of fleets in each fleet size category that do not currently have low-use vehicles. CARB staff assumed fleets that currently have low-use vehicles reported would continue to operate those vehicles in their fleet and would therefore be required to continue annual reporting under the Current Regulation. As part of the development of the Current Regulation, CARB staff estimated that it would take large and medium fleets on average eight hours a year to complete annual reporting, and on average four hours per year for small fleets.⁴⁵ Since the annual reporting requirements have not significantly changed with the Proposed Amendments and CARB has implemented streamlined reporting tools, these estimates are still valid. Finally, CARB staff assumed a first line supervisor for construction trades and extraction workers would be the most likely staff person to implement these requirements for the prime contractor, and, using the U.S. Bureau

⁴⁴ U.S. Bureau of Labor Statistics. (2020). State Occupational Employment and Wage Estimates – May 2020. Retrieved April 7, 2022, from [California - May 2020 OEWS State Occupational Employment and Wage Estimates \(bls.gov\)](#).

⁴⁵ CARB. (2007). Technical Support Document: Proposed Regulation for In-Use Off-Road Diesel Vehicles. Retrieved from [TSD FINAL \(ca.gov\)](#).

of Labor Statistics data,⁴⁶ CARB determined the labor rate to be \$56.17 an hour, adjusted for total compensation rate. Table 13 shows the costs for businesses associated with extended reporting requirements.

Table 13. Costs for Businesses Associated with Extended Annual Reporting

Fleet Size	Number of businesses impacted	Time to complete annual reporting (hours)	Labor rate (per hour)	Total annual cost	Applicable years
Large	572	8	\$56.17	\$256,989	2024-2036
Medium	437	8	\$56.17	\$196,370	2024-2036
Small	7948	4	\$56.17	\$1,785,689	2029-2036

⁴⁶ U.S. Bureau of Labor Statistics. (2020). State Occupational Employment and Wage Estimates – May 2020. Retrieved April 7, 2022, from [California - May 2020 OEWS State Occupational Employment and Wage Estimates \(bls.gov\)](#).

Table 14. Annual Direct Incremental Costs of the Proposed Amendments to Businesses

Year	Annual Vehicle Capital Costs (amortized, with tax)	Tier 4 final Maintenance Costs	Contracting Costs	Signage Costs	RD Exemption	Extended Reporting	Total Costs	Total Cost Savings	Total Net Costs
2023	\$380,126,996	\$0	\$0	\$0	\$0	\$0	\$380,126,996	\$0	\$380,126,996
2024	\$354,799,693	\$1,820,706	\$11,242,740	\$3,519,603	\$14,034	\$453,359	\$371,850,135	\$0	\$371,850,135
2025	\$474,777,657	\$1,820,706	\$11,242,740	\$3,519,603	\$14,034	\$453,359	\$491,828,099	\$0	\$491,828,099
2026	\$436,758,196	\$2,757,989	\$11,242,740	\$3,519,603	\$14,034	\$453,359	\$454,745,921	\$0	\$454,745,921
2027	\$637,328,230	\$2,757,989	\$11,242,740	\$3,519,603	\$14,034	\$453,359	\$655,315,955	\$0	\$655,315,955
2028	\$189,515,027	\$4,614,974	\$11,242,740	\$3,519,603	\$14,034	\$453,359	\$209,359,737	\$0	\$209,359,737
2029	\$233,403,829	\$4,614,974	\$11,242,740	\$3,519,603	\$14,034	\$2,239,049	\$255,034,228	\$0	\$255,034,228
2030	\$53,794,341	\$5,349,703	\$11,242,740	\$3,519,603	\$14,034	\$2,239,049	\$76,159,471	\$0	\$76,159,471
2031	\$67,825,505	\$5,349,703	\$11,242,740	\$3,519,603	\$14,034	\$2,239,049	\$90,190,634	\$0	\$90,190,634
2032	(\$185,109,593)	\$5,726,267	\$11,242,740	\$3,519,603	\$14,034	\$2,239,049	\$22,741,693	(\$185,109,593)	(\$162,367,900)
2033	(\$163,659,627)	\$5,726,267	\$11,242,740	\$3,519,603	\$14,034	\$2,239,049	\$22,741,693	(\$163,659,627)	(\$140,917,934)
2034	(\$223,602,810)	\$5,726,267	\$11,242,740	\$3,519,603	\$14,034	\$2,239,049	\$22,741,693	(\$223,602,810)	(\$200,861,118)
2035	(\$188,730,793)	\$5,726,267	\$11,242,740	\$3,519,603	\$14,034	\$2,239,049	\$22,741,693	(\$188,730,793)	(\$165,989,100)
2036	(\$197,172,355)	\$5,927,327	\$11,242,740	\$3,519,603	\$14,034	\$2,239,049	\$22,942,753	(\$197,172,355)	(\$174,229,603)
2037	(\$172,435,230)	\$5,927,327	\$11,242,740	\$3,519,603	\$14,034	\$2,239,049	\$22,942,753	(\$172,435,230)	(\$149,492,478)
2038	(\$150,039,711)	\$5,927,327	\$11,242,740	\$3,519,603	\$14,034	\$2,239,049	\$22,942,753	(\$150,039,711)	(\$127,096,959)
Total⁴⁷	\$1,547,579,355	\$69,773,792	\$168,641,100	\$52,794,045	\$210,511	\$24,657,282	\$3,144,406,205	(\$1,280,750,120)	\$1,863,656,085

⁴⁷ Note that totals may not sum due to rounding.

B.1.a: Costs to a Typical Small Business

As described in Section A.3 of the Economic Impact Statement, for the purposes of the cost analysis reported on the Form 399, a small business is defined as an ultra-small off-road diesel vehicle fleet. CARB staff conducted a case study to illustrate a typical fleet in each fleet size based on the fleets reported to CARB in DOORS, the online reporting tool for the Off-Road Regulation, which are large, medium, small, and ultra-small. To select a representative (or typical) fleet, CARB staff first calculated the average total horsepower and age of equipment statewide for each fleet size from all fleets reported in DOORS to be compliant with the Off-Road Regulation. CARB staff then identified fleets that were similar in average horsepower and vehicle age to the statewide calculations for each fleet size. Lastly, staff reviewed the fleets to select a fleet that had vehicles with a range of equipment types and horsepower, since horsepower has a direct impact on cost, and a fleet with only one equipment type would be specialized and not typical. This analysis and the fleet attributes provided below reflect the composition of fleets as of February 2022.

For all fleet sizes, CARB staff conducted the same analysis to estimate the costs of the Proposed Amendments to a typical business. For the baseline, CARB staff developed a potential compliance plan for the fleet to achieve the final requirements of the Current Regulation using CARB's compliance planning tool.⁴⁸ Because the Current Regulation itself drives accelerated turnover, CARB staff assumed, in developing this compliance plan, that, in the baseline scenario, after the final compliance date of the Off-Road Regulation, the fleet would not take additional actions, such as replacing a vehicle with a new or used vehicle, until the average age of the vehicles in the fleet was the same as the average age of the vehicles in the fleet in calendar year 2013. The year 2013 was a year in which all existing fleets should have been reported to CARB and prior to the start of the turnover requirements of the Off-Road Regulation. At that point, the analysis assumed the fleet would take actions to maintain that average age through 2038.⁴⁹ CARB staff then applied the same inputs and methodology described in Section B. Estimated Costs to calculate vehicle capital costs for the baseline. After calculating the baseline, CARB staff used the same compliance planning tool to develop a compliance plan for the Proposed Amendments. The same assumptions were made for the Proposed Amendments as were made for the baseline regarding average age of the vehicles in the fleet through 2038. CARB staff applied the same inputs and methodology as described in Section B. Estimated Costs to calculate vehicle capital costs for

⁴⁸ CARB's Fleet Average Calculator tools were developed by staff to assist with compliance planning. This tool allows a fleet to import its fleet of vehicles, along with the necessary information needed to calculate the fleet's emissions, into the Calculator. The tool allows a fleet to select different compliance actions (replace, retire, retrofit, designate as low-use, etc.) by vehicle in each year of the regulation to visualize the benefits and impacts of taking different compliance actions to assist in long-term planning. Web link: <https://ww2.arb.ca.gov/resources/documents/road-fleet-average-calculators>.

⁴⁹ Maintaining average age of the vehicles in the fleet in calendar year 2013, therefore, likely reflects typical fleet behavior in the absence of additional regulations.

the Proposed Amendments. The baseline vehicle capital cost was then subtracted from the Proposed Amendments vehicle capital cost, and then sales tax was applied to the difference.

To assess DEF and DPF maintenance costs for all fleets sizes, staff calculated the number of Tier 4 final vehicles in the fleet for each analysis year under the baseline and Proposed Amendments. CARB staff then applied the methodology described in Section B. Estimated Costs to assess costs for maintenance under the baseline and Proposed Amendments. The baseline vehicle maintenance cost was then subtracted from the Proposed Amendments vehicle maintenance cost to get the incremental maintenance cost due to the Proposed Amendments.

CARB staff did not include any costs associated with use of the RD exemption because most fleets do not operate in conditions that would qualify for this exemption. Costs associated with the extended reporting requirements are applied based on the applicable years for each fleet size.

Using the methodology described above, CARB staff selected a representative ultra-small fleet to analyze the costs of the Proposed Amendments to a typical small business. CARB believes that this fleet would be representative because it has a total horsepower and an average vehicle age similar to the average total horsepower and vehicle age of all fleets reported to CARB that are ultra-small fleets. Attributes of the fleet selected are shown in Table 15. The fleet is currently complying with the Off-Road Regulation by using BACT and will have enough compliance credits to comply with the Off-Road Regulation until 2028, when the credits expire and the fleet must begin turning over 10 percent of the total fleet horsepower each year until it meets the final fleet average target or the fleet complies with the optional compliance strategy for ultra-small fleets by January 1, 2029. In this scenario, CARB staff project that this fleet will replace its Tier 0 vehicle in 2028, making this fleet 100 percent Tier 2 or cleaner, and thus fully compliant with the Off-Road Regulation's optional compliance strategy for ultra-small fleets.

Table 15. Typical Small Business (Ultra-Small) Fleet Attributes

Vehicle Tier	Number of Vehicles and Combined hp
Tier 0	1 vehicle, 88.5 hp
Tier 1	0 vehicle, 0 hp
Tier 2	1 vehicle, 71 hp
Tier 3	0 vehicles, 0 hp
Tier 4 interim	0 vehicles, 0 hp
Tier 4 final	0 vehicles, 0 hp
Total	2 vehicles, 159.5 hp

Due to these projected actions taken to comply with the Off-Road Regulation, this typical small business (ultra-small) fleet would have no further requirements under the Proposed Amendments to comply with proposed the Tier 0 and Tier 1 phase-out provision. However, this fleet will need to comply with the proposed Tier 2 phase-out by January 1, 2036, so the

single Tier 2 vehicle that remains would need to be turned over in 2035. This fleet is not projected to make any additional purchases during the analysis period from 2023-2038 for either the baseline or Proposed Amendments scenarios.

Using the methodology described in Section B. Estimated Costs, CARB staff estimated the annual vehicle capital costs (amortized, with tax) and vehicle maintenance costs, which together comprise the incremental costs due to the Proposed Amendments. The results are shown in Table 16. CARB staff assumed that the vehicles purchased by the fleet would all be 5-year-old used vehicles and applied the cost from Table 8. This was done because there were only two vehicles in the fleet, and the compliance pathways probability fractions in Table 9 could not be applied. This typical small business fleet would see increased costs beginning in 2035 to comply with the proposed Tier 2 phase-out requirement on January 1, 2036. Overall, this fleet would see an increased incremental net cost of \$35,906 from the Proposed Amendments during the analysis period from 2023-2038, an initial cost of \$225 in 2029, and an average ongoing annual cost of \$3,965 from 2030 through 2038. The costs primarily take place during calendar years 2035 through 2038.

Table 16. Summary Incremental Costs due to the Proposed Amendments for a Typical Small Business Fleet

Year	Annual Vehicle Capital Costs (amortized, with tax)	Maintenance DPF Cost	Maintenance DEF Cost	Extended Reporting	Total Costs	Total Cost Savings	Total
2023	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2024	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2025	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2026	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2027	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2028	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2029	\$0	\$0	\$0	\$225	\$225	\$0	\$225
2030	\$0	\$0	\$0	\$225	\$225	\$0	\$225
2031	\$0	\$0	\$0	\$225	\$225	\$0	\$225
2032	\$0	\$0	\$0	\$225	\$225	\$0	\$225
2033	\$0	\$0	\$0	\$225	\$225	\$0	\$225
2034	\$0	\$0	\$0	\$225	\$225	\$0	\$225
2035	\$8,234	\$238	\$56	\$225	\$8,752	\$0	\$8,752
2036	\$8,234	\$238	\$56	\$225	\$8,752	\$0	\$8,752
2037	\$8,234	\$238	\$56	\$0	\$8,527	\$0	\$8,527
2038	\$8,234	\$238	\$56	\$0	\$8,527	\$0	\$8,527
Total ⁵⁰	\$32,935	\$950	\$224	\$1,797	\$35,906	\$0	\$35,906

⁵⁰ Note that totals may not sum due to rounding.

B.1.b: Costs to a Typical Business

For the purpose of the Proposed Amendments, typical businesses are defined as all affected off-road diesel vehicle fleets in the State that are small, medium, or large in size, as defined in the Off-Road Regulation. The costs to a typical business reported on Form 399 are the typical costs to a large fleet, which was selected as the typical fleet because large fleets own or operate 55 percent of the vehicles covered under the Off-Road Regulation (see Table 4), so large fleets will likely bear the greatest costs associated with the Proposed Amendments. Below, staff provides the analysis for a typical large, medium, and small fleet using the methodology described in Section B.1.a: Costs to a Typical Small Business for both fleet selection and cost analysis. CARB does not receive business operations data from fleets to know with certainty that a fleet’s size, as determined under the Off-Road Regulation, is the same as the size of the business that owns and operates the fleet. CARB has included analyses on different fleet sizes to provide costs to a range of different typical business sizes; for the purpose of this analysis, CARB is using fleet size as a surrogate for business size. CARB did not include costs from the RD exemption for operations in cold temperatures because this will not be a cost for a typical fleet. Indeed, the reporting that generates the cost will be limited to a small number of fleets that will need to use this exemption due to the location of their fleet operations.

Large Fleet

Using the methodology described above, CARB staff selected a representative large fleet to analyze the incremental costs to a typical business that is larger in size. A large fleet would have the highest cost to comply with the Proposed Amendments and reflects the higher end of potential costs incurred by a typical business. Attributes of the fleet selected are shown in Table 17. The fleet is currently complying with the Off-Road Regulation using BACT and is therefore required to turn over 10 percent of the fleet’s total horsepower each year until it meets the final fleet average target. CARB staff assumed that, to comply with the Current Regulation, the fleet would turn over the oldest vehicles first to comply with BACT, resulting in all Tier 0 and Tier 1 vehicles being removed from the fleet in 2023 and 2024. Based on CARB’s assumptions, this fleet would then achieve the fleet average target, as required by the Off-Road Regulation, by December 31, 2024. Due to the actions already required by the Off-Road Regulation, this typical large fleet would then not have to take further actions to comply with the Tier 0 and Tier 1 phase-out requirements of the Proposed Amendments. This fleet would need to comply with the Tier 2 phase-out on January 1, 2028.

Table 17. Typical Large Fleet Attributes

Vehicle Tier	Number of Vehicles and Combined hp
Tier 0	2 vehicles, 249 hp
Tier 1	12 vehicles, 1,793 hp
Tier 2	6 vehicles, 1,055 hp
Tier 3	17 vehicles, 4,066 hp
Tier 4 interim	10 vehicles, 1,761 hp

Vehicle Tier	Number of Vehicles and Combined hp
Tier 4 final	21 vehicles, 6,074 hp
Total	68 vehicles, 14,998 hp

Using the methodology described in Section B. Estimated Costs, CARB staff estimated the annual vehicle capital costs (amortized, with tax) and vehicle maintenance costs, which together comprise the incremental costs due to the Proposed Amendments. The results are shown in Table 18. This typical large fleet would see increased total costs starting in 2027 to comply with the Tier 2 phase-out requirement on January 1, 2028. Since the analyses for both the Proposed Amendments and the baseline incorporate business as usual to maintain an average fleet age into the future (the average age of the fleet as it was in 2013), the baseline scenario assumes that the fleet would start making these purchases in 2033, which is the year in which the average age of the fleet exceeded the average age of the fleet in 2013. In the Proposed Amendments scenario, the fleet does not start making business as usual purchases until 2035 because of the additional vehicle turnover that is required due to the Proposed Amendments between 2027 through 2032. Both scenarios will have continued costs beyond the analysis period.

This typical large fleet would see decreased costs from 2033 through 2038. Overall, this fleet would see an increased total net cost of \$338,002 from the Proposed Amendments during the analysis period from 2023 through 2038, an initial cost of \$449 in 2024, and an average ongoing cost of \$81,573 from 2025 through 2037. The costs primarily take place during calendar years 2027-2031. To determine this ongoing cost, CARB staff used the total costs to the fleet for the years 2025 through 2037 (years the fleet had costs), which totaled \$1,060,445, and divided that by the number of years (13).

Table 18. Summary Incremental Costs due to the Proposed Amendments for a Typical Large Fleet

Year	Annual Vehicle Capital Costs (amortized, with tax)	Maintenance DPF Cost	Maintenance DEF Cost	Extended Reporting	Total Costs	Total Cost Savings	Total
2023	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2024	\$0	\$0	\$0	\$449	\$449	\$0	\$449
2025	\$0	\$0	\$0	\$449	\$449	\$0	\$449
2026	\$0	\$0	\$0	\$449	\$449	\$0	\$449
2027	\$207,672	\$1,188	\$816	\$449	\$210,125	\$0	\$210,125
2028	\$207,672	\$1,188	\$816	\$449	\$210,125	\$0	\$210,125
2029	\$207,672	\$1,188	\$816	\$449	\$210,125	\$0	\$210,125
2030	\$207,672	\$1,188	\$816	\$449	\$210,125	\$0	\$210,125
2031	\$207,672	\$1,188	\$816	\$449	\$210,125	\$0	\$210,125
2032	\$0	\$1,188	\$816	\$449	\$2,453	\$0	\$2,453
2033	(\$37,719)	\$950	\$658	\$449	\$2,058	(\$37,719)	(\$35,661)
2034	(\$106,736)	\$713	\$398	\$449	\$1,560	(\$106,736)	(\$105,176)
2035	(\$113,156)	\$475	\$342	\$449	\$1,266	(\$113,156)	(\$111,890)
2036	(\$113,156)	\$475	\$342	\$449	\$1,266	(\$113,156)	(\$111,890)
2037	(\$182,174)	\$238	\$82	\$0	\$319	(\$182,174)	(\$181,855)
2038	(\$169,953)	\$0	\$0	\$0	\$0	(\$169,953)	(\$169,953)
Total⁵¹	\$315,466	\$9,975	\$6,720	\$5,842	\$1,060,896	(\$722,894)	\$338,002

Medium Fleet

Using the methodology described above, CARB staff selected a representative medium fleet to analyze the costs to a typical business that is medium in size. Attributes of the fleet selected are shown in Table 19. The fleet is currently complying with the Off-Road Regulation using BACT and is therefore required to turn over 10 percent of the fleet's total horsepower each year until it meets the final fleet average target. CARB staff assumed that, to comply with the baseline regulation, the fleet would turn over the oldest vehicles first to comply with BACT, resulting in all Tier 0 and Tier 1 vehicles being removed from the fleet in 2023 and 2024. With a 10 percent fleet horsepower turnover each year, this fleet does not achieve the final fleet average target as required under the Off-Road Regulation until December 31, 2028, at which point the fleet would have turned over 8 of their 10 Tier 2 vehicles between January 1, 2025, and December 31, 2028. Due to these actions taken to comply with the existing Off-Road Regulation, this typical medium fleet would then not have to take further actions to comply with the Tier 0 and Tier 1 phase-out requirements of the

⁵¹ Note that totals may not sum due to rounding.

Proposed Amendments. This fleet will need to comply with the Tier 2 phase-out beginning January 1, 2030. This fleet does not make additional purchases during the analysis period from 2023-2038 for the baseline or Proposed Amendments scenario.

Table 19. Typical Medium Fleet Attributes

Vehicle Tier	Number of Vehicles and Combined hp
Tier 0	1 vehicle, 84 hp
Tier 1	3 vehicles, 493 hp
Tier 2	10 vehicles, 1,034 hp
Tier 3	2 vehicles, 403 hp
Tier 4 interim	5 vehicles, 539 hp
Tier 4 final	5 vehicles, 304 hp
Total	26 vehicles, 2,857 hp

Using the methodology described in Section B. Estimated Costs, CARB staff estimated the annual vehicle capital costs (amortized, with tax) and vehicle maintenance costs, which together comprise the incremental costs due to the Proposed Amendments, and the results are shown in Table 20. This typical medium fleet would see increased total costs starting in 2029 to comply with the Tier 2 phase-out requirement on January 1, 2030. Overall, this fleet would see an increased total cost of \$209,840 from the Proposed Amendments during the analysis period from 2023-2038, an initial cost of \$449 in 2024, and an ongoing cost of \$14,956 from 2025 through 2038 (average of total costs during this time period). However, as shown in Table 20, the costs primarily take place during calendar years 2029 through 2033.

Table 20. Summary Incremental Costs due to the Proposed Amendments for a Typical Medium Fleet

Year	Annual Vehicle Capital Costs (amortized, with tax)	Maintenance DPF Cost	Maintenance DEF Cost	Extended Reporting	Total Costs	Total Cost Savings	Total
2023	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2024	\$0	\$0	\$0	\$449	\$449	\$0	\$449
2025	\$0	\$0	\$0	\$449	\$449	\$0	\$449
2026	\$0	\$0	\$0	\$449	\$449	\$0	\$449
2027	\$0	\$0	\$0	\$449	\$449	\$0	\$449
2028	\$0	\$0	\$0	\$449	\$449	\$0	\$449
2029	\$39,455	\$475	\$197	\$449	\$40,577	\$0	\$40,577
2030	\$39,455	\$475	\$197	\$449	\$40,577	\$0	\$40,577
2031	\$39,455	\$475	\$197	\$449	\$40,577	\$0	\$40,577
2032	\$39,455	\$475	\$197	\$449	\$40,577	\$0	\$40,577
2033	\$39,455	\$475	\$197	\$449	\$40,577	\$0	\$40,577
2034	\$0	\$475	\$197	\$449	\$1,122	\$0	\$1,122

Year	Annual Vehicle Capital Costs (amortized, with tax)	Maintenance DPF Cost	Maintenance DEF Cost	Extended Reporting	Total Costs	Total Cost Savings	Total
2035	\$0	\$475	\$197	\$449	\$1,122	\$0	\$1,122
2036	\$0	\$475	\$197	\$449	\$1,122	\$0	\$1,122
2037	\$0	\$475	\$197	\$0	\$672	\$0	\$672
2038	\$0	\$475	\$197	\$0	\$672	\$0	\$672
Total⁵²	\$197,275	\$4,750	\$1,973	\$5,842	\$209,840	\$0	\$209,840

Small Fleet

Using the methodology described above, CARB staff selected a representative small fleet to analyze the costs to a typical business that is smaller in size, but not as small as the business analyzed in the typical small business scenario. Some small fleets may have less than 500 hp (ultra-small fleet) and may benefit from some of the relaxed requirements provided to those fleets. An analysis of the impacts on an ultra-small fleet is discussed in Section B.1.a: Costs to a Typical Small Business. Attributes of the representative small fleet selected are shown in Table 21. This fleet currently has 26 vehicles. Of those 26 vehicles, 4 are Tier 0 permanent-low-use vehicles and 1 is a Tier 1 permanent low-use vehicle. Due to the small size of the fleet, CARB staff assumed that all vehicles would be replaced when required (the compliance scenario that a fleet would turn over a vehicle and not replace it was not assumed). The factors in Table 9 were not applied to the costs, and instead, the new or used vehicle costs in Table 8 were used directly in the analysis. The fleet is currently complying with the Off-Road Regulation by meeting the fleet average target for 2022. CARB staff projects that this fleet will comply with the Off-Road Regulation beyond 2022 as follows below.

Table 21. Typical Small Fleet Attributes

Vehicle Tier	Number of Vehicles and Combined hp
Tier 0	4 vehicles, 501 hp
Tier 1	3 vehicles, 281 hp
Tier 2	9 vehicles, 538 hp
Tier 3	3 vehicles, 334 hp
Tier 4 interim	1 vehicle, 46 hp
Tier 4 final	6 vehicles, 329 hp
Total	26 vehicles, 2,029 hp

⁵² Note that totals may not sum due to rounding.

This fleet will meet the fleet average target for 2023 with no further actions required. For compliance years 2024-2027, the fleet does not meet the fleet average target but does have enough compliance credits to comply with the regulation using BACT. The fleet is not required to take additional action until 2028 when the credits expire and the fleet must turn over 10 percent of the total fleet horsepower until it meets the final fleet average target. In this compliance scenario, the fleet meets the final fleet average target by January 1, 2032. For compliance years 2028 through 2032, when the fleet meets its final fleet average target, the fleet turns over all non-low-use vehicles with a Tier 0, Tier 1, or Tier 2 engine, as well as one vehicle with a Tier 3 engine.

Due to these projected actions taken to comply with the Off-Road Regulation, this typical small fleet would have no further requirements under the Proposed Amendments to comply with the Tier 0 and Tier 1 phase-out provision. However, this fleet will need to comply with the Tier 2 phase-out for the remaining vehicles beginning January 1, 2032. Essentially, this means that the single Tier 2 vehicle that the fleet would have turned over in 2032 in the baseline would now need to be turned over in 2031 to comply with the Proposed Amendments. This fleet does not make additional purchases during the analysis period from 2023-2038 for the baseline or Proposed Amendments scenario.

Under the Proposed Amendments, the four Tier 0 low-use vehicles would need to be phased out in 2036, while under the Off-Road Regulation, these vehicles could continue to operate indefinitely. CARB staff did not analyze costs associated with the phase-out of these Tier 0 low-use vehicles as it is assumed that these vehicles would not be replaced by the fleet, given their age and low usage. In 2036, these vehicles would be 61, 56, 40, and 40 years old, and would have been operating at less than 200 hours per year for 14 to 18 years. Since the analysis assumed that all of the other vehicles would be replaced, as discussed previously, CARB staff assumed the fleet would have sufficient horsepower remaining in the rest of the fleet to cover the work done by these Tier 0 low-use vehicles and consequently not need to replace them.

Using the methodology described in Section B. Estimated Costs, CARB staff estimated the annual vehicle capital costs (amortized, with tax) and vehicle maintenance costs, which together comprise the incremental costs due to the Proposed Amendments, and the results are shown in Table 22. This typical small fleet would see increased extended reporting costs beginning in 2029, and annual vehicle capital and maintenance costs in 2031 to comply with the Tier 2 phase-out requirement on January 1, 2032. This typical small fleet would see increased costs for extended reporting only from 2032 through 2036. Overall, this fleet would see an increased total net cost of \$2,351 from the Proposed Amendments during the analysis period from 2023 through 2038, an initial cost of \$225 in 2029, and an ongoing cost of \$4,316 from 2030 through 2036 (average of total costs during this time period). However, as shown in Table 22, the costs primarily take place during the calendar year 2031. CARB staff projects that this fleet will not make any additional vehicle purchases during the analysis period from 2023 through 2038 for both the baseline and Proposed Amendments scenarios.

Table 22. Summary Incremental Costs due to the Proposed Amendments for a Typical Small Fleet

Year	Annual Vehicle Capital Costs (amortized, with tax)	Maintenance DPF Cost	Maintenance DEF Cost	Extended Reporting	Total Costs	Total Cost Savings	Total
2023	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2024	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2025	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2026	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2027	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2028	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2029	\$0	\$0	\$0	\$225	\$225	\$0	\$225
2030	\$0	\$0	\$0	\$225	\$225	\$0	\$225
2031	\$28,085	\$475	\$78	\$225	\$28,863	\$0	\$28,863
2032	\$0	\$0	\$0	\$225	\$225	\$0	\$225
2033	\$0	\$0	\$0	\$225	\$225	\$0	\$225
2034	\$0	\$0	\$0	\$225	\$225	\$0	\$225
2035	\$0	\$0	\$0	\$225	\$225	\$0	\$225
2036	(\$28,085)	\$0	\$0	\$225	\$225	(\$28,085)	(\$27,860)
2037	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2038	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Total⁵³	\$0	\$475	\$78	\$1,797	\$30,435	(\$28,085)	\$2,351

As illustrated in the examples provided in Section B.1.b: Costs to a Typical Business, the cost to typical fleets will vary based on the size of the fleet, the type of equipment the fleet currently owns, and the types of actions taken to comply with the Proposed Amendments. In the examples, maximum annual amortized cost to comply with the Proposed Amendments was estimated to be approximately \$210,000, \$40,000, \$29,000, and \$9,000 for the large, medium, small, and ultra-small fleets (small business), respectively. In other years, these fleets may experience cost savings relative to the baseline, as they would no longer need to purchase vehicles in the later years of the analysis.

To illustrate the feasibility of compliance for these typical businesses, staff compared the maximum amortized annual cost with the average revenues of businesses in impacted industries.⁵⁴ Table 23 illustrates the average annual revenues per firm for the impacted industries as provided by the U.S. Census Bureau. Firms with fewer than 100 employees have lower annual revenues, which are shown to vary between \$0.6 to \$5.9 million. CARB does not

⁵³ Note that totals may not sum due to rounding.

⁵⁴ U.S. Census Bureau. (2017). 2017 Statistics of U.S. Business Annual Data Tables by Establishment Industry: 6-digit NAICS. Retrieved May 5, 2022, from https://www2.census.gov/programs-surveys/susb/datasets/2017/us_state_6digitnaics_2017.txt.

receive employee data from fleets and cannot directly link firm size to fleet size. However, this information provides some context for the impact of the estimated compliance costs on businesses with different employee sizes. The maximum amortized cost for a large fleet would represent less than 1 percent of average annual revenues for firms with 100 employees or greater and the maximum amortized cost for an ultra-small fleet (small business) would represent between 0.2 to 1.7 percent of average annual revenues for firms with fewer than 100 employees.

Table 23. Average Annual Revenues per Firm in Impacted Industries

Industry	NAICS Code	Average Revenues per Firm (millions, firms with greater than 100 employees)	Average Revenues per Firm (millions, firms with fewer than 100 employees)
Mining, quarrying, and oil and gas extraction	21	\$117.9	\$2.7
Construction	23	\$112.5	\$1.4
Air transportation	481	\$331.4	\$5.9
Commercial and industrial machinery and equipment rental and leasing	5324	\$93.4	\$2.7
Waste management and remediation services	562	\$100.1	\$2.1
Services to buildings and dwellings	5617	\$30.4	\$0.6
Commercial and industrial machinery and equipment (except automotive and electronic) repair and maintenance	8113	\$19.8	\$1.1

B.1.c: Costs to Individuals

The Proposed Amendments would not result in any direct costs to individuals. CARB staff anticipates that the Proposed Amendments could result in indirect costs to individuals, to the extent that compliance costs are passed through to consumers of construction, mining, industrial, government, and other industries. The costs incurred by affected businesses and the public sector could cascade through the economy and affect individuals.

One measure of this impact is the change in real personal income, which is income received from all sources, including compensation of employees and government and business transfer activity, adjusted for inflation. This is an aggregate statewide measure of personal income change, representing a net of income lost from jobs foregone in some sectors and jobs gained in other sectors.

Table 24 shows the estimated annual change in real personal income due to the Proposed Amendments across all individuals in California compared to the baseline. Total personal income decreases by \$732 million in 2023 and continues a downward trend until 2031, with the highest decrease of \$1.95 billion in 2027. Personal income increases after 2031. The

change in personal income can also be divided by the California population to show the average or per capita impact on personal income. Doing that shows personal income initially decreases by \$16 per person in 2023 and decreases to \$28 per person in 2027, which is the year with the greatest impact.

Table 24. Change in Personal Income

Year	Personal Income (2020M\$)	Change (2020M\$)	% Change	Personal Income Per Capita (2020\$)	Change (2020\$)	% Change
2023	2,714,456	-732	-0.03%	67,268	-16	-0.02%
2024	2,776,918	-1,230	-0.04%	68,447	-24	-0.03%
2025	2,855,988	-1,421	-0.05%	69,996	-24	-0.03%
2026	2,936,870	-1,572	-0.05%	71,596	-23	-0.03%
2027	3,024,159	-1,954	-0.07%	73,341	-28	-0.04%
2028	3,087,638	-988	-0.03%	74,500	-4	0.00%
2029	3,169,002	-965	-0.03%	76,087	-3	0.00%
2030	3,235,058	-448	-0.01%	77,299	7	0.01%
2031	3,308,360	-376	-0.01%	78,690	6	0.01%
2032	3,388,501	429	0.01%	80,246	20	0.03%
2033	3,472,251	436	0.01%	81,892	16	0.02%
2034	3,561,220	693	0.02%	83,666	17	0.02%
2035	3,655,299	629	0.02%	85,565	12	0.01%
2036	3,749,891	655	0.02%	87,482	10	0.01%
2037	3,846,605	580	0.02%	89,452	6	0.01%
2038	3,945,921	496	0.01%	91,490	4	0.00%

B.2: Share of Costs by Industry

The Proposed Amendments affect a wide variety of off-road diesel vehicles operating in several different industries. The impact on individual industries was calculated by taking the total lifetime costs of the Proposed Amendments and allocating the costs by the industry's percentage of fleets owned as determined by the industry's corresponding NAICS code (see Table 4). The directly-impacted businesses and their respective amortized vehicle costs (incl. sales tax), maintenance costs, reporting costs for prime contractors, renewable diesel exemption reporting costs, and extended annual reporting costs are as follows: mining (\$195M), construction (\$1,114M), air transportation (\$52M), commercial and industrial machinery and equipment rental and leasing (\$259M), waste management and remediation services (\$69M), services to buildings and dwellings (\$86M), and commercial and industrial machinery and equipment repair and maintenance (\$86M).

B.3: Annual Reporting Costs for a Typical Business

Off-road diesel vehicle fleet owners are currently required to complete mandatory annual reporting to CARB, retain records, and make records available to CARB or its agent upon request. To remove any ambiguity regarding the timeframe for which fleets need to report, and to ensure that fleets continue to verify and attest to their compliance with the regulation, the Proposed Amendments extend this annual reporting until 2036. This extended reporting is estimated to cost large and medium fleets \$449 annually from 2024 through 2036 and small fleets about \$225 annually from 2029 through 2036. Also, the Proposed Amendments require some additional reporting to CARB. This additional reporting includes attesting to the use of RD during annual reporting and submittal to CARB of hour-meter documentation used to verify low-use vehicle hours of operation. However, the additional reporting will be completed as part of the annual reporting already required under the baseline, so no additional reporting costs will be incurred by the vehicle owners. Fleets are currently required to gather and retain records related to low-use vehicle hours, and CARB does not anticipate any additional costs associated with submitting documentation to CARB that fleets are already collecting and reporting during annual reporting.

The Proposed Amendments also include new requirements for prime contractors; however, no reporting is required for prime contractors unless they observe non-compliance at their job site. Reporting of non-compliance should be non-substantive if the prime contractor is complying with the proposed new requirements to obtain a fleet's Certificate of Reported Compliance from the fleet prior to awarding the fleet a contract, and to only hire those fleets that have a valid Certificate of Reported Compliance. Reporting associated with the RD exemption for cold weather operations will not impact typical fleets. This reporting is limited to a small number of fleets statewide that are eligible for this exemption due to the location of their fleet operations.

B.4: Impacts to Housing Costs

The Proposed Amendments do not directly impact housing costs. CARB staff believes that it is unlikely that direct costs would be passed on to buyers or residents of new residential housing, and CARB staff analyzed the potential indirect impact on new residential construction on a per-unit basis based on forecasted production of new residential units and the needed units to meet California's housing needs identified in the 2022 Statewide Housing Plan. It is important to consider the housing needs established in the Statewide Housing Plan, as these inform obligations in the Regional Housing Needs Assessment (RHNA), which dictates how much housing local governments must plan to accommodate. The results and methodology for CARB's analysis is found in Section 9 (Appendix C) of the

Standardized Regulatory Impact Assessment for Amendments to the In-Use Off-Road Diesel-Fueled Fleets Regulation.⁵⁵

Governor Newsom has prioritized tackling California's housing crisis through a comprehensive housing vision focusing on four key areas: streamlining the building of new homes, breaking down barriers to build more affordable housing, addressing systemic bias by elevating fair housing principles, and holding local governments accountable to do their job. To achieve this, the Governor signed a 31-bill housing package in 2021 that touches on all four key areas, which will make it necessary for local governments to plan for the creation of more than 2.5 million units statewide – more than doubling their obligation under the previous RHNA cycle. This suite of legislation is complemented by a \$22 billion investment in housing as part of the California Comeback Plan. CARB's analysis is projecting potential impacts based on today's conditions; however, this robust package of legislation and funding provides a basis for extensive growth in the residential housing sector through the next decade.

Developing residential housing in California is complex, with multiple facets combined to add to the cost of development. These include land acquisition, hard construction costs, development fees, permitting and development timelines, financing, and regulations. Hard construction costs are those directly related to construction and are a significant percentage of total development costs. These costs are primarily driven by labor (prevailing wages) and materials (e.g., wood, concrete, plastics, composites, steel, etc.); vehicles, such as those subject to the Proposed Amendments, are not generally factored into cost drivers of residential housing in California.

CARB estimates that there could potentially be a one-time indirect cost increase to new residential construction per unit (calculated based on forecasted units) of \$236 to \$1,042, which represents 0.04 to 0.3 percent of the cost of a typical new residential unit, or a one-time cost per unit (calculated based on housing needs) of \$117 to \$487, which represents 0.02 to 0.1 percent of the cost of a typical new residential unit. If these costs were fully passed along to consumers of newly constructed, for-sale housing, this could potentially add \$1 to \$7 a month to a 30-year mortgage, at a 7.5 percent interest rate for some households purchasing newly constructed housing after the year 2023. For consumers of new rental housing constructed after the year 2023, if estimated costs were fully passed along to consumers, the potential additional cost would likely be less than that for consumers of for-sale housing and would likely be lower on a per-unit basis. This is because construction costs for these units are likely to be financed over a longer period time, and because of economies of scale in multi-family housing construction, which is the form of housing in which the majority of rental housing is likely to be produced. Importantly, for residents of deed-restricted low- and moderate-income affordable housing, any potential costs passed through to residential construction projects would not impact out-of-pocket expenses (i.e., monthly rent) to residents

⁵⁵ CARB. (2022). Standardized Regulatory Impact Assessment for the Amendments to the In-Use Off-Road Diesel-Fueled Fleets Regulation. Retrieved from [Appendix B Standardized Regulatory Impact Assessment \(SRIA\) Proposed Amendments to the In-Use Off-Road Diesel-Fueled Fleets Regulation \(ca.gov\)](#).

because these units are subject to rent restrictions based on area median incomes established by the federal government.

C.1: Benefits of the Regulation

Estimated Emission Benefits

The Proposed Amendments are expected to reduce NOx and PM from off-road diesel-fueled vehicles operating in California beyond what would be achieved under the current Off-Road Diesel-Fueled Fleets Regulation. Staff estimate that from 2024 through 2038, the Proposed Amendments would reduce cumulative statewide emissions by approximately 31,069 tons of NOx and 2,711 tons of PM beyond expected emissions reductions from the Current Regulation. Table 25 shows the estimated annual emission reductions that would result from the Proposed Amendments from 2024 through 2038; Figure 3 and Figure 4 show the difference in emissions between the baseline scenario and the Proposed Amendments for NOx and PM, respectively.

These Proposed Amendments constitute one of the control measures identified in the 2022 State SIP Strategy where CARB is committing to taking actions in order to achieve reductions in PM and NOx to reach federal air quality attainment. The PM and NOx emission reductions achieved through the Proposed Amendments will directly meet this commitment.

Table 25. Estimated Annual NOx and PM Emission Reductions Resulting from the Proposed Amendments from 2024 through 2038 Beyond the Baseline Emission Reductions⁵⁶

Year	NOx (tons)	PM (tons)
2024	2,590	275
2025	2,330	248
2026	2,671	249
2027	2,379	223
2028	2,903	242
2029	2,531	213
2030	2,484	200
2031	2,178	177
2032	1,957	157
2033	1,712	141
2034	1,500	123
2035	1,319	108
2036	1,678	132
2037	1,497	118
2038	1,340	105
Total	31,069	2,711

⁵⁶ Values have been rounded.

Figure 3. Statewide NOx Emissions from Off-Road Diesel Vehicles under the Baseline and Proposed Amendments

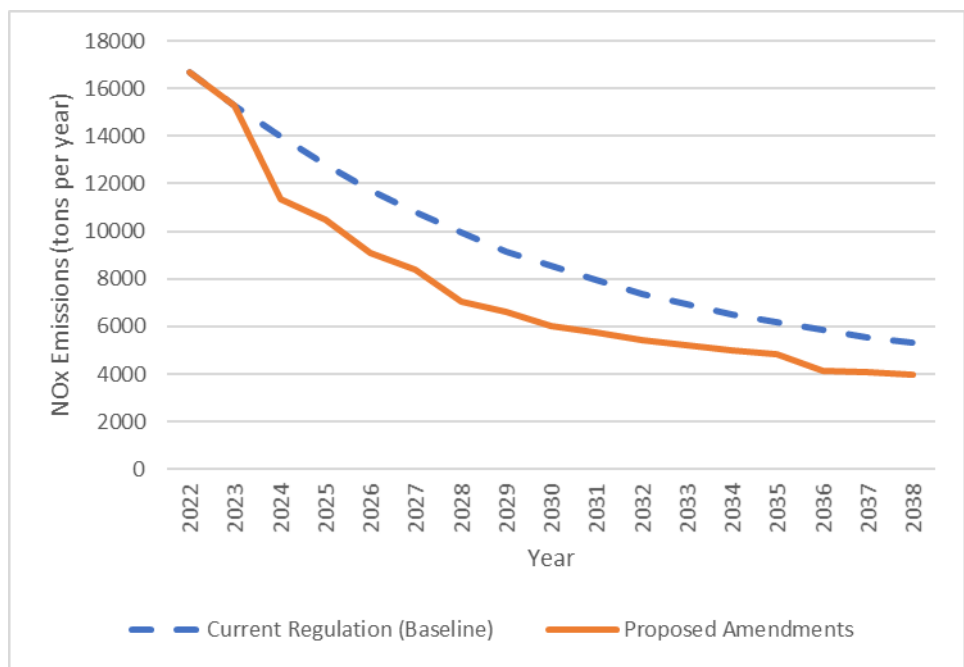
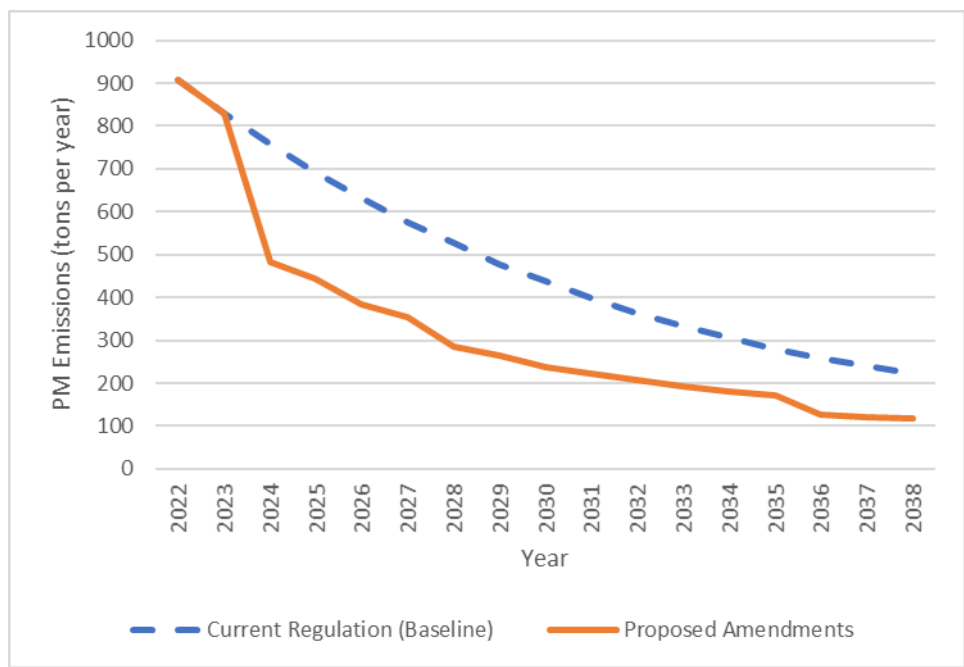


Figure 4. Statewide PM Emissions from Off-Road Diesel Vehicles under the Baseline and Proposed Amendments



Estimated Health Benefits

CARB staff estimated the reduction in adverse health outcomes associated with reduced emissions of PM_{2.5} and NO_x due to the Proposed Amendments. Section 2.4 of the Standardized Regulatory Impact Analysis (SRIA) provides additional details on the methodology for calculating the health benefits discussed in this section. These health outcomes include cardiopulmonary mortality, hospital admissions for cardiovascular and respiratory illnesses, and emergency room visits for asthma. Based on the analysis, staff estimates that the total reduction in the number of cases statewide due to the implementation of the Proposed Amendments from 2024 to 2038 would be as follows:

- 570 fewer premature deaths (446 to 698, 95 percent confidence interval (CI));
- 82 fewer hospital admissions for cardiovascular illnesses (0 to 161, 95 percent CI);
- 98 fewer hospital admissions for respiratory illnesses (23 to 173, 95 percent CI); and
- 277 fewer emergency room visits for asthma (175 to 378, 95 percent CI).

Table 26 shows the estimated reductions and 95 percent confidence intervals in adverse health outcomes resulting from the Proposed Amendments, by air basin, from 2024 through 2038. The biggest health benefits are expected to occur in the South Coast, San Joaquin Valley, and San Francisco Bay Area air basins.

Table 26. Total Reductions in Health Outcomes as a Result of the Proposed Amendments (2024 through 2038)

Air Basin ⁵⁷	Cardiopulmonary Mortality	Cardiovascular Hospital Admissions	Respiratory Hospital Admissions	Asthma Emergency Room Visits
Mojave Desert	13 (10 - 16)	2 (0 - 4)	2 (1 - 4)	5 (3 - 7)
Mountain Counties	3 (3 - 4)	0 (0 - 1)	0 (0 - 1)	1 (1 - 2)
North Central Coast	2 (1 - 2)	0 (0 - 1)	0 (0 - 1)	1 (1 - 1)
North Coast	1 (1 - 1)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
Sacramento Valley	25 (19 - 31)	3 (0 - 5)	3 (1 - 6)	10 (6 - 13)
Salton Sea	1 (1 - 2)	0 (0 - 0)	0 (0 - 0)	1 (0 - 1)
San Diego County	29 (23 - 36)	4 (0 - 7)	4 (1 - 8)	12 (8 - 17)
San Francisco Bay Area	51 (40 - 62)	8 (0 - 15)	9 (2 - 16)	29 (18 - 39)
San Joaquin Valley	83 (65 - 101)	9 (0 - 17)	11 (2 - 19)	31 (19 - 42)
South Central Coast	6 (5 - 8)	1 (0 - 2)	1 (0 - 2)	3 (2 - 4)
South Coast	355 (278 - 435)	56 (0 - 110)	67 (16 - 118)	184 (117 - 252)
Total⁵⁸	570 (446 - 698)	82 (0 - 161)	98 (23 - 173)	277 (175 - 378)

In accordance with U.S. Environmental Protection Agency (U.S. EPA) practice, CARB staff monetized health outcomes by multiplying the number of incidences by a standard value derived from economic studies.⁵⁹ Table 27 shows the valuation per incident avoided health outcome in 2020 U.S. Dollars (2020\$). The valuation for avoided premature mortality is based on the value of statistical life, which is a statistical construct based on the aggregated dollar amount that a large group of people would be willing to pay for a reduction in their individual risk of dying in a year, such that one death would be avoided in the year across the population.⁶⁰ This is not an estimate of how much any single individual would be willing to pay to prevent a certain death of any particular person,⁶¹ nor does it consider any specific costs, such as hospital expenditures, associated with mortality.

Unlike premature mortality valuation, the valuation for avoided hospitalizations and emergency room visits is based on a combination of typical costs associated with hospitalization and the willingness of surveyed individuals to pay to avoid adverse outcomes that occur when hospitalized. These include hospital charges, post-hospitalization medical

⁵⁷ Air Basins not listed have no quantifiable reductions in health outcomes as a result of the Proposed Amendments.

⁵⁸ Totals may not sum due to rounding.

⁵⁹ U.S. EPA. (2010). Appendix B: Mortality Risk Valuation Estimates. Retrieved July 6, 2022, from [Guidelines for Preparing Economic Analyses: Mortality Risk Valuation Estimates \(Appendix B\)](#).

⁶⁰ U.S. EPA. (2000). SAB Report on EPA's White Paper Valuing the Benefits of Fatal Cancer Risk Reduction. Retrieved July 6, 2022, from [Document Display | NEPIS | US EPA](#).

⁶¹ U.S. EPA. (n.d.). Mortality Risk Valuation – What does it mean the place a value on a life? Retrieved July 6, 2022, from [Mortality Risk Valuation | US EPA](#).

care, out-of-pocket expenses, lost earnings for both individuals and family members, lost recreation value, and lost household protection (e.g., valuation of time losses from inability to maintain the household or provide childcare). These costs are most closely associated with specific cost savings to individuals and costs to the healthcare system.

Table 27. Valuation per Incident Avoided Health Outcomes (2020\$)

Outcome	Valuation per Incident
Avoided Premature Deaths	\$10,030,076
Avoided Hospital Admissions for Cardiovascular Illnesses	\$59,247
Avoided Hospital Admissions for Respiratory Illnesses	\$51,678
Avoided Emergency Room Visits for Asthma	\$848

The statewide valuation of health benefits is calculated by multiplying the number of avoided adverse health outcomes by valuation per incident. Staff quantified the annual and total statewide valuation of avoided adverse health outcomes from 2024 through 2038, and they are shown in Table 28 and Table 29, respectively. The statewide distribution of these benefits follows the distribution of emission reductions and avoided adverse health outcomes; therefore, most benefits to individuals will occur in the South Coast, San Joaquin Valley, and San Francisco Bay Area air basins.

Table 28. Annual Statewide Avoided Adverse Health Outcomes and Valuation as a Result of the Proposed Amendments from 2024 through 2038

Year	Avoided Premature Deaths	Avoided Hospitalizations	Avoided Emergency Room Visits	Valuation (million 2020\$)
2024	50	14	25	\$499.3
2025	45	13	22	\$455.3
2026	49	14	24	\$489.3
2027	44	13	22	\$442.7
2028	51	16	25	\$511.8
2029	45	14	22	\$454.2
2030	44	14	21	\$441.4
2031	39	13	19	\$392.6
2032	35	12	17	\$354.9
2033	32	11	15	\$318.0
2034	28	9	13	\$281.5
2035	25	8	12	\$249.9
2036	31	11	15	\$310.4
2037	28	10	13	\$278.9
2038	25	9	12	\$251.4
Total ⁶²	570	180	277	\$5,731.6

⁶² Totals may not sum due to rounding.

Table 29. Total Statewide Valuation of Avoided Adverse Health Outcomes as a Result of the Proposed Amendments from 2024 through 2038

Outcome	Valuation (million 2020\$)
Avoided Premature Deaths	\$5,721.5
Avoided Hospital Admissions for Cardiovascular Illnesses	\$4.9
Avoided Hospital Admissions for Respiratory Illnesses	\$5.1
Avoided Emergency Room Visits for Asthma	\$0.2
Total ⁶³	\$5,731.6

Cost Savings

Section B. Estimated Costs describes the methodology used to calculate cost savings from the Proposed Amendments for industry. Annual cost savings from the Proposed Amendments occur when the baseline has larger capital cost than the Proposed Amendments. The baseline has larger capital costs in years where some portion of the baseline turnover population would have been turned over in a previous year due to implementation of the Proposed Amendments. Staff estimated cost savings to industry from the Proposed Amendments to be \$1.28 billion from 2023 to 2038, as shown previously in Table 14.

Other Benefits

The Proposed Amendments will provide air quality benefits that will benefit the health of not only people residing or working near places where off-road diesel vehicles are operated but also employees of the companies using these vehicles, as they are exposed to the emissions from operating these vehicles. These health benefits for employees would translate into reduced healthcare costs and reduced lost productivity from sickness associated with exposure to diesel emissions.

The increased demand for newer vehicles due to the Tier phase-out requirements would also increase sales of off-road diesel vehicles, resulting in additional income for businesses involved in the manufacture and distribution of off-road diesel vehicles, including vehicle and parts manufacturers, dealers, and financial institutions. Consulting companies that advise companies on compliance with the regulation's changes would also see increased revenue.

Often fleets see increased efficiencies from the use of newer off-road vehicles. Some vehicles have increased versatility due to the numerous attachments available, increasing the type of work for which a single machine can be used. Newer off-road vehicles often incorporate advancements that increase worker comfort, have more precise operations that decrease fuel use (e.g., telematics and electronic throttles for precision control), and newer engines that

⁶³ Total may not sum due to rounding.

may reduce fuel consumption through optional modes that reduce engine speed without reducing power, as examples.

Finally, businesses using off-road diesel vehicles would be provided with a more level playing field through the enhanced enforcement and reporting provisions of the Proposed Amendments, which would help ensure that compliant fleets would not be subjected to unfair competition by fleets that have chosen not to comply.

C.2: Statutory Requirements and Agency Goals

The California Legislature has found that:

The control and elimination of [air pollutant emissions from motor vehicles] is of prime importance for the protection and preservation of the public health and well-being, and for the prevention of irritation to the senses, interference with visibility, and damage to vegetation and property. . . . Dependence on petroleum based fuels in motor vehicles not only contributes to substantial degradation of air quality and risk to public health, but also impedes the state's progress toward the petroleum use reduction goal prescribed in Section 25000.5 of the Public Resources Code. (Health & Saf. Code, § 43000, subds. (b) & (e).)

The Legislature articulated its intent that CARB be responsible for controlling motor vehicle emissions and meeting State and federal ambient air quality standards and empowered CARB to adopt regulations to do so. (*Id.*, §§ 39002, 39003, 39500, 39601, 39602, and 39602.5.)

California has made significant improvements in its air quality over the past decade. However, despite these improvements, more than half (21 million out of nearly 40 million) of Californians live in areas that exceed the health-based federal ozone standards. In order to meet federal air quality standards and improve public health, further PM and NO_x emissions reductions are needed statewide. The Proposed Amendments are one of several statewide control measures CARB committed to bringing to the Board for consideration to achieve the NO_x reductions needed for the attainment of federal standards as part of the 2022 State Strategy for the State Implementation Plan. Furthermore, U.S. EPA is proposing to lower the annual PM_{2.5} National Ambient Air Quality Standard from the current 12 micrograms per cubic meter (µg/m³) to a level ranging from 8-11 µg/m³.⁶⁴ U.S. EPA is collecting public comments, and the new standard may not be finalized until late 2023/early 2024. Depending on the standard set by U.S. EPA, a vast majority of the state could be in nonattainment if the new standard ends up at the bottom end of the range currently proposed. Cumulatively, from 2024 through 2038, the Proposed Amendments are expected to reduce statewide emissions from off-road diesel-fueled vehicles by approximately 31,069 tons of NO_x and 2,711 tons of PM beyond the reductions expected from the Current Regulation. About half

⁶⁴ U.S. EPA. (2023). 40 Code of Federal Regulations (CFR) Parts 50, 53, and 58, Reconsideration of the National Ambient Air Quality Standards for Particulate Matter. Retrieved January 31, 2023, from [2023-00269.pdf \(govinfo.gov\)](#).

of the additional NO_x and PM reductions from the Proposed Amendments are expected to be realized within the first 6 years of implementation, greatly decreasing health risks associated with air pollutants from off-road diesel vehicles owned and operated throughout California.

The additional emissions reductions from the Proposed Amendments are expected to reduce the concentration of PM in the communities in which these vehicles operate, benefitting both local residents and the operators of the vehicles alike, as well as reduce the concentration of ozone which provides regional health benefits. Achieving further PM and NO_x reductions from the off-road sector is critically important to providing much-needed public health protection for the millions of Californians who still breathe unhealthy air, to reducing community exposure to air toxics, and to helping meet current health-based ambient air quality standards across California.

The proposed administrative requirements will also ensure that compliant fleets are not subject to unfair competition by fleets that have chosen not to comply, by aiding enforcement of the regulation's provisions.

Additionally, the Proposed Amendments support State policies and plans directing CARB to obtain additional diesel emission reductions, including the 2020 Mobile Source Strategy, Assembly Bill 617 (C. Garcia, Chapter 136, Statutes of 2017), Governor Newsom issued Executive Order (EO) N-79-20, and CARB's Short-Lived Climate Pollutant Reduction Strategy.

Although the Proposed Amendments are not a driver for the deployment of zero-emission vehicles, voluntary provisions have been included to promote this objective. These provisions support Governor Newsom's EO N-79-20 which orders that:

It shall be a goal of the State that 100 percent of in-state sales of new passenger cars and trucks will be zero-emission by 2035. It shall be a further goal of the State that 100 percent of medium- and heavy-duty vehicles in the State be zero-emission by 2045 for all operations where feasible and by 2035 for drayage trucks. It shall be further a goal of the State to transition to 100 percent zero-emission off-road vehicles and equipment by 2035 where feasible.

C.3: Total Statewide Benefits

As discussed above, the Proposed Amendments provide benefits in the form of PM and NO_x emissions reductions and health benefits to individuals resulting from those emissions reductions. Table 30 summarizes the total monetized statewide benefits, including the health benefits (Table 29) and the cost savings to fleets (Table 37).⁶⁵ The monetized benefits likely are underestimated, as only a limited set of health outcomes have methods to monetize. In addition to the monetized health impacts, there are additional health benefits associated with the emission reductions that the Proposed Amendments will achieve but that are

⁶⁵ Section 2.4 of the SRIA provides additional details on the methodology for calculating the monetized health benefits.

currently not monetized, including reductions in elevated vulnerability and impacts in disadvantaged communities, work loss days, school loss days, brain and lung health, cancer risk, and birth outcomes.

Table 30. Total Statewide Benefits from the Proposed Amendments from 2023-2038

Outcome	Valuation (million 2020\$)
Avoided Premature Deaths	\$5,721.5
Avoided Hospital Admissions for Cardiovascular Illnesses	\$4.9
Avoided Hospital Admissions for Respiratory Illnesses	\$5.1
Avoided Emergency Room Visits for Asthma	\$0.2
Cost Savings to Fleets	\$1,349.8
Total	\$7,082

D.1: Alternatives to the Regulation

Alternative 1 - Less Stringent

Alternative 1 is a less stringent requirement for fleets that own and operate the vehicles subject to the Proposed Amendments. Alternative 1 adjusts the Proposed Amendments by delaying the phase-out of vehicles with Tier 0, 1, and 2 engines by 2 years. Additionally, Alternative 1 does not implement a phase-out of Tier 2 engines for small and ultra-small (fleets with less than 500 hp) fleets. Alternative 1 also delays the restrictions on adding Tier 3 and Tier 4 interim vehicles to a fleet by two years when compared to the Proposed Amendments. Further, Alternative 1 does not require fleets to procure and use to R99 RD. Finally, this alternative would not make changes to the contracting, prime contractor or extended annual reporting requirements. Key elements of Alternative 1 include the following:

- Requirements for the Tier phase-out are adjusted based on the schedule in Table 31. Some exemptions apply, such as using a vehicle fewer than 200 hours per year (i.e., low-use). For all fleet sizes, low-use vehicles with Tier 0 or a MY 1994 or older on-road engines would be required to be phased out by January 1, 2036.

Table 31. Tier and Model Year Phase-out Dates by Fleet Size under Alternative 1

Year (January 1)	Large Fleets	Medium Fleets	Small Fleets ⁶⁶
2026	Tier 0/MY 1994 or older on-road		
2028	Tier 1/MY 1999 or older on-road	Tier 0/MY 1994 or older on-road	
2030	Tier 2/MY 2003 or older on-road	Tier 1/MY 1999 or older on-road	Tier 0/MY 1994 or older on-road
2032		Tier 2/MY 2003 or older on-road	Tier 1/MY 1999 or older on-road

- Requirements for the restrictions on the addition of a Tier 3 or Tier 4 interim (Tier 4i) vehicle or a MY 2006 or older on-road vehicle to a fleet are adjusted as shown in Table 32.

Table 32. Compliance Dates for the Restrictions on Adding Vehicles under Alternative 1

Year (January 1)	Large Fleets	Medium Fleets	Small and Ultra-Small Fleets
2024	Tier 3		
2026	Tier 4i/MY 2006 or older on-road	Tier 3	
2028		Tier 4i/MY 2006 or older on-road	Tier 3
2030			Tier 4i/MY 2006 or older on-road

This alternative aligns with proposals and comments made by stakeholders advocating for delayed implementation of several key elements of the Proposed Amendments and that CARB not require RD usage as part of the Proposed Amendments. CARB rejected Alternative 1 because it is less cost-effective and would achieve fewer NO_x and PM reductions than the Proposed Amendments. To the extent the vehicles impacted by the Proposed Amendments are domiciled at a facility, this alternative does not provide much needed localized reductions in toxic diesel PM. This alternative also does not align with the measure in the 2022 State SIP Strategy to achieve reductions of 4.1 tons per day of NO_x in 2037.

Alternative 2 – More Stringent

Alternative 2 is a more stringent requirement for fleets that own and operate the vehicles subject to the Proposed Amendments. Alternative 2 adjusts the Proposed Amendments by implementing the phase-out of vehicles with Tier 0, 1, and 2 engines earlier than the Proposed Amendments. Alternative 2 also imposes a phase-out of Tier 3 vehicles for all fleet sizes, which is not required under the Proposed Amendments. Additionally, Alternative 2

⁶⁶ Ultra-small fleets would not have additional phase-out requirements under Alternative 1.

implements the restrictions on adding Tier 3 and Tier 4i vehicles to large and medium fleets upon adoption of the proposal. For small fleets, Alternative 2 implements the restriction on adding Tier 3 vehicles upon adoption, and on Tier 4 interim vehicles two years earlier than the Proposed Amendments. This alternative would not make changes to the RD, contracting, prime contractor, or extended annual reporting requirements in the Proposed Amendments. Key elements of Alternative 2 include the following:

- Requirements for the Tier phase-out are adjusted as shown in the schedule in Table 33. Some exemptions apply, such as using a vehicle fewer than 200 hours per year (i.e., low-use). For all fleet sizes, low-use vehicles with a Tier 0 engine or a MY 1994 or older on-road engine would be required to be phased-out by January 1, 2036.

Table 33. Tier and Model Year Phase-out Dates by Fleet Size under Alternative 2

Year (January 1)	Large Fleets	Medium Fleets	Small Fleets	Ultra-Small ⁶⁷
Upon adoption (Late 2023)	Tier 0/MY 1994 or older on-road			
2024		Tier 0/MY1994 or older on-road		
2025	Tier 1/MY1999 or older on-road			
2026		Tier 1/MY 1999 or older on-road	Tier 0/MY 1994 or older on-road	
2027	Tier 2/MY 2003 or older on-road			
2028		Tier 2/MY 2003 or older on-road	Tier 1/MY 1999 or older on-road	
2029	Tier 3			
2030		Tier 3	Tier 2/MY 2003 or older on-road	
2032			Tier 3	
2036				Tier 2/MY 2003 or older on-road

- Requirements for the restrictions on the addition of a Tier 3 or Tier 4 interim (Tier 4i) vehicle or a MY 2006 or older on-road vehicle to a fleet are adjusted as shown in the schedule in Table 34.

⁶⁷ Ultra-small fleets are required to have 100 percent of their fleet Tier 2 or cleaner by January 1, 2029, under the Off-Road Regulation.

Table 34. Compliance Dates for the Restrictions on Adding Vehicles under Alternative 2

Year	Large Fleets	Medium Fleets	Small and Ultra-Small Fleets
Adoption	Tier 4i/MY 2006 or older on-road	Tier 4i/MY 2006 or older on-road	Tier 3 or older
2026			Tier 4i/MY 2006 or older on-road

This alternative aligns with proposals and comments made by stakeholders advocating to achieve additional emission reductions from this sector as quickly as possible and to require the phase-out of Tier 3 engines in California. CARB rejected Alternative 2 because it imposes higher costs but achieves low additional emission reductions; therefore, it would be less cost-effective to implement than the Proposed Amendments. The accelerated timeline under Alternative 2 creates significant additional costs in the near-term, which could put fleets at risk of noncompliance or inability to continue their business at current levels. Additionally, due to the additional near-term vehicle turnover that would be required, there could be a lack of availability of compliant vehicles to meet the near-term need.

D.2: Comparison of Costs and Benefits

The methodology and assumptions used to quantify costs, cost savings, and monetized health impacts associated with the two alternatives are the same as the methodology used for the Proposed Amendments. The description can be found in Economic Impact Statement Section B. Estimated Costs and C.1: Benefits of the Regulation.

Table 35 summarizes the benefits and costs associated with the Proposed Amendments, Alternative 1, and Alternative 2 from 2023 to 2038. Note that, in contrast to earlier tables showing only the benefits of the Proposed Amendments, because Alternative 2 takes effect upon adoption of the Proposed Amendments, Table 35 and subsequent tables that include Alternative 2 display benefits a year earlier, to account for the effects from Alternative 2 over the last several months of 2023.

Table 35. Total Statewide Costs and Benefits from 2023 to 2038

Scenario	Benefits	Costs
Proposed Amendments	\$7.08 Billion	\$3.32 Billion
Alternative 1	\$3.95 Billion	\$2.68 Billion
Alternative 2	\$8.40 Billion	\$4.27 Billion

Figure 5 and Figure 6 show the NO_x and PM emissions under the baseline, Proposed Amendments, and Alternative 1. Figure 7 and Figure 8 show the NO_x and PM emissions under the baseline, Proposed Amendments, and Alternative 2.

Figure 5. Projected NOx Emissions under the Baseline, Proposed Amendments, and Alternative 1

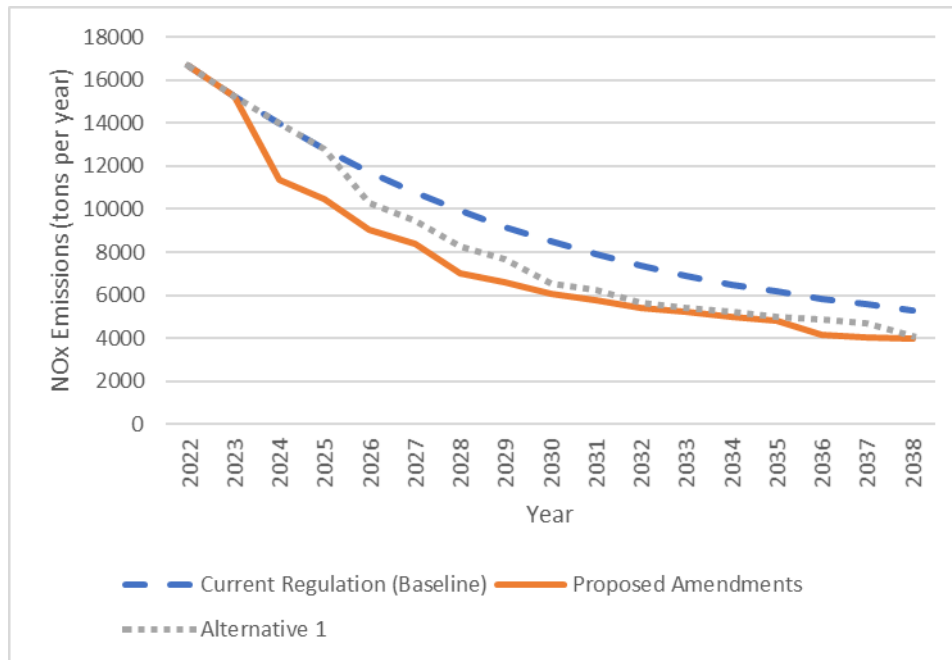


Figure 6. Projected PM Emissions under the Baseline, Proposed Amendments, and Alternative 1

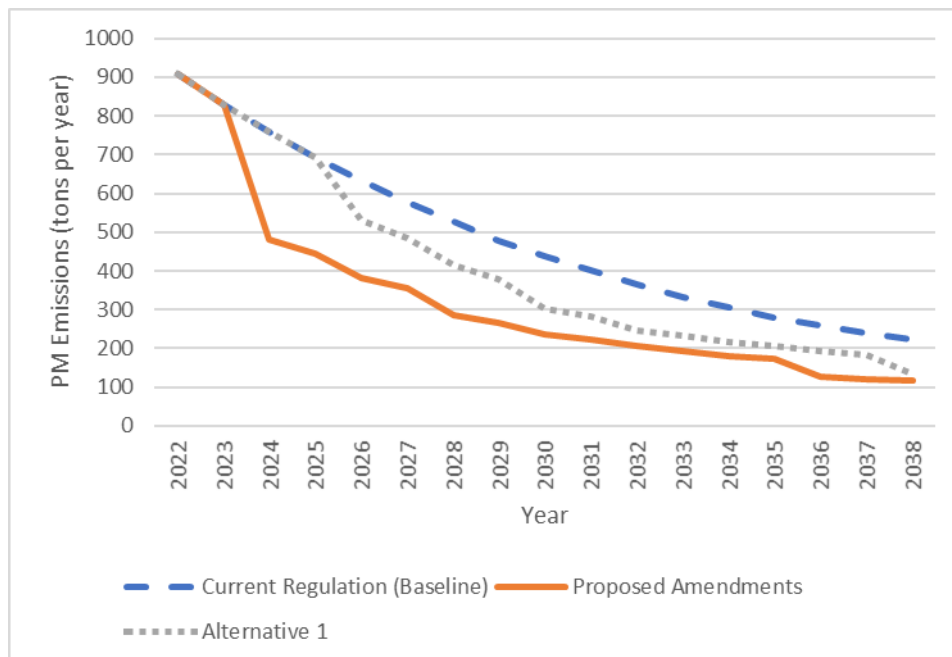


Figure 7. Projected NOx Emissions under the Baseline, Proposed Amendments, and Alternative 2

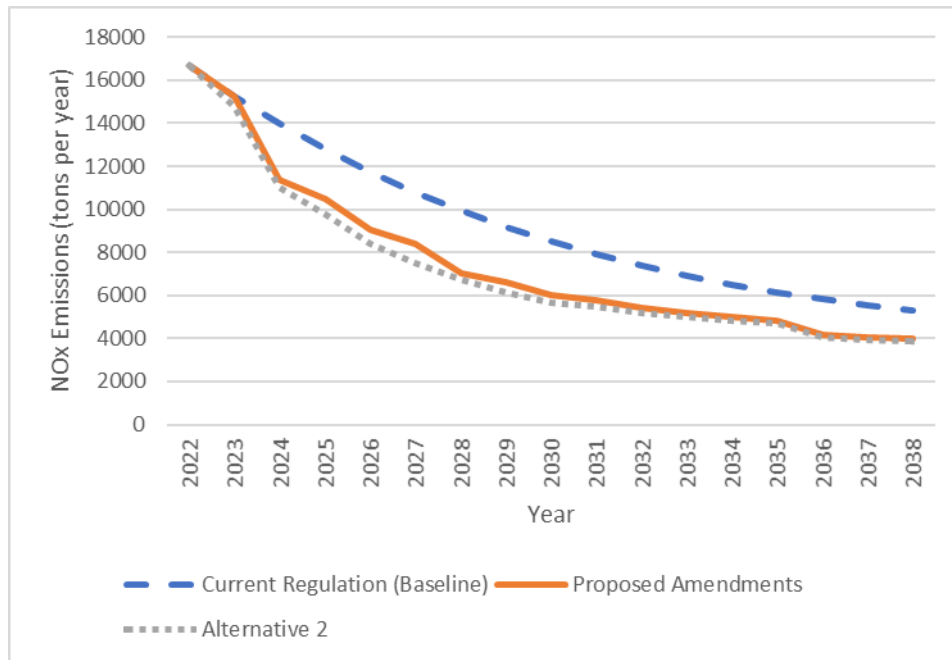


Figure 8. Projected PM Emissions under the Baseline, Proposed Amendments, and Alternative 2

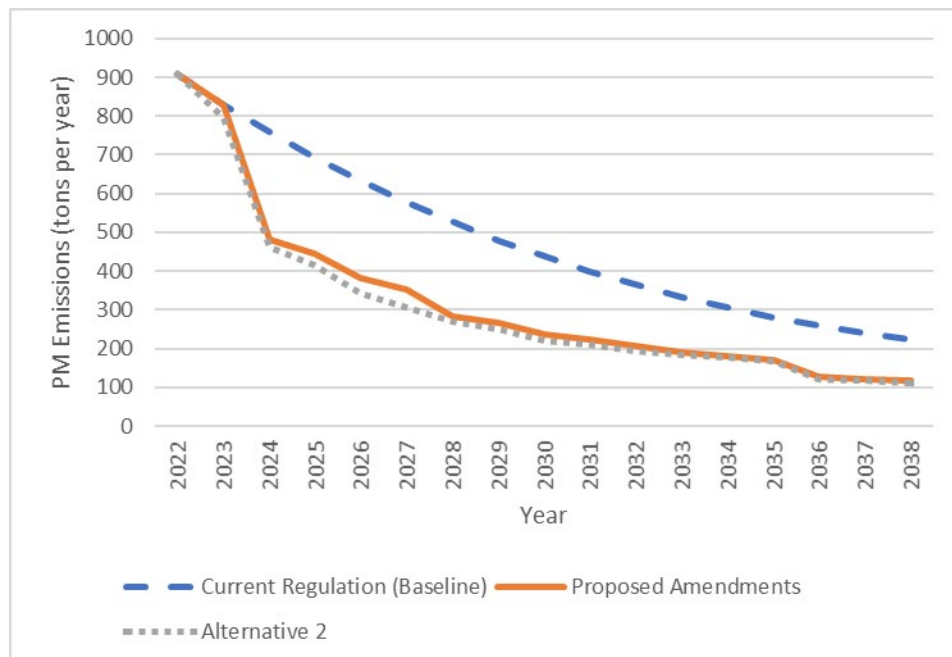


Table 36 shows the total cumulative NOx and PM emissions reductions for the Proposed Amendments, Alternative 1, and Alternative 2.

Table 36. Total Cumulative NOx and PM emission reductions from 2023 through 2038 for the Proposed Amendments, Alternative 1 and Alternative 2, in tons

Scenario	NOx (tons)	PM (tons)
Proposed Amendments	31,069	2,711
Alternative 1	18,294	1,252
Alternative 2	36,715	2,986

D.4: Performance Standards as an Alternative

The Proposed Amendments do not mandate the use of specific technologies or equipment or prescribe specific actions for regulated entities. However, out of an abundance of caution CARB staff have evaluated some provisions of the Proposed Amendments that may be viewed as prescriptive if read in isolation. First is the Tier 0, Tier 1, and Tier 2 phase-out. The Tier phase-out states that fleets can no longer operate vehicles with engines meeting specific Tier standards at specified dates. An alternative to this would be continuing the current fleet average target approach beyond the Current Regulation's requirements through the imposition of additional, more stringent fleet average targets, to take effect for medium and large fleets beyond 2023, and for small fleets, beyond 2028.

CARB is rejecting this alternative because to achieve similar reductions in a similar timeframe as in the Proposed Amendments, very stringent fleet average targets will need to be set, so that most of the flexibility expected from the averaging approach would be lost anyway. Additionally, this alternative does meet primary objectives of the Proposed Amendments, to streamline and simplify the requirements of the regulation and increase the enforceability of its provisions. A fleet average is inherently more time and labor-intensive for both enforcement personnel and the fleet being audited, as the entire fleet's vehicles across all of its locations need to be accounted for. This results in a lower number of fleets that can be examined as part of enforcement activities. The Proposed Amendments' vehicle-based requirements would allow for far more efficient enforcement of the regulation, and thus better ensure a level playing field among regulated entities who dutifully comply with the requirements and those who choose to ignore their obligations, as well as better ensure that the expected emissions reductions are realized.

Second, the Proposed Amendments require fleets to use RD beginning January 1, 2024, with some limited exemptions. An alternative to this would be to not require fleets to use RD and allow fleets to continue to operate using conventional diesel. The alternative to not require the use of RD would not achieve significant near-term NOx reductions needed to help meet the federal ambient air quality standards for ozone and achieve additional PM reductions in communities throughout the State.

E.3: Total Costs and Cost-Effectiveness

Total Statewide Incremental Costs of the Proposed Amendments

Table 37 shows the total statewide costs and cost savings for the Proposed Amendments. The analysis assumes that businesses finance vehicle capital costs. If regulated entities cannot obtain loans, then the upfront costs in certain years would be higher than the annualized cost. Table 37 includes direct costs⁶⁸ and cost savings for businesses, in addition to costs to local, State and federal governments. The methodology to estimate contracting costs for public works awarding bodies is described below.

⁶⁸ Direct costs do not include CARB's implementation costs.

Table 37. Total Statewide Direct Costs and Savings for the Proposed Amendments

Year	Annual Vehicle Capital Costs (amortized, with tax)	Tier 4 final Maintenance Costs	Contracting Costs	Signage Costs	RD Exemption	Extended Reporting	Total Costs	Total Cost Savings	Total Net Costs
2023	\$400,623,623	\$0	\$0	\$0	\$0	\$0	\$400,623,623	\$0	\$400,623,623
2024	\$373,930,659	\$1,916,532	\$12,501,229	\$3,519,603	\$14,773	\$477,220	\$392,360,017	\$0	\$392,360,017
2025	\$500,377,892	\$1,916,532	\$12,501,229	\$3,519,603	\$14,773	\$477,220	\$518,807,249	\$0	\$518,807,249
2026	\$460,308,403	\$2,903,146	\$12,501,229	\$3,519,603	\$14,773	\$477,220	\$479,724,374	\$0	\$479,724,374
2027	\$671,693,268	\$2,903,146	\$12,501,229	\$3,519,603	\$14,773	\$477,220	\$691,109,239	\$0	\$691,109,239
2028	\$199,733,766	\$4,857,867	\$12,501,229	\$3,519,603	\$14,773	\$477,220	\$221,104,458	\$0	\$221,104,458
2029	\$245,989,073	\$4,857,867	\$12,501,229	\$3,519,603	\$14,773	\$2,356,893	\$269,239,438	\$0	\$269,239,438
2030	\$56,694,958	\$5,631,267	\$12,501,229	\$3,519,603	\$14,773	\$2,356,893	\$80,718,722	\$0	\$80,718,722
2031	\$71,482,688	\$5,631,267	\$12,501,229	\$3,519,603	\$14,773	\$2,356,893	\$95,506,453	\$0	\$95,506,453
2032	(\$195,090,789)	\$6,027,650	\$12,501,229	\$3,519,603	\$14,773	\$2,356,893	\$24,420,148	(\$195,090,789)	(\$170,670,642)
2033	(\$172,484,231)	\$6,027,650	\$12,501,229	\$3,519,603	\$14,773	\$2,356,893	\$24,420,148	(\$172,484,231)	(\$148,064,084)
2034	(\$235,659,579)	\$6,027,650	\$12,501,229	\$3,519,603	\$14,773	\$2,356,893	\$24,420,148	(\$235,659,579)	(\$211,239,431)
2035	(\$198,907,246)	\$6,027,650	\$12,501,229	\$3,519,603	\$14,773	\$2,356,893	\$24,420,148	(\$198,907,246)	(\$174,487,098)
2036	(\$207,803,982)	\$6,239,292	\$12,501,229	\$3,519,603	\$14,773	\$2,356,893	\$24,631,789	(\$207,803,982)	(\$183,172,192)
2037	(\$181,733,019)	\$6,239,292	\$12,501,229	\$3,519,603	\$14,773	\$0	\$22,274,896	(\$181,733,019)	(\$159,458,123)
2038	(\$158,129,923)	\$6,239,292	\$12,501,229	\$3,519,603	\$14,773	\$0	\$22,274,896	(\$158,129,923)	(\$135,855,027)
Total⁶⁹	\$1,631,025,562	\$73,446,097	\$187,518,433	\$52,794,047	\$221,591	\$21,241,247	\$3,316,055,747	(\$1,349,808,769)	\$1,966,246,977

⁶⁹ Note that totals may not add due to rounding.

Contracting Costs for Public Works Awarding Bodies

The Proposed Amendments include new contracting requirements for prime contractors and public works awarding bodies that require these entities to only hire compliant fleets and maintain appropriate records. The contracting costs for prime contractors can be found in section B. Estimated Costs, Costs for Prime Contractors. CARB estimated the contracting costs to public works awarding bodies using the same methodology as prime contractors because the proposed requirements are the same for all contracting entities. In order to estimate the potential costs to public works awarding bodies, CARB staff analyzed three key factors: (1) the number of contracted public works projects in California that utilize off-road diesel vehicles, (2) the number of hours needed by a public works awarding body staff person to verify compliance and maintain records, and (3) the job classification and labor rate of the staff person who would most likely be performing this work.

To analyze the potential number of public works projects occurring annually in California, CARB staff reviewed several cities' Capital Improvement Plans^{70 71 72 73 74 75 76} to understand how many public works projects cities typically initiate annually that would require the use of off-road diesel machinery. After looking at several plans, it became clear that cities with larger populations had a larger number of projects, so CARB staff categorized cities into large cities (population greater than 400,000) and small cities, then averaged the number of capital improvement projects for each city category to get an estimate of annual projects of all the cities in California. Small cities had an average of 14 projects per year, and large cities had an average of 100 projects per year. Taking the total number of cities in California to be 482 (9 of which are large under CARB staff's assumptions) resulted in an estimated 7,522 capital improvement projects from all cities annually.

Many projects implemented by cities are maintenance or on-call type projects that are not included in Capital Improvement Plans. CARB staff could not find data showing the number of these types of projects, so CARB staff assumed the number of these projects would be

⁷⁰ City of San Diego. (2022). Capital Improvement Program Project List – March 2022. City of San Diego. Retrieved from [CIP Project List \(sandiego.gov\)](https://www.sandiego.gov/cip-project-list).

⁷¹ City of Temecula. (2022). Department of Public Works Project Status Report – February 2022. City of Temecula. Retrieved July 26, 2022, from [Infrastructure-Projects \(temecula.gov\)](https://www.temecula.gov/infrastructure-projects).

⁷² City of Santa Rosa. (2022). Capital Improvement Project List – March 2022. City of Santa Rosa. Retrieved March 2022, from [CIP List \(srcity.org\)](https://www.srcity.org/cip-list).

⁷³ City of Los Angeles. (2021). Capital and Technology Improvement Program 2021-22 to 2025-26. City of Los Angeles. Retrieved April 5, 2022, from [20211117 CAO FIVE- YEAR CAPITAL AND TECHNOLOGY IMPROVEMENT PROGRAM \(CTIP\) BOOK.pdf \(lacity.org\)](https://www.lacity.org/2021/11/17/cao-five-year-capital-and-technology-improvement-program-ctip-book).

⁷⁴ City of South San Francisco. (2021). Proposed Capital Improvement Program: Fiscal Year 2021-22. Retrieved April 5, 2022, from [637632507801070000 \(ssf.net\)](https://www.ssf.net/637632507801070000).

⁷⁵ City of Sacramento. (2016). 2016-2021 Approved Capital Improvement Program. Retrieved April 5, 2022, from <https://www.cityofsacramento.org/-/media/Corporate/Files/Finance/Budget/2016-2021CIP/A015-Index-L-Projects-Receiving-New-Funding-by-Funding-Source.pdf?la=en>.

⁷⁶ City of Oakland. (2021). Capital Improvement Program: Adopted Fiscal Year 2021-23. Retrieved April 5, 2022, from [FY-21-23-Adopted-CIP-Book-9.29.21.pdf \(cao-94612.s3.amazonaws.com\)](https://www.cao-94612.s3.amazonaws.com/fy-21-23-adopted-cip-book-9.29.21.pdf).

much greater than what is included in the Capital Improvement Plans because these plans generally include very large projects. CARB staff assumed there would be triple the number of these smaller types of projects versus capital improvement projects. The total number of maintenance projects by cities was thereby estimated to be 22,566 projects, which results in cities being assumed to have a total of 30,088 projects annually.

In addition to cities, other governmental bodies, including counties, transportation districts, school districts, and State agencies, also play the role of public works awarding bodies, but CARB staff were not able to find data that show the number of annual projects for these entities. To estimate the number of projects these governmental bodies initiate each year, CARB staff compared each of these other types of public agencies to cities in terms of agency size, number of such entities, area of jurisdiction, and typical construction activity. CARB staff projected the number of projects of these other government bodies as a factor of the number of projects of a city. Table 38 depicts the results of Staff's projection. These results are based on the best available data and on broad assumptions.

Table 38. Estimated Number of Public Works Projects Initiated in California Each Year

Type of Entity	Number of Projects Each Year
Cities	30,088
Counties	5,800
Special Districts	62,820
UC Campus	150
Cal State Campus	345
State Agencies	942
Total	100,145

Next, CARB staff analyzed the amount of labor required for a public works awarding body to comply with the proposed new requirements. CARB anticipates that the number of labor hours required to implement these provisions would vary greatly, based on the size of the project. For a small project, a public works awarding body may only need to verify the Certificate of Reported Compliance for one or two fleets. For a large project, however, a public works awarding body may need to verify the Certificate of Reported Compliance for many fleets. Public contracting, generally, is a formalized process and CARB expects that, with the existing procedures that the public works awarding bodies have in place, the submittal and verification of the Certificates of Reported Compliance would be streamlined and consistent with other forms of documentation that contractors must submit to public works awarding bodies as part of the contracting process. Therefore, CARB anticipates the verification of the Certificates of Reported Compliance would take between 5 minutes for a small project to upwards of 45 minutes for a larger project. Based on this understanding, CARB staff used 25 minutes, which is the average amount of time needed to comply with these requirements, recognizing that an individual public works awarding body could require quite a bit more or less time to comply with the requirements.

Finally, CARB assumed an office and administrative support staff person would perform the verification of the Certificate of Reported Compliance for the public works awarding bodies, and using the U.S. Bureau of Labor Statistics data,⁷⁷ CARB assigned a to this reporting work a labor rate of \$30.16 an hour, which is adjusted for total compensation rate.

Taking an estimate of 100,145 projects initiated in California by public works awarding bodies each year, an average of 25 minutes to report information to CARB for each project, and a labor rate of \$30.16 per hour, the total potential annual cost to all public works awarding bodies across the State from the Proposed Amendments' contracting requirement is estimated to be \$1,258,489.

Total Statewide Incremental Costs of Alternative 1 and Alternative 2

Table 39 and Table 40 display the total statewide incremental costs and cost savings from Alternative 1 and Alternative 2, respectively, from 2023 through 2038.

⁷⁷ U.S. Bureau of Labor Statistics. (2020). State Occupational Employment and Wage Estimates – May 2020. Retrieved July 13, 2022, from [California - May 2020 OEWS State Occupational Employment and Wage Estimates \(bls.gov\)](https://www.bls.gov/news.release/states/ohio202005.pdf).

Table 39. Total Statewide Incremental Costs of Alternative 1 from 2023 through 2038

Year	Annual Vehicle Capital Costs (amortized, with tax)	Tier 4 final Maintenance Costs	Contracting Costs	Signage Costs	Extended Reporting	Total Costs	Total Cost Savings	Total net costs
2023	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2024	\$0	\$0	\$12,501,229	\$3,519,603	\$477,220	\$16,498,052	\$0	\$16,498,052
2025	\$348,337,868	\$0	\$12,501,229	\$3,519,603	\$477,220	\$364,835,920	\$0	\$364,835,920
2026	\$324,364,656	\$1,669,374	\$12,501,229	\$3,519,603	\$477,220	\$342,532,082	\$0	\$342,532,082
2027	\$426,872,881	\$1,669,374	\$12,501,229	\$3,519,603	\$477,220	\$445,040,307	\$0	\$445,040,307
2028	\$392,568,931	\$2,672,415	\$12,501,229	\$3,519,603	\$477,220	\$411,739,398	\$0	\$411,739,398
2029	\$541,660,120	\$2,672,415	\$12,501,229	\$3,519,603	\$2,356,893	\$562,710,260	\$0	\$562,710,260
2030	\$135,636,153	\$4,109,815	\$12,501,229	\$3,519,603	\$2,356,893	\$158,123,694	\$0	\$158,123,694
2031	\$173,452,123	\$4,109,815	\$12,501,229	\$3,519,603	\$2,356,893	\$195,939,664	\$0	\$195,939,664
2032	\$20,157,862	\$4,796,242	\$12,501,229	\$3,519,603	\$2,356,893	\$43,331,829	\$0	\$43,331,829
2033	\$8,155,965	\$4,796,242	\$12,501,229	\$3,519,603	\$2,356,893	\$31,329,931	\$0	\$31,329,931
2034	(\$183,500,312)	\$4,796,242	\$12,501,229	\$3,519,603	\$2,356,893	\$23,173,967	(\$183,500,312)	(\$160,326,345)
2035	(\$165,448,637)	\$4,796,242	\$12,501,229	\$3,519,603	\$2,356,893	\$23,173,967	(\$165,448,637)	(\$142,274,670)
2036	(\$213,390,882)	\$4,796,242	\$12,501,229	\$3,519,603	\$2,356,893	\$23,173,967	(\$213,390,882)	(\$190,216,915)
2037	(\$191,652,462)	\$4,796,242	\$12,501,229	\$3,519,603	\$0	\$20,817,074	(\$191,652,462)	(\$170,835,388)
2038	(\$170,307,899)	\$4,796,242	\$12,501,229	\$3,519,603	\$0	\$20,817,074	(\$170,307,899)	(\$149,490,825)
Total⁷⁸	\$1,446,906,366	\$50,476,901	\$187,518,435	\$52,794,045	\$21,241,247	\$2,683,237,185	(\$924,300,191)	\$1,758,936,994

⁷⁸ Note that totals may not add due to rounding.

Table 40. Total Statewide Incremental Costs of Alternative 2 from 2023 through 2038

Year	Annual Vehicle Capital Costs (amortized, with tax)	Tier 4 final Maintenance Costs	Contracting Costs	Signage Costs	RD Exemption	Extended Reporting	Total Costs	Total Cost Savings	Total Net Costs
2023	\$460,341,662	\$514,139	\$0	\$0	\$0	\$0	\$460,855,800	\$0	\$460,855,800
2024	\$548,464,385	\$910,167	\$12,501,229	\$3,519,603	\$14,773	\$477,220	\$565,887,377	\$0	\$565,887,377
2025	\$665,580,097	\$1,692,842	\$12,501,229	\$3,519,603	\$14,773	\$477,220	\$683,785,764	\$0	\$683,785,764
2026	\$747,397,529	\$3,130,589	\$12,501,229	\$3,519,603	\$14,773	\$477,220	\$767,040,943	\$0	\$767,040,943
2027	\$767,499,900	\$4,087,801	\$12,501,229	\$3,519,603	\$14,773	\$477,220	\$788,100,526	\$0	\$788,100,526
2028	\$379,810,525	\$5,031,786	\$12,501,229	\$3,519,603	\$14,773	\$477,220	\$401,355,136	\$0	\$401,355,136
2029	\$284,741,159	\$5,938,060	\$12,501,229	\$3,519,603	\$14,773	\$2,356,893	\$309,071,717	\$0	\$309,071,717
2030	\$70,450,511	\$6,752,967	\$12,501,229	\$3,519,603	\$14,773	\$2,356,893	\$95,595,976	\$0	\$95,595,976
2031	(\$64,129,306)	\$6,752,967	\$12,501,229	\$3,519,603	\$14,773	\$2,356,893	\$25,145,465	(\$64,129,306)	(\$38,983,841)
2032	(\$163,420,631)	\$7,022,264	\$12,501,229	\$3,519,603	\$14,773	\$2,356,893	\$25,414,762	(\$163,420,631)	(\$138,005,870)
2033	(\$303,856,995)	\$7,022,264	\$12,501,229	\$3,519,603	\$14,773	\$2,356,893	\$25,414,762	(\$303,856,995)	(\$278,442,233)
2034	(\$354,815,690)	\$7,022,264	\$12,501,229	\$3,519,603	\$14,773	\$2,356,893	\$25,414,762	(\$354,815,690)	(\$329,400,929)
2035	(\$294,063,546)	\$7,022,264	\$12,501,229	\$3,519,603	\$14,773	\$2,356,893	\$25,414,762	(\$294,063,546)	(\$268,648,784)
2036	(\$282,227,947)	\$7,329,848	\$12,501,229	\$3,519,603	\$14,773	\$2,356,893	\$25,722,346	(\$282,227,947)	(\$256,505,601)
2037	(\$236,413,533)	\$7,329,848	\$12,501,229	\$3,519,603	\$14,773	\$0	\$23,365,453	(\$236,413,533)	(\$213,048,081)
2038	(\$196,290,901)	\$7,329,848	\$12,501,229	\$3,519,603	\$14,773	\$0	\$23,365,453	(\$196,290,901)	(\$172,925,448)
Total⁷⁹	\$2,029,067,217	\$84,889,917	\$187,518,435	\$52,794,045	\$221,591	\$21,241,247	\$4,270,951,002	(\$1,895,218,550)	\$2,375,732,452

⁷⁹ Note that totals may not add due to rounding.

Cost-Effectiveness

Cost-effectiveness is a measure of the cost of a regulation per ton of expected emission reduction. There are multiple approaches to calculating cost-effectiveness. Staff calculated the cost-effectiveness of Proposed Amendments, Alternative 1, and Alternative 2 (in \$/weighted ton) using the cost-effectiveness method provided in Appendix C of the Carl Moyer Program Guidelines, which divides the cost over a period of time by the weighted emission reductions (in tons per year) over that time period⁸⁰ using the following equation.

$$Cost - Effectiveness = \frac{Net\ Direct\ Costs}{[NOx\ (TPY) + (20 \times PM\ 2.5)\ (TPY)]}$$

Where:

Net Direct Costs = Direct Costs – Cost Savings

NOx = Cumulative tons of NOx emission reductions in tons per year

PM2.5 = Cumulative tons of PM2.5 emission reductions in tons per year

The cost-effectiveness of the Proposed Amendments, Alternative 1, and Alternative 2 is summarized in Table 41. CARB staff estimates that Alternative 1 is less cost-effective than the Proposed Amendments due to the reduced emissions reductions from the delay in the Tier phase-out and the lack of a requirement for fleets to use RD. CARB staff estimates that Alternative 2 is less cost-effective than the Proposed Amendments due to the increased costs associated with the implementation of the Tier phase-out on an accelerated timeframe, along with the addition of the Tier 3 phase-out.

Table 41. Cost-Effectiveness of the Proposed Amendments, Alternative 1, and Alternative 2

Scenario	Carl Moyer Program Cost-Effectiveness per Weighted Ton
Proposed Amendments	\$23,054
Alternative 1	\$40,590
Alternative 2	\$24,636

E.5: Investment and Innovation

Impacts on Investments in California

Private domestic investment consists of purchases of residential and nonresidential structures, and of equipment and software by private businesses and nonprofit institutions. It

⁸⁰ CARB. (2017). The Carl Moyer Program Guidelines: Appendix C. Retrieved April 7, 2022, from [The Carl Moyer Program Guidelines 2017 Revision Volume I](#).

is used as a proxy for impacts on investments in California, because it provides an indicator of the future productive capacity of the economy.

The relative changes to growth in private investment due to the Proposed Amendments are shown in Table 42. Private domestic investment is estimated to show a decrease of \$282 million in 2023 compared to the baseline private investment value. The largest decrease of private investment is \$919 million in 2027, which is followed by a positive trend resulting in an increase of \$281 million by 2038 due to vehicle purchases and replacements made earlier in the regulatory horizon. Businesses are expected to continue to realize increases in investments for several years past the lifetime of this analysis. In any given year, this represents changes of 0.17 percent or less than that of baseline investment.

Table 42. Change in Gross Domestic Investment

Year	Private Investment (2020M\$)	Change (2020M\$)	% Change
2023	485,258	-282	-0.06%
2024	504,256	-541	-0.11%
2025	526,128	-711	-0.14%
2026	545,609	-790	-0.15%
2027	556,705	-919	-0.17%
2028	565,522	-608	-0.11%
2029	576,760	-430	-0.08%
2030	586,880	-166	-0.03%
2031	596,624	-26	0.00%
2032	607,305	275	0.05%
2033	618,834	389	0.06%
2034	631,826	481	0.08%
2035	646,416	465	0.07%
2036	661,423	429	0.07%
2037	676,668	360	0.05%
2038	691,411	281	0.04%

Incentives for Innovation

The Proposed Amendments will further reduce emissions from off-road diesel equipment operating in California by phasing out the use of the most polluting vehicles. The Proposed Amendments target the removal of vehicles with Tier 0, 1, and 2 engines, and require the vehicles to be replaced with the cleanest available technology. The Tier 4 final engine standard has been in use since the late 2010's. Hence, the Proposed Amendments' requirements can be met with existing technology, and they will not be driving innovation in terms of engine standards.

However, the Proposed Amendments include an optional flexibility provision for fleets that want to incorporate zero-emission technology into their fleets. CARB staff does not assume

any benefits or costs associated with this provision, as it is optional. The Proposed Amendments provide the opportunity for the development and deployment of zero-emission technologies and could provide much-needed compliance flexibility for fleets wanting to participate in the beachhead innovation of off-road zero-emission technology. The compliance flexibility offered in the Proposed Amendments could create a staging ground for fleets to initiate and improve their experience with zero-emission technology. While this provision provides opportunities, the degree to which it will be employed will depend on individual fleets' decisions and thus are not quantified.

Fiscal Impact Statement

A. Fiscal Impact on Local Government

Off-Road Diesel Vehicle Costs to Owners

Local governments' fleets are subject to the Tier phase-out and additional vehicle restrictions of the Proposed Amendments. Any local government could own and operate a vehicle subject to the Proposed Amendments, such as a forklift operating in a warehouse or other facility. However, the local agencies that will be most impacted are those that are involved in public works, waste management, and sanitation, including flood control and water agencies, parks and recreation districts, fire departments, and transportation agencies.

Using February 2022 data from DOORS,⁸¹ CARB staff determined the number of vehicles owned by local governments to be three percent of the total number of vehicles reported to CARB and assumed three percent of the statewide costs in Table 37 would apply to local governments. To estimate the costs incurred by local government off-road diesel vehicle owners due to the Proposed Amendments CARB applied three percent to the statewide annual vehicle capital costs in Table 37. The assumptions underlying the direct capital costs of vehicles to local government agencies are identical to those identified in Section B. Estimated Costs.

Maintenance Costs

Local governments own and operate vehicles subject to the Tier phase-out and adding vehicle restrictions of the Proposed Amendments. As local governments comply with these requirements, many of the affected vehicles will be replaced with vehicles with Tier 4 final engines. As described in Section B. Estimated Costs, Tier 4 final engines employ technologies that require additional maintenance costs beyond what is required by older engines. CARB staff determined the number of vehicles owned by local governments to be three percent of the total number of vehicles reported and assumed three percent of the statewide costs in Table 37 would apply to local governments. To estimate the costs incurred by local governments CARB applied three percent to the statewide maintenance costs in Table 37. The underlying assumptions for calculating the direct costs of maintenance to local government agencies are identical to those identified in Section B. Estimated Costs.

Local Sales Tax

Sales tax is levied in California to fund a variety of programs at the State and local levels. The Proposed Amendments would result in the sale of more expensive off-road diesel vehicles in California, which would result in a direct increase in sales tax revenue collected by local governments. However, overall, local sales tax revenue may increase less than the direct increase from off-road diesel vehicle sales if overall business spending does not increase. For

⁸¹ CARB. (n.d.). DOORS. Retrieved April 18, 2022, from [DOORS \(ca.gov\)](https://doors.ca.gov).

this analysis, CARB staff used a combined State and local sales tax rate of 8.74 percent, which is a weighted average based on county-level output, with 3.94 percent⁸² going toward State sales tax and 4.8 percent⁸³ going toward local sales tax.

Contracting Costs

The Proposed Amendments require that public works awarding bodies verify fleet compliance by obtaining and reviewing the Certificate of Reported Compliance from all known fleets before awarding a contract and only enter into contracts with fleets compliant with the regulation. These requirements have costs that affect the direct costs on local governments. Using the assumptions and cost analysis described in Section B. Estimated Costs, CARB staff determined that 99 percent of the projects that would be subject to these requirements would be happening at the local level.

Renewable Diesel Exemption Costs

Local governments own and operate vehicles subject to the RD requirements of the Proposed Amendments. The Proposed Amendments include exemptions from the RD requirements for fleets that operate in places with extremely cold temperatures that could be unsuitable for the use of RD. These exemptions have costs related to reporting that affect the direct costs on local governments. CARB staff determined the number of vehicles owned by local governments to be three percent of the total number of vehicles reported and assumed three percent of the statewide costs in Table 37 would apply to local governments. To estimate the costs incurred by local governments CARB applied three percent to the statewide RD exemption costs in Table 37. The underlying assumptions for calculating the direct costs of the RD exemption costs to local government agencies are identical to those identified in Section B. Estimated Costs.

Extended Reporting Costs

Local governments own and operate vehicles subject to the annual reporting requirements of the Proposed Amendments. The Proposed Amendments extend the existing annual reporting requirement through 2036. This annual reporting has costs that affect the direct costs on local governments. CARB staff determined the number of vehicles owned by local governments to be three percent of the total number of vehicles reported and assumed three percent of the statewide costs in Table 37 would apply to local governments. To estimate the costs incurred by local governments CARB applied three percent to the statewide extended annual reporting costs in Table 37. The underlying assumptions for

⁸² California Department of Tax and Fee Administration. (2022). Detailed Description of the Sales & Use Tax Rate. California Department of Tax and Fee Administration. Retrieved March 11, 2022, from [Detailed Description of the Sales & Use Tax Rate \(ca.gov\)](#).

⁸³ California Department of Tax and Fee Administration. (2022). California City & County Sales & Use Tax Rates, April 1, 2022. Retrieved February 22, 2023, from California City & County Sales & Use Tax Rates. [California City & County Sales & Use Tax Rates](#).

calculating the direct costs of the extended annual reporting to local government agencies are identical to those identified in Section B. Estimated Costs.

Fiscal Impacts on Local Governments

Table 43 shows the estimated incremental fiscal impacts to local governments due to the Proposed Amendments, based on the fiscal aspect explained above. Costs (expenditures) to local governments are shown as a positive number, and cost savings are shown as a negative number (in parenthesis). Local sales tax revenue is shown as a positive number when there is an increase in revenue, and a negative number when there is a decrease in revenue (in parenthesis). From 2023 through 2038, local government is estimated to face additional costs of approximately \$111 million, savings of \$40 million, an increase of revenue of \$145 million, and a decrease of revenue of \$93 million.

Table 43. Estimated Incremental Fiscal Impacts to Local Governments from 2023 through 2038 (2020\$)

Year	Vehicle Cost (amortized)	Tier 4 final Maintenance Costs	Contracting Costs	RD Exemption	Extended Reporting	Local Sales Tax Revenue	Total Costs	Total Cost Savings	Revenue Increase	Revenue Decrease
2023	\$12,004,010	\$0	\$0	\$0	\$0	\$76,563,868	\$12,004,010	\$0	\$76,563,868	\$0
2024	\$11,204,201	\$57,496	\$1,245,904	\$443	\$14,317	(\$5,101,338)	\$12,522,361	\$0	\$0	(\$5,101,338)
2025	\$14,992,979	\$57,496	\$1,245,904	\$443	\$14,317	\$24,165,548	\$16,311,138	\$0	\$24,165,548	\$0
2026	\$13,792,364	\$87,094	\$1,245,904	\$443	\$14,317	(\$7,657,749)	\$15,140,122	\$0	\$0	(\$7,657,749)
2027	\$20,126,155	\$87,094	\$1,245,904	\$443	\$14,317	\$40,398,124	\$21,473,913	\$0	\$40,398,124	\$0
2028	\$5,984,685	\$145,736	\$1,245,904	\$443	\$14,317	(\$13,633,122)	\$7,391,085	\$0	\$0	(\$13,633,122)
2029	\$7,370,647	\$145,736	\$1,245,904	\$443	\$70,707	\$3,738,593	\$8,833,437	\$0	\$3,738,593	\$0
2030	\$1,698,769	\$168,938	\$1,245,904	\$443	\$70,707	(\$12,010,776)	\$3,184,761	\$0	\$0	(\$12,010,776)
2031	\$2,141,858	\$168,938	\$1,245,904	\$443	\$70,707	(\$4,831,640)	\$3,627,850	\$0	\$0	(\$4,831,640)
2032	(\$5,845,566)	\$180,829	\$1,245,904	\$443	\$70,707	(\$10,547,190)	\$1,497,883	(\$5,845,566)	\$0	(\$10,547,190)
2033	(\$5,168,199)	\$180,829	\$1,245,904	\$443	\$70,707	(\$9,312,744)	\$1,497,883	(\$5,168,199)	\$0	(\$9,312,744)
2034	(\$7,061,141)	\$180,829	\$1,245,904	\$443	\$70,707	(\$8,334,956)	\$1,497,883	(\$7,061,141)	\$0	(\$8,334,956)
2035	(\$5,959,920)	\$180,829	\$1,245,904	\$443	\$70,707	(\$4,986,974)	\$1,497,883	(\$5,959,920)	\$0	(\$4,986,974)
2036	(\$6,226,495)	\$187,179	\$1,245,904	\$443	\$70,707	(\$6,531,911)	\$1,504,233	(\$6,226,495)	\$0	(\$6,531,911)
2037	(\$5,445,323)	\$187,179	\$1,245,904	\$443	\$0	(\$5,564,724)	\$1,433,526	(\$5,445,323)	\$0	(\$5,564,724)
2038	(\$4,738,096)	\$187,179	\$1,245,904	\$443	\$0	(\$4,801,916)	\$1,433,526	(\$4,738,096)	\$0	(\$4,801,916)
Total⁸⁴	\$48,870,928	\$2,203,381	\$18,688,560	\$6,645	\$637,241	\$51,551,093	\$110,851,495	(\$40,444,740)	\$144,866,133	(\$93,315,040)

⁸⁴ Note that totals may not sum due to rounding.

The Proposed Amendments are estimated to result in about \$111 million in costs from 2023-2028 that are not reimbursable pursuant to Section 6 of Article XIII B of the California Constitution and Part 7 (commencing with Section 17500) of Division 4, Title 2 of the Government Code. The direct costs from the Proposed Regulation can generally be categorized into three categories: 1) vehicles and maintenance costs, 2) contracting costs for public works awarding bodies to receive Certificates of Reported Compliance from contractors, and 3) reporting costs. The vehicle, maintenance, and reporting costs are not reimbursable because these apply generally to all entities that own and operate affected vehicles, including local agencies. The contracting requirements apply broadly to all prime contractors and all public works awarding bodies that contract for a project involving the use of vehicles subject to the Off-Road Regulation, which effectively applies to most construction-related contracting in the State where vehicles subject to the Off-Road Regulation are operating. Additionally, the contracting requirements do not require a higher level of service from public works awarding bodies because most agencies already require compliance with State law as a condition of getting a contract. Therefore, the Proposed Amendments do not constitute a “Program” imposing any unique requirements on local agencies as set forth in section 17514 of the California Government Code. The Proposed Amendments are estimated to result in savings of \$50 million from 2032-2038 primarily due to an increase in revenues from local sales tax.

The Proposed Amendments are not anticipated to have fiscal impacts in the current fiscal year, Fiscal Year 2022-2023. The fiscal impacts in calendar year 2023 are anticipated to occur in the second half of 2023 subsequent to the adoption and effective date of the Proposed Amendments. Table 44 shows the total costs, savings, revenue increases, and revenue decreases to local government for the current and next two fiscal years.

Table 44. Total Costs and Savings to Local Government in Fiscal Years 2022-2023, 2023-2024, and 2024-2025

Fiscal Year	Total Costs	Total Savings	Revenue Increase	Revenue Decrease
2022-2023	\$0	\$0	\$0	0
2023-2024	\$18,265,191	\$0	\$76,563,868	(\$2,550,669)
2024-2025	\$14,416,749	\$0	\$12,082,774	(\$2,550,669)

B. Fiscal Impact on State Government

Off-Road Diesel Vehicle Costs to Owners

The State government fleets are subject to the Tier phase-out and vehicle adding restrictions of the Proposed Amendments. Using February 2022 data from DOORS, CARB staff determined the number of vehicles owned by the State government to be one percent of the total number of vehicles reported and assumed one percent of the statewide costs in Table 37 would apply to the State government. To estimate the costs incurred by the State

government CARB applied one percent to the statewide annual vehicle capital costs in Table 37. The assumptions underlying the direct capital costs of vehicles to State government agencies are identical to those identified in Section B. Estimated Costs.

Maintenance Costs

The State government fleets are subject to the Tier phase-out and adding vehicle restrictions of the Proposed Amendments. As the State government complies with these requirements, many of these vehicles will be replaced with vehicles with Tier 4 final engines. As described in Section B. Estimated Costs, Tier 4 final engines employ technologies that require additional maintenance costs beyond what is required by older engines. CARB staff determined the number of vehicles owned by the State government to be one percent of the total number of vehicles reported to CARB and assumed one percent of the statewide costs in Table 37 would apply to the State government. To estimate the costs incurred by the State government CARB applied one percent to the statewide maintenance costs in Table 37. The assumptions underlying the direct costs of maintenance to State government agencies are identical to those identified in Section B. Estimated Costs.

State Sales Tax

Sales tax is levied in California to fund a variety of programs at the State and local levels. The Proposed Amendments would result in the sale of more expensive off-road diesel vehicles in California, which would result in a direct increase in sales tax revenue collected by the State. However, overall, State sales tax revenue may increase less than the direct increase from off-road diesel vehicle sales if overall business spending does not increase. For this analysis, staff used a combined State and local sales tax rate of 8.74 percent, which is a weighted average based on county-level output, with 3.94 percent⁸⁵ going toward State sales tax and 4.8 percent⁸⁶ going toward local sales tax.

Contracting Costs

The Proposed Amendments require that public works awarding bodies verify fleet compliance by obtaining and reviewing the Certificate of Reported Compliance from all known fleets bidding on a contract and only enter into contracts with fleets compliant with the regulation. These requirements have costs that affect the direct costs on the State government. Using the assumptions and cost analysis described in Section B. Estimated Costs, CARB staff determined that one percent of the projects that would be subject to these requirements would be occurring at the State level.

⁸⁵ California Department of Tax and Fee Administration. (2022). Detailed Description of the Sales & Use Tax Rate. California Department of Tax and Fee Administration. Retrieved March 11, 2022, from [Detailed Description of the Sales & Use Tax Rate \(ca.gov\)](#).

⁸⁶ California Department of Tax and Fee Administration. (2022). California City & County Sales & Use Tax Rates, April 1, 2022. Retrieved February 22, 2023, from California City & County Sales & Use Tax Rates. [California City & County Sales & Use Tax Rates](#).

Renewable Diesel Exemption Costs

State government fleets own and operate vehicles subject to the RD requirements of the Proposed Amendments. The Proposed Amendments include exemptions from the RD requirements for fleets that operate in places with extremely cold temperatures, that could be unsuitable for the use of RD. These exemptions have costs related to reporting that affect the direct costs on the State government. CARB staff determined the number of vehicles owned by the State government to be one percent of the total number of vehicles reported and assumed one percent of the statewide costs in Table 37 would apply to the State government. To estimate the costs incurred by the State government CARB applied one percent to the statewide RD exemption costs in Table 37. The underlying assumptions for calculating the direct costs of the RD exemption costs to the State government agencies are identical to those identified in Section B. Estimated Costs.

Extended Reporting Costs

State government fleets own and operate vehicles subject to the annual reporting requirements of the Proposed Amendments. The Proposed Amendments extend the existing annual reporting requirement through 2036. This annual reporting has direct costs to the State government. CARB staff determined the number of vehicles owned by the State government to be three percent of the total number of vehicles reported and assumed one percent of the statewide costs in Table 37 would apply to the State government. To estimate the costs incurred by the State government CARB applied one percent to the statewide extended annual reporting costs in Table 37. The underlying assumptions for calculating the direct costs of the extended annual reporting of the State government agencies are identical to those identified in Section B. Estimated Costs.

Cost to CARB

Additional Staffing

Table 45 displays the additional permanent, full-time CARB staff that are needed to successfully implement and enforce the Proposed Amendments in 2024. Table 46 shows the estimated staffing costs expected to be incurred by CARB from 2023 through 2038. The Proposed Amendments will increase the number of enforcement referrals that CARB receives resulting from the new contracting and prime contractor requirements, which will increase fleet audits. Additional staff are also needed for outreach and compliance assistance to newly regulated prime contractors and public works awarding bodies, and development and maintenance of compliance assistance tools.

Table 45. Number of Additional CARB Positions Required and Costs in 2024

Position	Number of Positions	Initial Budget Year Cost (Annual Salary plus Benefits per Position)	Ongoing Cost (Annual Salary plus Benefits per Position)
Air Pollution Specialist	3	\$211,000	\$210,000
Air Resources Technician II	4	\$105,000	\$104,000

Table 46. Estimated Additional Annual Staffing Costs Incurred by CARB from 2023 through 2038

Year	Annual CARB Staffing Cost
2023	\$0
2024	\$1,053,000
2025	\$1,046,000
2026	\$1,046,000
2027	\$1,046,000
2028	\$1,046,000
2029	\$1,046,000
2030	\$1,046,000
2031	\$1,046,000
2032	\$1,046,000
2033	\$1,046,000
2034	\$1,046,000
2035	\$1,046,000
2036	\$1,046,000
2037	\$1,046,000
2038	\$1,046,000
Total	\$15,697,000

Fiscal Impacts on State Government

Table 47 shows the estimated incremental fiscal impacts to the State government due to the Proposed Amendments, based on the fiscal aspect explained above. Costs (expenditures) to the State government are shown as a positive number, and cost savings are shown as a negative number (in parenthesis). State sales tax revenue is shown as a positive number when there is an increase in revenue, and a negative number when there is a decrease in revenue (in parenthesis). From 2023 through 2038, State government is estimated to face additional costs of approximately \$47 million, savings of \$13 million, an increase of revenue of \$119 million, and a decrease of revenue of \$77 million.

The vehicle and maintenance costs will not be spread equally across all State government agencies. Based on data reported in DOORS, the California Department of Transportation owns and operates about 40 percent of all the State-owned vehicles and, along with the California Department of General Services, does the most public works contracting that would be subject to the Proposed Amendments. Other agencies that will be impacted by the Proposed Amendments include, but are not limited to, the California Department of Forestry and Fire Protection and the California Department of Parks and Recreation, each of which have approximately 7 percent of reported State-owned vehicles, and the California Department of Fish and Wildlife, which has approximately 6 percent of reported State-owned vehicles.

Table 47. Estimated Incremental Fiscal Impact on State Government from 2023 through 2038 (2020\$)

Year	Vehicle Cost (amortized)	Tier 4 final Maintenance Costs	Contracting Costs	RD Exemption	Extended Reporting	State Sales Tax Revenue	CARB Personnel Cost	Total Costs	Total Cost Savings	Revenue Increase	Revenue Decrease
2023	\$4,001,337	\$0	\$0	\$0	\$0	\$62,846,175	\$0	\$4,001,337	\$0	\$62,846,175	\$0
2024	\$3,734,734	\$19,165	\$12,585	\$148	\$4,772	(\$4,187,348)	\$1,053,000	\$4,824,404	\$0	\$0	(\$4,187,348)
2025	\$4,997,660	\$19,165	\$12,585	\$148	\$4,772	\$19,835,887	\$1,046,000	\$6,080,330	\$0	\$19,835,887	\$0
2026	\$4,597,455	\$29,031	\$12,585	\$148	\$4,772	(\$6,285,735)	\$1,046,000	\$5,689,991	\$0	\$0	(\$6,285,735)
2027	\$6,708,718	\$29,031	\$12,585	\$148	\$4,772	\$33,160,127	\$1,046,000	\$7,801,255	\$0	\$33,160,127	\$0
2028	\$1,994,895	\$48,579	\$12,585	\$148	\$4,772	(\$11,190,521)	\$1,046,000	\$3,106,979	\$0	\$0	(\$11,190,521)
2029	\$2,456,882	\$48,579	\$12,585	\$148	\$23,569	\$3,068,762	\$1,046,000	\$3,587,763	\$0	\$3,068,762	\$0
2030	\$566,256	\$56,313	\$12,585	\$148	\$23,569	(\$9,858,845)	\$1,046,000	\$1,704,871	\$0	\$0	(\$9,858,845)
2031	\$713,953	\$56,313	\$12,585	\$148	\$23,569	(\$3,965,971)	\$1,046,000	\$1,852,567	\$0	\$0	(\$3,965,971)
2032	(\$1,948,522)	\$60,276	\$12,585	\$148	\$23,569	(\$8,657,485)	\$1,046,000	\$1,142,578	(\$1,948,522)	\$0	(\$8,657,485)
2033	(\$1,722,733)	\$60,276	\$12,585	\$148	\$23,569	(\$7,644,211)	\$1,046,000	\$1,142,578	(\$1,722,733)	\$0	(\$7,644,211)
2034	(\$2,353,714)	\$60,276	\$12,585	\$148	\$23,569	(\$6,841,610)	\$1,046,000	\$1,142,578	(\$2,353,714)	\$0	(\$6,841,610)
2035	(\$1,986,640)	\$60,276	\$12,585	\$148	\$23,569	(\$4,093,475)	\$1,046,000	\$1,142,578	(\$1,986,640)	\$0	(\$4,093,475)
2036	(\$2,075,498)	\$62,393	\$12,585	\$148	\$23,569	(\$5,361,610)	\$1,046,000	\$1,144,695	(\$2,075,498)	\$0	(\$5,361,610)
2037	(\$1,815,108)	\$62,393	\$12,585	\$148	\$0	(\$4,567,711)	\$1,046,000	\$1,121,126	(\$1,815,108)	\$0	(\$4,567,711)
2038	(\$1,579,365)	\$62,393	\$12,585	\$148	\$0	(\$3,941,573)	\$1,046,000	\$1,121,126	(\$1,579,365)	\$0	(\$3,941,573)
Total⁸⁷	\$16,290,309	\$734,461	\$188,775	\$2,216	\$212,412	\$42,314,855	\$15,697,000	\$46,606,754	(\$13,481,580)	\$118,910,951	(\$76,596,096)

⁸⁷ Note that totals may not add due to rounding.

The Proposed Amendments are not anticipated to have impacts in the current fiscal year (Fiscal Year 2022-2023). The impacts in calendar year 2023 are anticipated to occur in the second half of 2023, subsequent to the adoption and effective date of the Proposed Amendments. Table 48 shows the total costs, savings, revenue increases, and revenue decreases to the State government for the current and next two fiscal years.

Table 48. Total Costs and Savings to State Government in Fiscal Years 2022-2023, 2023-2024, and 2024-2025

Fiscal Year	Total Costs	Total Savings	Revenue Increase	Revenue Decrease
2022-2023	\$0	\$0	\$0	0
2023-2024	\$6,413,539	\$0	\$62,846,175	(\$2,093,674)
2024-2025	\$5,452,367	\$0	\$9,917,943	(\$2,093,674)

C. Federal Government

CARB staff do not anticipate any additional fiscal impact on federal government agencies other than the direct costs discussed below and shown in Table 49.

Off-Road Diesel Vehicle Costs to Owners

The Federal government owns and operates vehicles subject to the Tier phase-out and additional vehicle restrictions of the Proposed Amendments. Using February 2022 data from DOORS, CARB staff determined the number of vehicles owned by the Federal government to be one percent of the total number of vehicles reported to CARB and assumed one percent of the statewide costs in Table 37 would apply to the Federal government. To estimate the costs incurred by the Federal government CARB applied one percent to the statewide annual vehicle capital costs in Table 37. The underlying assumptions for calculating the direct capital costs of vehicles owned by Federal government agencies are identical to those identified in Section B. Estimated Costs.

Maintenance Costs

The Federal government owns and operates vehicles subject to the Tier phase-out and adding vehicle restrictions of the Proposed Amendments. As the Federal government complies with these requirements, many of the affected vehicles will be replaced with vehicles with Tier 4 final engines. As described in Section B. Estimated Costs, Tier 4 final engines employ technologies that require additional maintenance costs beyond what is required by older engines. CARB staff determined the number of vehicles owned by the Federal government to be one percent of the total number of vehicles reported and assumed one percent of the statewide costs in Table 37 would apply to the Federal government. To estimate the costs incurred by the Federal government CARB applied one percent to the statewide maintenance costs in Table 37. The underlying assumptions for

calculating the direct costs of maintenance to Federal government agencies are identical to those identified in Section B. Estimated Costs.

Renewable Diesel Exemption Costs

Federal government fleets own and operate vehicles subject to the RD requirements of the Proposed Amendments. The Proposed Amendments include exemptions from the RD requirements for fleets that operate in places with extremely cold temperatures, that could be unsuitable for the use of RD. These exemptions have costs related to reporting that affect the direct costs on the Federal government. CARB staff determined the number of vehicles owned by the Federal government to be one percent of the total number of vehicles reported and assumed one percent of the statewide costs in Table 37 would apply to the Federal government. To estimate the costs incurred by the Federal government CARB applied one percent to the statewide RD exemption costs in Table 37. The underlying assumptions for calculating the direct costs of the RD exemption costs to the Federal government agencies are identical to those identified in Section B. Estimated Costs.

Extended Reporting Costs

The Federal government fleets own and operate vehicles subject to the annual reporting requirements of the Proposed Amendments. The Proposed Amendments extend the existing annual reporting requirement through 2036. This annual reporting has direct costs to the Federal government. CARB staff determined the number of vehicles owned by the Federal government to be one percent of the total number of vehicles reported and assumed one percent of the statewide costs in Table 37 would apply to the Federal government. To estimate the costs incurred by the Federal government CARB applied one percent to the statewide extended annual reporting costs in Table 37. The underlying assumptions for calculating the direct costs of the extended annual reporting to the Federal government are identical to those identified in Section B. Estimated Costs.

Direct Costs to the Federal Government

Table 49 shows the estimated incremental direct costs to the Federal government due to the Proposed Amendments, based on the fiscal aspect explained above. CARB staff did not attribute costs from the contracting requirements to the Federal government because projects under the complete and direct control of the Federal government will not be required to comply with those requirements. Costs (expenditures) to the Federal government are shown as positive numbers and savings to the Federal government are shown as negative numbers (in parenthesis). The total direct costs, defined as total costs minus total cost savings, to the Federal government are estimated to be about \$12.8 million in costs over the first three years of the regulation, due to vehicle purchase costs, and a cumulative net cost of about \$17 million over the regulatory horizon. Total costs for the Proposed Amendments are \$30.7 million cumulatively over the regulatory horizon.

Table 49. Estimated Incremental Direct Costs to the Federal Government from 2023 through 2038 (2020\$)

Year	Vehicle Cost (amortized)	Tier 4 final Maintenance Costs	RD Exemption	Extended Reporting	Total Costs	Total Cost Savings	Total Net Costs
2023	\$4,001,337	\$0	\$0	\$0	\$4,001,337	\$0	\$4,001,337
2024	\$3,734,734	\$19,165	\$148	\$4,772	\$3,758,819	\$0	\$3,758,819
2025	\$4,997,660	\$19,165	\$148	\$4,772	\$5,021,745	\$0	\$5,021,745
2026	\$4,597,455	\$29,031	\$148	\$4,772	\$4,631,406	\$0	\$4,631,406
2027	\$6,708,718	\$29,031	\$148	\$4,772	\$6,742,670	\$0	\$6,742,670
2028	\$1,994,895	\$48,579	\$148	\$4,772	\$2,048,394	\$0	\$2,048,394
2029	\$2,456,882	\$48,579	\$148	\$23,569	\$2,529,178	\$0	\$2,529,178
2030	\$566,256	\$56,313	\$148	\$23,569	\$646,286	\$0	\$646,286
2031	\$713,953	\$56,313	\$148	\$23,569	\$793,982	\$0	\$793,982
2032	(\$1,948,522)	\$60,276	\$148	\$23,569	\$83,993	(\$1,948,522)	(\$1,864,529)
2033	(\$1,722,733)	\$60,276	\$148	\$23,569	\$83,993	(\$1,722,733)	(\$1,638,740)
2034	(\$2,353,714)	\$60,276	\$148	\$23,569	\$83,993	(\$2,353,714)	(\$2,269,721)
2035	(\$1,986,640)	\$60,276	\$148	\$23,569	\$83,993	(\$1,986,640)	(\$1,902,647)
2036	(\$2,075,498)	\$62,393	\$148	\$23,569	\$86,110	(\$2,075,498)	(\$1,989,389)
2037	(\$1,815,108)	\$62,393	\$148	\$0	\$62,541	(\$1,815,108)	(\$1,752,567)
2038	(\$1,579,365)	\$62,393	\$148	\$0	\$62,541	(\$1,579,365)	(\$1,516,825)
Total⁸⁸	\$16,290,309	\$734,461	\$2,216	\$212,412	\$30,720,979	(\$13,481,580)	\$17,239,398

⁸⁸ Note that totals may not add due to rounding.